

**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES  
KADAPA**

**INDEX**

<b>S.NO.</b>	<b>TITLE</b>	<b>PAGE NO.</b>
1	Course Outcomes	2-74
2	R15 Syllabus	75-841

# ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES KADAPA

## DEPARTMENT:- ELECTRONICS & COMMUNICATION ENGINEERING

### COURSE OUTCOMES

**REGULATION : R15**

Year/Sem .	S.No.	Subject Name	SUB CODE	COURSE OUTCOMES	
	1	MATHEMATIC S-III	15A54301	<b>CO1</b>	Explain the concepts of matrices and its applications
				<b>CO2</b>	Able to solve the algebraic and transcendental equations using numerical methods
				<b>CO3</b>	Able to understand interpolation and extrapolation and apply the appropriate methods to solve the problems
				<b>CO4</b>	Construct the different types of curves by using the different numerical techniques.
				<b>CO5</b>	Solve the ordinary differential equations by applying the various numerical techniques
	2	ELECTRONIC DEVICES AND CIRCUITS	15A04301	<b>CO1</b>	Analyze the Junction Diode Characteristics, Special Semiconductor Diodes characteristics and applications.
				<b>CO2</b>	To understand the concept of Rectifiers and analyze using Filters
				<b>CO3</b>	Design and analyze the DC bias circuitry of BJT and FET.
				<b>CO4</b>	To understand and analyze Transistor Biasing and Thermal Stabilization for BJT and FET.
				<b>CO5</b>	To understand and apply Small Signal Low Frequency Transistor Amplifier Models
	3	SWITCHING THEORY AND LOGIC	15A04302	<b>CO1</b>	To understand and analyze the different types of number systems and the Boolean algebra and its simplification.
				<b>CO2</b>	To understand and analyze the K – map and tabular simplification techniques
				<b>CO3</b>	To understand the concepts and study the procedures for the analysis and design of combinational circuits

<b>II YEAR- I SEM</b>		DESIGN		<b>CO4</b>	To understand the concepts and study the procedures for the analysis and design of synchronous and asynchronous sequential circuits
				<b>CO5</b>	To understand the concepts different memory systems and study the procedures for the analysis and design of Programmable logic devices
	4	SIGNALS AND SYSTEMS	15A04303	<b>CO1</b>	To Understand Signals and systems and make use of Integer & differential equations.
				<b>CO2</b>	Analysis of signals using Continuous time Fourier Transform and Fourier series
				<b>CO3</b>	To Understand concept of convolution for Signal Transmission Through linear Systems
				<b>CO4</b>	Analysis of signals using Discrete Fourier Transform
				<b>CO5</b>	To Understand and analyze discrete time signals using Z-transform.
	5	PROBABILITY THEORY & STOCHASTIC PROCESSES	15A04304	<b>CO1</b>	To understand the concept of a Random Variable and operations that may be performed on a single Random variable
				<b>CO2</b>	To understand the concept of a Multiple Random Variable and operations that may be performed on a single Multiple Random variable
				<b>CO3</b>	To determine the temporal characteristics of random signal response of a given linear system.
				<b>CO4</b>	To determine the spectral characteristics of random signal response of a given linear system
				<b>CO5</b>	To understand Linear Systems with Random inputs
	6	ELECTRICAL TECHNOLOGY	15A02306	<b>CO1</b>	To Understand DC Generators and its operation
				<b>CO2</b>	To Understand D.C. Motors, and its operation
				<b>CO3</b>	To Understand Single Phase transformers.
				<b>CO4</b>	To Understand 3-Phase Induction Motors
				<b>CO5</b>	To Understand Synchronous Machines
	7	ELECTRICAL TECHNOLOGY AND BASIC SIMULATION LABORATORY	15A02307	<b>CO1</b>	perform the Characteristics of D.C. Shunt Generator
				<b>CO2</b>	Perform various operations on signals
				<b>CO3</b>	Verify the properties of LTI system and its response for different inputs.
				<b>CO4</b>	Analyze the signals using various transforms

				<b>CO5</b>	Analyze the characteristics of signals in noisy environment.
	8	ELECTRONIC DEVICES AND CIRCUITS LABORATORY	15A04305	<b>CO1</b>	Get knowledge about Semiconductor devices and also learn the current and voltage characteristics of various devices.
				<b>CO2</b>	Get knowledge about different types rectifiers and filters along with their efficiency and ripple factors.
				<b>CO3</b>	Learn about different types of BJT Transistor configurations along with current and voltage characteristics
				<b>CO4</b>	Learn about different types of FET Transistor configurations along with current and voltage characteristics
				<b>CO5</b>	Get knowledge about small signal low frequency BJT Transistor amplifiers along with their h-parameters.
	1	COMPUTER ORGANIZATION	15A05402	<b>CO1</b>	Describe fundamental organization and functional components of computer.
				<b>CO2</b>	Explain addressing modes, Instruction formats and program control statements.
				<b>CO3</b>	To understand basic concepts of Micro programmed control, and Binary arithmetic operations.
				<b>CO4</b>	Describe the organization of Various parts of Memory Hierarchy.
				<b>CO5</b>	To understand the fundamentals of pipelining and vector processing.
	2	SOCIAL VALUES & ETHICS	15A99501	<b>CO1</b>	Able recall family, and human values and compare his family with others and analyse the
				<b>CO2</b>	Classify the fundamental Rights and fundamental duties of citizen Influence the factors affecting youth crime..
				<b>CO3</b>	Explain the Environmental issues and Justify the objectives of civil defense.
				<b>CO4</b>	Demonstrate Gender inequality, Domestic violence and Appraise the government schemes ,laws.
				<b>CO5</b>	Importance the games ,sports, and benefits of exercise, Recommend the yoga asanas ,mudras and pranayama .
				<b>CO1</b>	To Approximate parametric equations for the calculation in the far field region.

<b>III YEAR I-SEM</b>	3	ANTENNA &WAVE PROPAGATIO N	15A04501	<b>CO2</b>	Remember and apply parametric integral expressions for a given current source.
				<b>CO3</b>	Understand and Evaluate electromagnetic fields for a given vector potential.
				<b>CO4</b>	Analyze and create pattern multiplication principle for array antennas.
				<b>CO5</b>	To understand and analyze Wave Propagation
	4	LINEAR INTEGRATED CIRCUITS AND APPLICATION S	15A04503	<b>CO1</b>	To Understand the basic building blocks of linear integrated circuits and its characteristics.
				<b>CO2</b>	To Analyzethelinear,non-linearandspecializedapplicationsofoperational amplifiers.
				<b>CO3</b>	To Realize the importance of Operational Amplifier.
				<b>CO4</b>	To Analyze and Understand the importance of Oscillators
				<b>CO5</b>	To Understand the concept of ADC and DAC
	5	DIGITAL COMMUNICA TION SYSTEM	15A04502	<b>CO1</b>	To Understand the elements of DCS & the fundamentals concepts of sampling theorem along with different coding and modulation techniques
				<b>CO2</b>	To Understand the basic principles of baseband and pass band digital modulation schemes
				<b>CO3</b>	To Analyze probability of error performance of digital systems and are able to design digital communication systems.
				<b>CO4</b>	To Analyze and Understand Pass band Data Transmission.
				<b>CO5</b>	To understand and apply Channel Coding
	6	MEMS & MICRO SYSTEMS	15A04506	<b>CO1</b>	Describe about introduction to mems and Microsystems and properties and materials for MEMS devices
				<b>CO2</b>	Explain about different micro machining technique and fabrication of Mems devices
				<b>CO3</b>	Explain about different micro sensors and applications of Mems Sensors.
				<b>CO4</b>	Describe different Mems accelerometer and case study on Mems applications.
				<b>CO5</b>	Explain about Mems applications
		DIGITAL		<b>CO1</b>	Capable of using Computer-aided design tools to model, simulate, verify, analyze, and synthesize complex digital logic circuits.
				<b>CO2</b>	To Efficiently design any Digital System using basic structure ICs

	7	SYSTEM DESIGN	15A04504	CO3	To Able to design and prototype with standard cell technology and programmable logic
				CO4	To Apply design test for digital logic circuits, and design forttest ability.
				CO5	To Design examples using VHDL
	8	IC Applications Laboratory	15A04507	CO1	Classify different storage devices and indexing methods.
				CO2	Design analog circuits for practical applications using Op Amp IC-741
				CO3	Design waveform generators and PLL circuits using ICs
				CO4	Design multi vibrators using IC555 and Schmitt trigger using IC741
				CO5	Analyze the practical applications of Voltage Regulator using various ICs.
	9	Digital Communication Systems Laboratory	15A04508	CO1	The students will be able to experience real time behavior of different digital modulation schemes
				CO2	Experiment with the principle of PCM, DPCM, DM, ADM and TDM
				CO3	Analyze different digital modulation and demodulation schemes.
				CO4	Analyze Spectral characteristics of PAM, PWM and QAM
				CO5	Experiment with OFDM generation and detection
	1	EMBEDDED SYSTEMS	15A04702	CO1	To Design & Understanding of embedded systems leading to 32-bit application development.
				CO2	Analyze and implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.
				CO3	Understand hardware-interfacing concepts to connect digital as well as analog sensors while ensuring low power considerations.
				CO4	Analyze and Create Microcontroller to communicate with external sensors and actuators in real world.
				CO5	Understand Embedded Networking and IoT concepts based upon connected MCUs and Apply it in RTOS
	2	OPTICAL FIBER COMMUNICATION	15A04701	CO1	Understand basic fundamental theory of fiber optics.
				CO2	Discuss the channel impairments like attenuation, scattering losses, bending losses and dispersion.
				CO3	Demonstrate basic mechanism of light generation.
				CO4	Analyze the detection of light.

<b>IV YEAR I SEM</b>				<b>CO5</b>	Design architectures of optical fiber communication systems
	3	MICROWAVE ENGINEERING	15A04703	<b>CO1</b>	Ability to analyze micro-wave circuits incorporating hollow, dielectric and planar waveguides, transmission lines, filters and other passive components, active devices.
				<b>CO2</b>	Ability to Use S-parameter terminology to describe circuits and to explain how microwave devices and circuits are characterized in terms of their “S”-Parameters.
				<b>CO3</b>	Ability to understanding of microwave transmission lines and how to Use microwave components such as isolators, Couplers, Circulators, Tees, Gyrators etc.
				<b>CO4</b>	Ability to understanding of microwave solid state devices
				<b>CO5</b>	Ability to understanding of microwave measurements
	4	RADAR SYSTEMS	15A04705	<b>CO1</b>	To understand the basic concepts of RADAR and Derive the Basic Radar Range equation.
				<b>CO2</b>	To understand the basic concepts of CW RADAR and FM-CW Radar.
				<b>CO3</b>	Understanding the various radars like MTI, Pulse Doppler radars.
				<b>CO4</b>	Describe the Basic concepts of Tracking in Radar and different types of Tracking techniques..
				<b>CO5</b>	Understanding the detection of radar signals in noise and Different types of Radar displays ,Duplexers.
	5	DATA COMMUNICA TIONS AND NETWORKING	15A04704	<b>CO1</b>	Understand and explain the concept of Data Communication and networks, layered architecture and their applications.
				<b>CO2</b>	Analyze and Set up protocol designing issues for Communication networks.
				<b>CO3</b>	Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.
				<b>CO4</b>	Apply various network layer techniques for designing subnets and super nets and analyze packet flow on basis of routing protocols.
				<b>CO5</b>	Understand and design application layer protocols and internet applications such as network security, Email and DNS,
				<b>CO1</b>	Able to apply the Image processing concept for various fields of engineering and real life to process as per needs & specifications.

	6	DIGITAL IMAGE PROCESSING	15A04708	CO2	Get the skills to Heuristically develop new techniques to process images of any context
				CO3	Can experiment, analyze & interpret image data /processing data.
				CO4	Can Categorize various compression techniques.
				CO5	Learnt different techniques employed for the enhancement of images
	7	Microwave and Optical Communication Laboratory	15A04711	CO1	Capable of Applying microwave Concepts/ Microwave components and test them
				CO2	Able to design and analyse an optical fiber communications link
				CO3	Measure different parameters of various microwave devices.
				CO4	Measure the Scattering Parameters of various Tee Junctions
				CO5	Measure the Antenna Patterns
	8	VLSI & Embedded Systems Laboratory	15A04711	CO1	Design and draw the internal structure of the various digital integrated circuits
				CO2	Develop VHDL/Verilog HDL source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.
				CO3	Verify the logical operations of the digital IC's (Hardware) in the laboratory
				CO4	Design and Implement Combinational Logic Circuits on FPGAs
				CO5	Design and Implement Sequential Logic Circuits on FPGAs.
	1	MATHEMATIC S-IV	15A54402	CO1	Able to get knowledge in beta and gamma functions and Techniques of Beta and Gamma functions to improper integrals, Expressing complex functions in power series, Conformal mappings and bilinear transformations
				CO2	Develop skills in Analyzing the properties exhibited by complex functions in Argand plane, Properties of real integrals through complex variable techniques, The properties of improper integrals through residue theory, Conformal transformations of complex valued functions for inferences.
				CO3	Develop skills in designing mathematical models involving Integrals of complex variable functions, Improper integrals using beta and gamma functions, Residue theory of complex functions



<b>II YEAR II SEM</b>				<b>CO4</b>	Develop analytical skills in providing solutions for problems involving Integration of complex functions, Improper real integrals
				<b>CO5</b>	Use relevant Complex variable techniques for Residues and integrals of complex functions, Improper real integrals through complex functions
	2	ELECTRONIC CIRCUIT ANALYSIS	15A04401	<b>CO1</b>	Demonstrate different feedback amplifiers including Voltage series, Voltage shunt, Current series and Current shunt Feedback amplifiers
				<b>CO2</b>	Analyze the frequency response of the BJT amplifiers at high frequencies
				<b>CO3</b>	Illustrate the parameters of Single stage and multistage amplifiers.
				<b>CO4</b>	Design and analyze different types of power amplifiers including Class-A, Class-B, Class-AB & Class –D power amplifiers and compare them in terms of Efficiency
				<b>CO5</b>	Design and analyze different types of Tuned Amplifiers
	3	DATA STRUCTURES	15A05201	<b>CO1</b>	Ability to analyze algorithms and algorithm correctness.
				<b>CO2</b>	Ability to summarize searching and sorting techniques
				<b>CO3</b>	Ability to describe stack, queue and linked list operation.
				<b>CO4</b>	Ability to have knowledge of tree and graphs concepts
				<b>CO5</b>	Ability to have knowledge of algorithms
	4	ANALOG COMMUNICA TION SYSTEMS	15A04402	<b>CO1</b>	Understand the basic concepts of the Analog communication systems.
				<b>CO2</b>	Identify and Evaluate characteristics of various analog modulation schemes including AM,FM and PM such as modulation index, bandwidth and power requirements.
				<b>CO3</b>	List and Analyze various analog continuous wave and analog pulse modulation and demodulation techniques including AM FM and PM and radio receiver characteristics.
				<b>CO4</b>	Evaluate the performance of the communication system in the presence of noise.
				<b>CO5</b>	Discuss about Information and Channel Capacity
				<b>CO1</b>	Understand basic laws of static electric fields, Maxwell's equations for electrostatic fields, problems applying laws of electrostatics.
				<b>CO2</b>	Understand basic laws of static magnetic fields, Maxwell's equations for static magnetic fields, problems applying laws of magneto statics.

5	ELECTROMAGNETIC THEORY AND TRANSMISSION LINES	15A04403	CO3	Analyze electric and magnetic fields at the interface of different media, Understand concept of wave propagation through the Maxwell's equations.
			CO4	Understand principles of reflections and refraction for different incidences, concept of power flow using Poynting vector, Brewster angle, and surface impedance.
			CO5	Describes the transmission lines with equivalent circuit and explain their characteristic with various lengths.
6	CONTROL SYSTEMS ENGINEERING	15A02303	CO1	Understand & Evaluate the transfer function of physical systems, block diagrams and signal flow graphs
			CO2	Remember and Analyze the transient & Steady state responses and its specifications their characteristics
			CO3	Determine the absolute and relative stability of a system using RH and Root loci concepts.
			CO4	Analyse & Evaluate the stability of the system and design of Bode, polar, Nyquist and compensation networks
			CO5	Describe the state variable representation of physical system and solve the state equation
7	Analog Communication Systems Laboratory	15A04404	CO1	Design analog modulation circuits as amplitude and frequency modulation.
			CO2	Understand the operations of analog and pulse modulation & demodulation techniques
			CO3	Design the circuit to sample an analog signal.
			CO4	Design of communication circuits such as AM, SSB-SC, DSB-SC, FM.
			CO5	Design various pulse modulation techniques as PAM, PPM, PWM.
8	Electronic Circuit Analysis Laboratory	15A04405	CO1	The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.
			CO2	Designing and analyzing the transistor at high frequencies.
			CO3	Design, simulate and verify feedback amplifiers and oscillators.
			CO4	Design, simulate and verify power amplifier circuits.
			CO5	Design, simulate and verify Multivibrators and Sweep Circuits.

	1	MICROPROCESSORS AND MICROCONTROLLERS	15A04601	CO1	To understand the basic Concepts and Architecture of 8086 Microprocessor.
				CO2	To understand various 8086 Instruction set, Assembler directives and able to programming with 8086.
				CO3	To understand the basic concepts of MSP 430 microcontroller and embedded systems on it.
				CO4	To understand the concepts of low power aspects of MSP 430, RTC, PWM control, DC and comparator in MSP 430.
				CO5	To understand the concepts of serial, synchronous, Asynchronous communications and different inter facing using MSP 430
	2	ELECTRONIC MEASUREMENT & INSTRUMENTATION	15A04602	CO1	Explains about static & dynamic char's and different types of meters for measurement of voltage, current and resistance
				CO2	Explains and analysis about functionality of Cathode Ray Oscilloscope and sampling oscilloscope and storage oscilloscope
				CO3	Explains about different types of signal generators and signal analyzers
				CO4	Explains about ac & dc bridges for measurement of resistance, capacitance, inductance.
				CO5	Understand different types of transducers for the measurement of displacement, R,L,C, velocity and pressure
	3	VLSI DESIGN	15A04604	CO1	To acquire Complete Knowledge about Fabrication process of ICs and To understand electrical properties of MOS circuits
				CO2	To understand the basic circuits concepts and to understand the VLSI circuit design processes
				CO3	To understand and able to design VLSI circuits as per specifications given, at gate level and to understand the physical design
				CO4	Capable of optimizing the design of Arithmetic / logic building Blocks at all levels of Design/Fabrication and to understand the VLSI design styles
				CO5	To understand the synthesis, simulation and verification tools and process of testing
		MANAGERIAL ECONOMICS		CO1	The student will able to understand various aspects of Managerial Economics
				CO2	To Analyze the financial statements and inputs.

<b>III YEAR II SEM</b>	4	AND FINANCIAL ANALYSIS	15A52301	<b>CO3</b>	To Understand the sound and effective decisions under different economic environment and market situations
				<b>CO4</b>	To Remember and Apply the Profitability, and Activity Ratios (simple problems).
				<b>CO5</b>	Methods and Evaluation of Capital Budgeting Projects
	5	DIGITAL SIGNAL PROCESSING	15A04603	<b>CO1</b>	Formulate engineering problems in terms of DSP tasks.
				<b>CO2</b>	Apply engineering problems solving strategies to DSP problems.
				<b>CO3</b>	Design and test DSP algorithms.
				<b>CO4</b>	Analyze digital and analog signals and systems.
				<b>CO5</b>	Analyze and compare different signal processing strategies
	6	MATLAB PROGRAMMI NG	15A04605	<b>CO1</b>	To able to familiarize the MATLAB Windows, syntaxes for basic computing.
				<b>CO2</b>	To understand and familiarize of Numeric, Cell and structure arrays and their operations
				<b>CO3</b>	To apply built-in and user defined functions concepts in writing MATLAB scripts in developing the solutions
				<b>CO4</b>	To use various data operators, flow controls and advanced plotting commands in writing MATLAB scripts.
				<b>CO5</b>	To differentiate underdetermined and overdetermined systems and use appropriate MATLAB commands to provide the solutions of each.
	7	Microprocessors & Microcontrollers Laboratory	15A04607	<b>CO1</b>	Can Ensure the completely use of MASM programming environment.
				<b>CO2</b>	Debug assembly language programs using 8086 assembler.
				<b>CO3</b>	Analyze the interfacing between external peripherals and 8086 microprocessor using development kit.
				<b>CO4</b>	Debug msp430 assembly language programs using CCS
				<b>CO5</b>	Analyze the interfacing between external peripherals and MSP 430 microcontroller using development kit.
				<b>CO1</b>	Find the response of a Linear time invariant discrete time system.
				<b>CO2</b>	Analyze the frequency spectrum of a discrete time signal

IV YEAR II SEM	8	Digital Signal Processing Laboratory	15A04608	CO3	Determine the spectrum of a real world signal using Fast Fourier Transform algorithm
				CO4	Design real time DSP systems and real world applications.
				CO5	Implement DSP algorithms using both fixed and floating point processors
	1	ADVANCED DIGITAL SIGNAL PROCESSING- MULTIRATE & WAVELET	15A04801	CO1	To Get complete knowledge regarding various algorithms associated with Digital signal processing and multirate signal processing.
				CO2	To Verify & Analyze the power spectral estimation by using Barlett, Welch & Blackman & Turkey methods.
				CO3	To Understand the effects of finite word length in fixed-point DSP systems by using ADC and FFT algorithms
				CO4	To Understand the Journey from the CWT to the DWT.
				CO5	To Understand Efficient signal design and realization of signals
	2	PATTERN RECOGNITION & APPLICATIONS	15A04803	CO1	To Understand the concept of a pattern and the basic approach to the development of pattern recognition and machine intelligence algorithms
				CO2	To Understand the basic methods of feature extraction, feature evaluation, and data mining
				CO3	To Understand and apply both supervised and unsupervised classification methods to detect and characterize patterns in real-world data
				CO4	To Develop prototype pattern recognition algorithms that can be used to study algorithm behavior and performance against real-world multivariate data
				CO5	To Understand the Time Varying pattern Recognitions & applications.
	3	Technical Seminar	15A04806	CO1	Identify emerging topic specific to the programme.
				CO3	Deliver the knowledge using multimedia.
				CO4	Answer the queries with appropriate explanation and elaboration.
				CO5	Compile an effective technical report, providing conclusions and proposing an appropriate future scope.
				CO1	Identify problem, conduct relevant literature survey and formalize it.

	4	Project Work	15A04807	CO2	Analyze & design efficient, cost-effective and eco-friendly solutions using relevant tools(if necessary) and processes
				CO3	Implement the design and demonstrate the functionality of developed model
				CO4	Evaluate the results to derive the conclusion and provide scope for future enhancement.
				CO5	Exhibit good interpersonal and leadership skills in meeting project deadlines with individual contribution towards progress of the project.

# ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES KADAPA

DEPARTMENT : COMPUTER SCIENCE & ENGINEERING					
COURSE OUTCOMES				REGULATION : R15	
Year/Sem .	S.No.	Subject Name	SUB CODE	COURSE OUT COMES	
	1	BASIC ELECTRICAL & ELECTRONICS ENGINEERING	15A99301	CO1	Understand basic concepts of the currents and voltage by using theorems and two-port networks.
				CO2	Analyze the performance of AC & DC Machines.
				CO3	Analyze the operating principles of major electronic devices, its characteristics and Explain different rectifiers and filters used in power supply section.
				CO4	Explain and analyze basic transistor amplifier circuits using BJT and FET.
				CO5	Design and analyze the application of BJT.
	2	MANAGERIAL ECONOMICS & FINANCIAL ANALYSIS	15A52301	CO1	To Remember the concept of Economics and its relation with other subjects and understand the demand, its forecasting methods and measurement of elasticity of demand.
				CO2	Understand the theory of production, laws of production, applying the methodology of cost analysis and breakeven point.
				CO3	Analyze the types of markets, perfect and imperfect competitions and Evaluating the forms of business organizations and LPG.
				CO4	Analyze financial accounting importance, preparation and Evaluate the Ratios with the supporting of Ratio analysis.
				CO5	Evaluate the capitalization, sources and measures of capital and creating the capital budgeting with different types.
				CO1	List & Understand numerical and character representations in digital logic including ASCII and error detecting and correcting codes and Evaluate and simplify logical functions using Boolean algebra.

II YEAR I-SEM	3	DIGITAL LOGIC DESIGN	15A04402	CO2	Explain about the Gate–Level Minimization Techniques.
				CO3	Analyze and design modular combinatorial logic circuits containing decoders, multiplexers, demultiplexers and adders.
				CO4	Analyze and design of sequential circuits by applying the functionality of flip-flops.
				CO5	Discuss about Memory and Programmable Logic & Digital Logic Circuits
	4	DISCRETE MATHEMATIC S	15A05302	CO1	Write an argument using logical notation and determine if the argument is or is not valid. able to express a logic sentence in terms of predicates, quantifiers, and logical connectives.
				CO2	Demonstrate an understanding of relations and functions and be able to determine their properties. Determine when a function is 1-1 and "onto"
				CO3	Able to apply algebraic structures such as group theory and group codes to solve the real world problems. able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.
				CO4	Demonstrate different traversal methods for trees and graphs. Model problems in Computer Science using graphs and trees..
				CO5	Apply counting principles to determine probabilities
	5	MATHEMATIC S-III	15A54301	CO1	Understand the existence of linear equations with rank knowledge
				CO2	able to apply numerical techniques to solve algebraic and transcendental equations
				CO3	able to shoot the solutions by Interpolation techniques
				CO4	able to understand how to fit a curve for the set of tabulated values
				CO5	able to find solutions Laplace equations using Finite difference approximation
				CO1	Explain the features of database management systems and Relational database. Demonstrate the basic elements of a relational database management system



	6	DATABASE MANAGEMENT SYSTEMS	15A05301	CO2	Ability to identify the data models for relevant problems.
				CO3	Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.
				CO4	Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
				CO5	Apply normalization for the development of application software & Build The indexing mechanisms for efficient retrieval of information from a database. Understand the appropriate DBMS software installation and Transform an
	7	DATABASE MANAGEMENT SYSTEMS LABORATORY	15A05303	CO1	information model into a relational database schema and to use a data definition language and/or utilities to implement the schema using a DBMS.
				CO2	use an SQL interface of a multi-user relational DBMS package to create, secure, populate, maintain, and query a database.
				CO3	Formulate query, using SQL, solutions to a broad range of query and data update problems.
	8	BASIC ELECTRICAL & ELECTRONICS LABORATORY	15A99302	CO1	Understand and compare basic electric circuit theorems with actual working circuits.
				CO2	Apply and Conduct experiments to obtain the load characteristics of D.C. Generators
				CO3	Apply and Conduct tests on D.C. motors for predetermination of efficiency
				CO4	Understand electrical model for various semiconductor devices.
				CO5	Create the practical applications of the semiconductor devices.
	1	COMPUTER NETWORKS	15A05502	CO1	Able to discuss standards, administration and Network models.
				CO2	Able to calculate the properties of physical media and Error detection and Correction methods during data transmission.
				CO3	Able to calculate the performance at Transport Layer protocols.

			CO4	Able to implement Application Layer protocols such as HTTP, DNS and SMTP.
			CO5	Able to examine the various Routing protocols, Internet Control protocols and Quality of Service.
2	OBJECT ORIENTED ANALYSIS AND DESIGN	15A05503	CO1	Illustrate the fundamentals of Object Modeling
			CO2	Explain about Classes, Objects and Relationships
			CO3	Construct object models for complex system.
			CO4	Construct class and Object diagrams using conceptual model of UML.
			CO5	Design Package, Composite structure, component and Deployment diagrams using Structural modeling
			CO6	Design Use case, Interaction, Communication and Timing diagrams using Behavioral modeling
3	OPERATING SYSTEMS	15A05501	CO1	Understand the difference between different types of modern operating systems, virtual machines and their structure of implementation and understand the difference between process & thread, issues of scheduling of applications
			CO2	user-level processes/ threads and their issues Produce customized algorithmic solutions for given synchronization problems.
			CO3	Identify the rationale behind various memory management techniques along with issues and challenges of main memory, virtual memory and file system
			CO4	Infer the performance of page replacement algorithms in various scenarios
			CO5	Understand the concepts of deadlock in operating systems and how they can be managed / avoided and implement them in multiprogramming system.
	PRINCIPLES OF PROGRAMMING LANGUAGES		CO1	Discuss software development environment, design models for programming languages and their syntax and semantics..
			CO2	Discuss structure of data types and implementation models

III YEAR I SEM	4		15A05504	CO3	Explain language constructs, pattern matching, Non determinism and backtracking, Event driven computations, concurrent computations. Describe Software Design methods for modularity and generic
				CO4	Discuss the basic concepts of Object-oriented Programming languages
				CO5	Discuss the functional, logic and rule based languages.
	5	R PROGRAMMING	15A05507	CO1	To understand the fundamentals of 'R' programming and working with Objects
				CO2	Describe the data statistical test and tabulation and Analyze simple hypothesis testing
				CO3	Design graphical analysis and formulate Notation And Complex Statistics
				CO4	Describe the analysis of variance and linear regression.
				CO5	Design the adding elements to existing plots and Describe writing your own scripts
	6	SOFTWARE TESTING	15A05505	CO1	To understand the basic Concepts & Purpose of testing.
				CO2	Classify two different types of testing and applying those methods to evaluate the testing.
				CO3	Extend the type of testing and applying those methods to evaluate the testing.
				CO4	Classify two different types of testing and applying those methods to analyze & evaluate the testing.
				CO5	Relating the previous methods to perform testing and applying those methods to evaluate the testing.
		SOCIAL		CO1	Able recall family, and human values and compare his family with others and analyse the
				CO2	Classify the fundamental Rights and fundamental duties of citizen Influence the factors affecting youth crime..

	7	VALUES AND ETHICS (AUDIT COURSE)	15A99501	CO3	Explain the Environmental issues and Justify the objectives of civil defense.
				CO4	Demonstrate Gender inequality, Domestic violence and Appraise the government schemes ,laws.
				CO5	Importance the games ,sports,and benefits of exercise, Recommend the yoga asanas ,mudras and pranayama .
	8	OBJECT ORIENTED ANALYSIS & DESIGN AND SOFTWARE TESTING LAB	15A05509	CO1	Demonstrate fundamentals of UML Tools.
				CO2	Develop Structural diagrams for modeling complex systems
				CO3	Develop Behavioral diagrams for modeling complex systems.
				CO4	Execute the working of control statements in C programming.
				CO5	Describe SRS and test cases for Banking applications and Library management system reporting bugs.
	9	OPERATING SYSTEMS LABORATORY	15A05510	CO1	Simulate the following CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority
				CO2	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked
				CO3	Simulate MVT and MFT
				CO4	Simulate all File Organization Techniques a) Single level directory b) Two level c) Hierarchical d) DAG
				CO5	Simulate Bankers Algorithm for Dead Lock Avoidance
				CO1	To define the use of Computer graphics and various technologies involved in it
				CO2	Able to construct 2D transformations, viewing techniques on a given area.

	1	COMPUTER GRAPHICS	15A05705	CO3	Analyzethe concept of 3D object surfaces, variouscurve representations on a system.
				CO4	To apply 3D geometric transformations, clippings on a given surface.
				CO5	Able to solve the various visible surface detection methods and their implementation
	2	INFORMATION SECURITY	151A05702	CO1	Describe principles and practices of cryptography
				CO2	Apply the number theory in public key cryptography
				CO3	Apply hash functions, message authentication codes and digital signature schemes in user authentication and security techniques to personal computer
				CO4	Analyze remote user authentication using symmetric encryption and asymmetric encryption
				CO5	Analyze symmetric and asymmetric cryptographic techniques
	3	MOBILE APPLICATION DEVELOPMENT	15A05703	CO1	To understand the fundamentals of android operating systems and its components
				CO2	Illustrate the various components, layouts and creating views in android applications
				CO3	Design and Analyze building blocks for android application design and Utilizing Resources
				CO4	Build android applications with widgets and Debugging application
				CO5	Illustrate Menus and Create data sharing with different applications and sending SMS.
				CO1	To understand the concepts of management its functions, theories of Motivation, Leadership and organization Structures
				CO2	To know about plant location and layout, inventory Management, PLC, channels and ASPM strategies.

IV YEAR I SEM	4	MANAGEMENT T SCIENCE	15A52601	CO3	To tell about the HRM concepts like HRP, Performance appraisal, Employee grievances, Recruitment strategies, Training and Development.
				CO4	To know about the Corporate Planning process, Environmental scanning, SWOT analysis, Program Evaluation, Review Technique and Critical Path method.
				CO5	To describe the contemporary management practices like BPR, BPO, Balance score card, six-sigma, Total Quality Management.
	5	SOFTWARE PROJECT MANAGEMENT	15A05704	CO1	Demonstrate conventional models and software cost estimation.
				CO2	Differentiate the principles of conventional software engineering with modern software management and software economics.
				CO3	Explain project organization, artifacts, of software process and workflow of software project management.
				CO4	Apply metrics for software project control, process instrumentation future software project management.
				CO5	Compare the software life cycle phases in software project management.
	6	GRID AND CLOUD COMPUTING	15A05701	CO1	Understand the basic concepts of traditional computing technologies and modern technologies.
				CO2	Understand and elaborate the open standard services for Grid Architecture. Understand and how data intensive grid service models works.
				CO3	Understand the basic concepts of virtualization and apply in grid and cloud computing environment and it gives optimum resource utilization.
				CO4	Understand the Grid and Cloud Tool Kit to program on it and also understand Hadoop concept and map reduce functions.
				CO5	Understand and apply the security model in Grid and Cloud Environment. The cloud supports SaaS, PaaS and IaaS.
		MOBILE APPLICATION DEVELOPMENT		CO1	Illustrate Download, Install and Configure Eclipse and SDK Platform for creating Android Applications
				CO2	Build a basic Android Applications using Activity class.

	7	LABORATORY	15A05711	CO3	Develop and Test the Android Application by using Text Edit control.
				CO4	Create an Android Application to choose options, play the Audio and Video clips.
				CO5	Design the Android Application for Menus and Action Bar and display Drop-Down List Action Bar
	8	GRID AND CLOUD COMPUTING LABORATORY	15A05710	CO1	Understand and use the GridSim in grid computing environment.
				CO2	Understand the basic concept of Globus Toolkit and apply grid computing programs.
				CO3	Understand the SaaS and use in cloud computing programs.
				CO4	Understand how PaaS work and apply to programs.
	1	FORMAL LANGUAGES & AUTOMATA THEORY	15A05404	CO1	Prove properties of languages, grammars and automata with formal mathematical methods. Construct Finite Automata and its types
				CO2	Construct automata to recognize whether the given language is accepted or rejected.
				CO3	Build the given grammar into Chomsky normal form and griebach normal forms.
				CO4	Analyze whether the given grammar is in well structured or not using context-free grammar
				CO5	Design Push Down Automata for a given language.
	2	COMPUTER ORGANIZATION	15A05402	CO1	Able to illustrate fundamentals of computer components. Able to explain the design issues of machine instructions, input output systems, memory systems and processor systems
				CO2	Able to calculate arithmetic operations and logical operations of a Computer
				CO3	Able to calculate performance of primary and secondary storage systems

II YEAR II SEM				CO4	Able to illustrate design issues of parallel systems
				CO5	Able to calculate performance of Parallel systems
	3	PROBABILITY AND STATISTICS	15A54401	CO1	Understand and apply the basic axioms of Probability
				CO2	ables and rules the moments of discrete & Continuous random variables
				CO3	able to analyze the problem of engineering and industry using testing of hypothesis techniques
				CO4	Apply the knowledge of SQC in industry and engineering related areas
				CO5	Able to understand the queuing techniques
	4	SOFTWARE ENGINEERING	15A05401	CO1	Define and develop a software project from requirement gathering to implementation
				CO2	Ability to code and test the software
				CO3	Understanding and analyzing and applying the Design concepts with neat details
				CO4	Analyzing and applying and create a interfaces and designing webApps
				CO5	Analyzing and evaluating components and software's
	5	MICROPROCES SORS & INTERFACING	15A04407	CO1	Understand the architecture of 8085 and 8086 microprocessor
				CO2	Explains addressing modes, instructions of 8086 and programming in 8086
				CO3	Explains about Interrupts ,Memory and I/O interfacing



			CO4	Explains features and interfacing of programmable devices
			CO5	Understand and analyze the architecture ,instructions, registers ,instructions and interfacing devices with microcontroller 8051
6	MICROPROCESSORS &INTERFACING LABORATORY	15A04408	CO1	Introduction to MASM Programming
			CO2	Simulate Arithmetic operations
			CO3	Simulate Logic operations
			CO4	Simulate string operation
			CO5	Simulate 8259 – Interrupt Controller Interfacing with 8086
7	OBJECT ORIENTED PROGRAMMING USING JAVA	15A05403	CO1	Able to understand the use of OOPs concepts.
			CO2	Able to solve real world problems using OOP techniques.
			CO3	Able to understand the use of abstraction. Able to understand the use of Packages and Interface in java.
			CO4	Able to develop and understand exception handling, multithreaded applications with synchronization
			CO5	Able to understand the use of Collection Framework. Able to design GUI based applications and develop applets for web applications. and receive clear instructions
8	JAVA PROGRAMMING LABORATORY	15A05405	CO1	Ability to solve problems using object oriented approach and implement them using Java
			CO2	Ability to write Efficient programs with multitasking ability and handle exceptions.
			CO3	Create user friendly interface

				CO4	Creating and Understanding the usage of user defined packages
				CO5	Ability to create GUI based applications using AWT and Swings
	1	COMPILER DESIGN	15A05601	CO1	To understand the basic Concepts of phases of compiler and its process (LEX & YACC Tools).
				CO2	Design and Analyze the parsers and learn to how different parsers are constructed and evaluated for the requirements of application fields.
				CO3	Construct the intermediate code representations and generation.
				CO4	Understand the runtime storage organization and symbol table organization
				CO5	Convert source code for a novel language into machine code for a novel computer
	2	DESIGN PATTERNS	15A05603	CO1	To understand the fundamentals of design patterns and organize the catalog of design patterns.
				CO2	Implement behavioral patterns to design a document editor supporting multiple look & feel standards.
				CO3	Explain the structural patterns included by adapter, bridge, composite, decorator, façade, flyweight and proxy
				CO4	Examine the behavioral patterns to recognize the chain of responsibility, command, interpreter and observer
				CO5	Choose behavioral patterns with state, strategy and template method
	3	DATA WAREHOUSE AND MINING	15A05602	CO1	Able to describe the basic concepts of data warehouse, data mining systems, and application oriented database.
				CO2	Able to apply pre-processing techniques on data
				CO3	Able to implement data warehouse and OLAP techniques for data mining.

III YEAR II SEM				CO4	Able to apply association methods for data mining.
				CO5	Able to apply classification methods for data mining.
	4	DESIGN AND ANALYSIS OF ALGORITHMS	15A05604	CO1	Analyze the time and space complexity of a given algorithm and apply Divide-and-Conquer design approach to solve the problems
				CO2	Apply Greedy method and Dynamic Programming Techniques to solve the optimization problems.
				CO3	Able to apply Back tracking technique for solving constraint satisfaction problems.
				CO4	Able to understand basics of tree, graphs NP complete problem.
				CO5	Apply Branch and Bound design technique to solve combinatorial optimization problems
	5	WEB AND INTERNET TECHNOLOGIES	15A05605	CO1	Ability to create dynamic and interactive web sites
				CO2	Gain knowledge of client side scripting using javascript and DHTML
				CO3	To create dynamic and interactive web pages with PHP
				CO4	To Demonstrate understanding of XML and analyze how to parse and use XML data
				CO5	To design rich client presentation using AJAX and understand web services concept
	6	LINUX ENVIRONMENT SYSTEM	15A05607	CO1	Students will be able to understand the basic commands of Linux operating system and can write shell scripts
				CO2	Students will be able to create file systems and directories and operate them
				CO3	Students will be able to create processes background and fore ground etc..by fork() system calls

				CO4	Students will be create shared memory segments, pipes ,message queues and can exercise inter process communication
				CO5	Students can able to perform disk partition and able to apply core system services
	7	DATA WAREHOUSIN G & MINING LABORATORY	15A05610	CO1	Able to demonstrate WEKA Tool. Able to Identify the attribute types of datasets using WEKA.
				CO2	Able to explore association rule mining on data sets.
				CO3	Able to explore Classification on data sets.
				CO4	Able to apply Clustering techniques on data sets
				CO5	Able to interpret Regression models on Data sets.
	8	WEB AND INTERNET TECHNOLOGIE S LABORATORY	15A05609	CO1	To create basic web page using HTML5 and its Elements
				CO2	To Design and build a Web page using CSS3 embedded with HTML5
				CO3	To interpret and Develop interactive web page at client side using Javascript
				CO4	To Build a Web page with Server Programming using Java Servlet and JSP
				CO5	To Develop a PHP program and apply with the Database to server programming
				CO6	Illustrate and construct XML DTD and its Schema
	1	ENABLING TECHNOLOGIE S FOR DATA SCIENCE ANALYTICS: IOT	15A05805	CO1	Understand the IoT concepts and Applications.
				CO2	Understand and analyze IoT system Management.
				CO3	Design and analysis of IoT system and its applications.
				CO4	Understand Hadoop concept and IEEE 802 committee family of protocols.
				CO5	Understand, analyze and design of Zigbee.
				CO1	To understand the basic Concepts of Wireless Sensor Networks.

IV YEAR II SEM	2	MOBILE COMPUTING	15A05502	CO2	Design and Analyze Wired and wireless sensor networks (Ad-Hoc Wireless Networks ) and learn to how the MAC Protocols are suitable for wireless networks by assessing the requirements of application fields.
				CO3	Demonstrate basic skills for Routing Protocols and Transport Layer and Security Protocols.
				CO4	Understand the fundamentals of Quality of service and energy management in wireless sensor networks.
				CO5	Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks
	3	SEMINAR	15A05808	CO }	The students will be able to recall existing technologies in the area of computer science
				CO2	The students will be able to describe, compare and evaluate different technologies
				CO3	The students will be able to decide the area of interest
				CO4	The students will be able to develop their communication skills
				CO5	The students will be able to write technical reports.
	4	Project	15A05809	CO1	Graduates will be able to identify and define problems in the area of Computer science
				CO2	Graduates will be able to explain and illustrate their practical skills needed to understand and
				CO3	Graduates will get a chance to apply current technologies and develop applications for the problems.
				CO4	Graduates will get opportunities to practice as teams on multidisciplinary projects with effective writing and communication skills.
				CO5	Able to apply the engineering and management principles to achieve the goal of the project

# ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES KADAPA

DEPARTMENT: ELECTRICAL & ELECTRONICS ENGINEERING					
COURSE OUTCOMES				REGULATION: R-15	
Year/Sem.	S.No.	Subject Name	SUB CODE		
	1	MATHEMATICS –III	15A54301	CO1	Explain the concepts of matrices and its applications
				CO2	Able to solve the algebraic and transcendental equations using numerical methods
				CO3	Able to understand interpolation and extrapolation and apply the appropriate methods to solve the problems
				CO4	Construct the different types of curves by using the different numerical techniques.
				CO5	Solve the ordinary differential equations by applying the various numerical techniques
	2	ELECTRICAL CIRCUITS – II	15A02301	CO1	To understand and determine the transient response of R-L, R-C, R-L-C series circuits for D.C. and A.C. excitations
				CO2	To analyze of three phase balanced and unbalanced circuits and to measure active and reactive power in three phase circuits
				CO3	To apply of Fourier transforms to electrical circuits excited by non-sinusoidal sources

<b>II YEAR</b>				<b>CO4</b>	Study of Network topology, Analysis of Electrical Networks, Duality and Dual Networks
				<b>CO5</b>	To design and analyze Different types of filters and equalizers
	3	ELECTRICAL MACHINES – I	15A02302	<b>CO1</b>	Able to analyze the energy balance equation of electro magnetic systems
				<b>CO2</b>	Understanding and analyzing of Construction, working, effect of armature reaction and commutation process of dc generators
				<b>CO3</b>	Understanding the classification of generators and analyzing the characteristics and paralleling the DC generators
				<b>CO4</b>	Understanding, analyzing the DC motors and starters
				<b>CO5</b>	Able to perform the different tests on dc motors and and determine the performance
	4	CONTROL SYSTEMS ENGINEERING	15A02303	<b>CO1</b>	Understand & Evaluate the transfer function of physical systems, block diagrams and signal flow graphs
				<b>CO2</b>	Remember and Analyze the transient & Steady state responses and its specifications their characteristics
				<b>CO3</b>	Determine the absolute and relative stability of a system using RH and Root loci concepts.
				<b>CO4</b>	Analyse & Evaluate the stability of the system and design of Bode, polar, Nyquist and compensation networks

ISEM				<b>CO5</b>	Describe the state variable representation of physical system and solve the state equation
	5	ELECTRONIC DEVICES & CIRCUITS	15A04301	<b>CO1</b>	Analyze the Junction Diode Characteristics, Special Semiconductor Diodes characteristics and applications.
				<b>CO2</b>	To understand the concept of Rectifiers and analyze using Filters
				<b>CO3</b>	Design and analyze the DC bias circuitry of BJT and FET.
				<b>CO4</b>	To understand and analyze Transistor Biasing and Thermal Stabilization for BJT and FET.
				<b>CO5</b>	To understand and apply Small Signal Low Frequency Transistor Amplifier Models
	6	DATA STRUCTURES	15A05201	<b>CO1</b>	Ability to analyze algorithms and algorithm concepts
				<b>CO2</b>	Ability to apply basic concepts about arrays, linkedlist, stacks, queues.
				<b>CO3</b>	Ability to design trees and graphs.
				<b>CO4</b>	Ability to solve the concepts about searching and sorting techniques
				<b>CO5</b>	Ability to build new data structures according to given problem
	7	ELECTRICAL CIRCUITS SIMULATION	15A02305	<b>CO1</b>	Explain Electric Circuit Concepts By Interpreting The Simulation Results
				<b>CO2</b>	Design And Analyze Electrical Circuits Experimentally Using Simulation Tools.
				<b>CO3</b>	Apply Network Theorems To Electrical Circuits To Simplify The Circuits



		LABORATORY		<b>CO4</b>	Design Rl, Rc And Rlc Circuits For Specified Transient Response And Design Rlc Series Circuit For Specified Frequency Response
				<b>CO5</b>	Analyse Three Phase Balanced And Unbalanced Circuits
	8	ELECTRONIC DEVICES & CIRCUITS LABORATORY	15A04305	<b>CO1</b>	Get Knowledge About P-N Junction Diode And Germanium Diode And Also Their Cut In Voltage, Diode Resistances Based On V-I Characteristics.
				<b>CO2</b>	Get Knowledge About Zener Diode And Also Their Cut In Voltage, Diode Resistances Based On V-I Characteristics.
				<b>CO3</b>	Learn About Functioning Of Rectifiers With And Without Load And Also Calculate Their Ripple Factor And Efficiency.
				<b>CO4</b>	Learn About Cb,Ce Configuration With Static And Dynamic Characteristics
				<b>CO5</b>	Learn About Fet Configuration With Static And Dynamic Characteristics
				<b>CO1</b>	Understand the concepts of various voltmeter and ammeter instruments and functional concepts of Cathode Ray Oscilloscope and its applications.
				<b>CO2</b>	Analyse the various methods of measurement of resistance, inductance and capacitance using bridge concepts.

	1	ELECTRICAL MEASUREMENTS	15A02501	CO3	Understand and analyse the measurement of power, power factor and energy with functional descriptions.
				CO4	Design and analyses of instrument transformers and precise measurement of electrical parameters with potentiometers.
				CO5	Understand and analyse the magnetic parameters measurements with suitable functional instruments
	2	LINEAR & DIGITAL IC APPLICATIONS	15A04509	CO1	Understand the basic building blocks of linear integrated circuits and its characteristics.
				CO2	Analyze the linear, non-linear and specialized applications of operational amplifiers.
				CO3	Get the knowledge of various logic families and exposure to VHDL programming.
				CO4	Design the digital circuits using VHDL Programming.
				CO5	Design various combinational & sequential circuits using various digital integrated IC's.
	3	ELECTRICAL POWER TRANSMISSION SYSTEMS	15A02502	CO1	Able to determine the transmission line parameters
				CO2	Able to determine the performance of the transmission line
				CO3	Determine the electrical and mechanical characteristics of transmission lines.
				CO4	Analyze the effect of transients due to switching with different terminations at load side in transmission lines

<b>III YEAR I SEM</b>				<b>CO5</b>	Analyze the construction and characteristics of Underground cables
	4	POWER ELECTRONICS	15A02503	<b>CO1</b>	To understand the basic Concepts of Power Semiconductor Devices
				<b>CO2</b>	Describe basic operation and compare performance of various power semiconductor devices
				<b>CO3</b>	Design and Analyze power converter circuits and learn to select suitable power electronic devices by assessing the requirements of application fields.
				<b>CO4</b>	Formulate and analyze a power electronic design at the system level and assess the performance.
				<b>CO5</b>	Identify the critical areas in application levels and execute typical alternative solutions, select suitable power converters to control Electrical Motors and other industry grade apparatus
	5	ELECTRICAL MACHINES – III	15A02504	<b>CO1</b>	To Explain the Construction, Principle of operation of Synchronous Machines.
				<b>CO2</b>	To Predetermine the regulation of synchronous generators using different methods
				<b>CO3</b>	To Determine how several alternators running in parallel share the load on the system
				<b>CO4</b>	To Analyze the performance characteristics of synchronous motors.
				<b>CO5</b>	To Choose specific 1-phase motor and/or special motors for a given application.

6	DIGITAL CIRCUITS AND SYSTEMS	15A04510	<b>CO1</b>	Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.
			<b>CO2</b>	Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
			<b>CO3</b>	Be able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
			<b>CO4</b>	Be able to understand classification of microprocessors and memories.
			<b>CO5</b>	Be able to design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits
7	ELECTRICAL MACHINES LABORATORY – II	15A02506	<b>CO1</b>	To Acquires sufficiently good practical knowledge about the operation, testing, and characteristics of transformers, Induction Motors
			<b>CO2</b>	To Acquires sufficiently good practical knowledge about the operation, testing, and characteristics of Alternators and Synchronous Motors
			<b>CO3</b>	To Acquire the knowledge about the fixation of the rating of transformers

			<b>CO4</b>	To Acquire the knowledge about the fixation of the rating of induction motors and synchronous machines..
			<b>CO5</b>	To determine the performance the electrical machines
8	ELECTRICAL MEASUREMENTS LABORATORY	15A02507	<b>CO1</b>	Calibrate various electrical measuring/recording instruments.
			<b>CO2</b>	Accurately determine the values of inductance and capacitance using a.c bridges
			<b>CO3</b>	Accurately determine the values of very low resistances
			<b>CO4</b>	Measure reactive power in 3-phase circuit using single wattmeter
			<b>CO5</b>	Determine ratio error and phase angle error of CT
9	SOCIAL VALUES AND ETHICS (AUDIT COURSE)	15A99501	<b>CO1</b>	Able recall family, and human values and compare his family with others and analyse the importance of family in the society.
			<b>CO2</b>	Classify the fundamental Rights and fundamental duties of citizen Influence the factors affecting youth crime..
			<b>CO3</b>	Explain the Environmental issues and Justify the objectives of civil defense.
			<b>CO4</b>	Demonstrate Gender inequality, Domestic violence and Appraise the government schemes ,laws.
			<b>CO5</b>	Importance the games ,sports, and benefits of exercise, Recommend the yoga asanas ,mudras and pranayama
			<b>CO1</b>	Compute the various factors associated with power distribution

	1	ELECTRICAL DISTRIBUTION SYSTEMS	15A02701	CO2	Make voltage drop calculations in given distribution networks
				CO3	Learn principles of substation Layouts
				CO4	Compute power factor improvement for a given system and load
				CO5	Understand implementation of SCADA for distribution automation
	2	DIGITAL SIGNAL PROCESSING	15A04603	CO1	Formulate engineering problems in terms of DSP tasks.
				CO2	Apply engineering problems solving strategies to DSP problems.
				CO3	Design and test DSP algorithms.
				CO4	Analyze digital and analog signals and systems.
				CO5	Analyze and compare different signal processing strategies
	3	POWER SYSTEM OPERATION AND CONTROL	15A02702	CO1	To Evaluate the economic operation of power system
				CO2	To Develop the mathematical models of turbines and governors
				CO3	To Discuss the Load Frequency Control methods
				CO4	To Explain how shunt and series compensation helps in reactive power control
				CO5	To Explain the issues concerned with power system operation in competitive Environment
	4	UTILIZATION OF ELECTRICAL ENERGY	15A02703	CO1	Understand & Analyze the laws of illumination and their application for various lighting schemes& Lamps.
				CO2	Understand & Apply the Principles and methods of electric heating, electric welding and Electrolysis.
				CO3	Describe the Systems of electric traction and study of traction equipment.

<b>IV YEAR I SEM</b>				<b>CO4</b>	Analyze the mechanics of Train movement and Evaluate the speed time curves for different services.
				<b>CO5</b>	Ability to choose the better equipment with consideration of economic aspects and Evaluate the losses& efficiency of the electrical equipments used in various industries
	5	ENERGY AUDITING & DEMAND SIDE MANAGEMENT	15A02706	<b>CO1</b>	Elaborate energy auditing and evaluate energy audit results
				<b>CO2</b>	Determine motor energy audit
				<b>CO3</b>	Analyze Lighting energy instruments for audit
				<b>CO4</b>	Analyze demand side management concepts through case study
				<b>CO5</b>	Analyze economics and cost effectiveness tests of DSM Programs
	6	FLEXIBLE AC TRANSMISSION SYSTEMS	15A02708	<b>CO1</b>	Understand the need, significance and types of FACTS controllers
				<b>CO2</b>	Understand, analyse the level of significance and concepts of voltage source and current source converters
				<b>CO3</b>	Understand, analyse and evaluate the objectives and various types of shunt controllers.
				<b>CO4</b>	Understand, analyse and evaluate the objectives and various types of series controllers.
				<b>CO5</b>	Understand and analyse the power flow controllers in single and multi transmission lines.
				<b>CO1</b>	Find the response of a Linear time invariant discrete time system.
				<b>CO2</b>	Analyze the frequency spectrum of a discrete time signal

	7	DIGITAL SIGNAL PROCESSING LABORATORY	15A04608	CO3	Determine the spectrum of a real world signal using Fast Fourier Transform algorithm
				CO4	Design real time DSP systems and real world applications.
				CO5	Implement DSP algorithms using both fixed and floating point processors
	8	POWER SYSTEMS & SIMULATION LABORATORY	15A02710	CO1	To Experimental determination (in machines lab) of sequence impedance and subtransient reactance of synchronous machine
				CO2	To Conducting experiments to analyze LG, LL, LLG, LLLG faults
				CO3	To The equivalent circuit of three winding transformer by conducting a suitable experiment
				CO4	To Developing MATLAB program for formation of Y,Z buses and gauss-seidel and fast decoupled load flow studies.
				CO5	To Developing the SIMULINK model for single area load frequency control problem.
				CO1	Able to get knowledge in beta and gamma functions and Techniques of Beta and Gamma functions to improper integrals, Expressing complex functions in power series, Conformal mappings and bilinear transformations



	1	MATHEMATICS – IV	15A54402	CO2	Develop skills in Analyzing the properties exhibited by complex functions in Argand plane, Properties of real integrals through complex variable techniques, The properties of improper integrals through residue theory, Conformal transformations of complex valued functions for inferences.
				CO3	Develop skills in designing mathematical models involving Integrals of complex variable functions, Improper integrals using beta and gamma functions, Residue theory of complex functions
				CO4	Develop analytical skills in providing solutions for problems involving Integration of complex functions, Improper real integrals
				CO5	Use relevant Complex variable techniques for Residues and integrals of complex functions, Improper real integrals through complex functions
	2	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	15A52301	CO1	Capable of analyzing fundamentals such as Demand, Elasticity & Forecasting methods
				CO2	To apply production , pricing & Supply concepts for effective business organization
				CO3	Students can able to identify the influence of various markets , the forms of business organisation
				CO4	Analyze Accounting statements like balance sheet and to understand financial performance

<b>II YEAR II SEM</b>				<b>CO5</b>	To analyze how to invest the amount of Capital in order to get maximum return from selected business activity
	3	ELECTRICAL MACHINES – II	15A02401	<b>CO1</b>	Conduct O.C, S.C tests and predetermine the regulation and efficiency of transformer
				<b>CO2</b>	Compute the load shared by each transformer when several transformers operate in parallel
				<b>CO3</b>	Understand The concept of a three phase Induction motor
				<b>CO4</b>	Draw the circle diagram of a three phase Induction motor and predetermine the performance
				<b>CO5</b>	characteristics Determine the starting torque, maximum torque, slip at maximum torque using given data
	4	ELECTRICAL POWER GENERATING SYSTEMS	15A02402	<b>CO1</b>	Estimate the coal requirement, cost per kWh generation and number of units generated for thermal power station
				<b>CO2</b>	Estimate the required flow of river water, cost of generation and number of units generated in hydel power generation and Nuclear power generation
				<b>CO3</b>	Identify Solar and Winds energy as alternate form of energy and to know how it can be tapped
				<b>CO4</b>	Identify bio gas generation and its impact on environment and Understand the Geothermal &Tidal energy, its mechanism of production and its applications.

			<b>CO5</b>	Evaluate various factors like load factor, plant factor and the tariffs to be charged for the consumers, Plot the load curve, load duration curve and hence determine the load capacity of the plant.
5	ANALOG ELECTRONIC CIRCUITS	15A04409	<b>CO1</b>	Analyzing the Methods of biasing transistors & Design of simple amplifier circuits.
			<b>CO2</b>	Understanding the Mid – band analysis of amplifier circuits using small - signal equivalent circuits to determine gain, input impedance and output impedance.
			<b>CO3</b>	Method of Apply & calculating cutoff frequencies and to determine bandwidth.
			<b>CO4</b>	Design and analyze different Oscillator circuits.
			<b>CO5</b>	Design and creating the circuits for linear wave shaping and Multi-vibrators
6	ELECTROMAGNETIC FIELDS	15A02403	<b>CO1</b>	The knowledge to understand the concepts of electrostatic charges and its field's analysis.
			<b>CO2</b>	To analyze the behavior of conductors and dielectrics under the influence of electrostatic fields.
			<b>CO3</b>	Capable to understand the concepts of magnetostatic charges and its field's analysis.
			<b>CO4</b>	Able to analyse the and design various types of inductors and concept of magnetic potential.

				<b>CO5</b>	To understand the knowledge of time varying electromagnetic fields by maxwell's equations and uniform plane & wave equations
	7	ELECTRICAL MACHINES LABORATORY – I	15A02404	<b>CO1</b>	To Conduct experiments to obtain the no-load and load characteristics of D.C. Generators
				<b>CO2</b>	To Conduct tests on D.C. Generators for predetermination of efficiency
				<b>CO3</b>	To Conduct tests on D.C. motors for predetermination of efficiency
				<b>CO4</b>	To Control the speed of D.C. motor in a given range using appropriate method
				<b>CO5</b>	To Identify the reason as to why D.C. Generator is not building up voltage
	8	CONTROL SYSTEMS & SIMULATION LABORATORY	15A02405	<b>CO1</b>	Evaluate the transfer function model for physical systems and control system components
				<b>CO2</b>	Compute the time response of systems and steady state errors
				<b>CO3</b>	Determine the absolute and relative stability of a system using RH and root loci concepts.
				<b>CO4</b>	Analyse the stability of the system and design compensation networks
				<b>CO5</b>	Describe the state variable representation of physical system and solve the state equation
				<b>CO1</b>	To understand the concepts of management its functions, theories of Motivation, Leadership and organization Structures

	1	MANAGEMENT SCIENCE	15A52601	CO2	To know about plant location and layout, inventory Management, PLC, channels and ASPM strategies.
				CO3	To tell about the HRM concepts like HRP, Performance appraisal, Employee grievances, Recruitment strategies , Training and Development.
				CO4	To know about the Corporate Planning process, Environmental scanning, SWOT analysis, Program Evaluation, Review Technique and Critical Path method.
				CO5	To describe the contemporary management practices like BPR, BPO, Balance score card, six-sigma, Total Quality Management
	2	POWER SEMICONDUCTOR DRIVES	15A02601	CO1	To choose the suitable drive system for particular application and analyze the single phase and three phase rectifiers fed DC motors.
				CO2	To understand the multi quadrant operation of dc motor and analyze the various electrical braking schemes with suitable dual converters.
				CO3	Able to control and analyse the drive operation in single, two and multi quadrants with suitable chopper circuits.
				CO4	Understand and apply the concept of control of induction motor by various control strategies and suitable converters.

			<b>CO5</b>	Understand and apply the concept of control of induction motor by various control strategies and suitable converters.
3	POWER SYSTEM PROTECTION	15A02602	<b>CO1</b>	Explain the principles of operation of various types of electromagnetic relays, Static relays as well as Microprocessor based relays
			<b>CO2</b>	Apply the basic relays for the protection of generators and Transformers.
			<b>CO3</b>	Apply various types of protective schemes used for feeders and bus bar protection.
			<b>CO4</b>	Solve numerical problems concerning the arc interruption and recovery in circuit breakers and Understand the principles of operation of various types of circuit breakers
			<b>CO5</b>	Explain the different types of over voltages appearing in the system, including existing protective schemes required for insulation co-ordination
4	MICROPROCESSORS & MICROCONTROLLER	15A04601	<b>CO1</b>	To understand the basic Concepts and Architecture of 8086 Microprocessor .
			<b>CO2</b>	To understand various 8086 Instruction set,Assembler directives and able to programming with 8086.
			<b>CO3</b>	To understand the basic concepts of MSP 430 microcontroller and embedded systems on it.

<b>III YEAR II SEM</b>		S		<b>CO4</b>	To under stand the concepts of low power aspects of MSP 430 ,RTC,PWM control,ADC and comparator in MSP 430.
				<b>CO5</b>	To understand the concepts of serial,synchronous,Asynchronous communications and different inter facing using MSP 430.
	5	POWER SYSTEM ANALYSIS	15A02603	<b>CO1</b>	To Explain the basics and form of Zbus and Ybus of a given power system network..
				<b>CO2</b>	To Apply computational models for symmetrical and unsymmetrical fault conditions in Electrical power systems
				<b>CO3</b>	To Distinguish between different types of buses used in load flow solution.
				<b>CO4</b>	To Evaluate load flow studies on a given power system
				<b>CO5</b>	To Determine the transient stability by equal area criterion and steady state stability limit
	6	PROGRAMMABLE LOGIC CONTROLLER & ITS	15A02605	<b>CO1</b>	Program a PLC for a given application
				<b>CO2</b>	Implement Ladder logic for various Industrial applications
				<b>CO3</b>	Design control circuits for various applications
				<b>CO4</b>	PLC logic and arithmetic operations
				<b>CO5</b>	PLC Installation, Troubleshooting and Maintenance
		MICROPROCESSORS		<b>CO1</b>	Can Ensure the completely use of MASM programming environment.
				<b>CO2</b>	Debug assembly language programs using 8086 assembler.

	7	& MICROCONTROLLER S LABORATORY	5A04607	CO3	Analyze the interfacing between external peripherals and 8086 microprocessor using development kit.
				CO4	Debug msp430 assembly language programs using CCS
				CO5	Analyze the interfacing between external peripherals and MSP 430 microcontroller using development kit.
	8	POWER ELECTRONICS & SIMULATION LABORATORY	15A02607	CO1	The study of various power electronic devices and their commutation circuits
				CO2	The voltage and current characteristics of various converters and inverters at different
				CO3	
				CO4	firing angles
				CO5	The study of different types converters and inverters with different types of loads
				CO-4	Analyze the TPS7A4901, TPS7A8300 and TPS54160 buck regulators,
				CO-5	The PSPICE/PSIM programming for various power electronic devices
	9	ADVANCED ENGLISH LANGUAGE & COMMUNICATION	15A52602	CO1	Choose suitable vocabulary and use appropriately in day-to-day communication and Understand how reading enhances their communicative competency.
				CO2	Select suitable formats and formulate resumes, formal reports, official e-mails.
				CO3	Simplify the language and give Effective presentations and Justify the objective of presentations..



		SKILLS		CO4	Demonstrate their ideas effectively during GDs, Debates and maximize the chances of selection in job interviews.
				CO5	Develop all-round personalities with a mature outlook to function effectively in different circumstances.
	1	INSTRUMENTATION	15A02801	CO1	To Identify and explain the types of errors occurring in measurement systems.
				CO2	To Differentiate among types of data transmission and modulation techniques.
				CO3	To Explain the working principles of different signal analyzers and Digital meters
				CO4	To Apply digital techniques to measure voltage, frequency and speed
				CO5	To Choose suitable transducers for the measurement of non-electrical quantities.
	2	ENERGY RESOURCES & TECHNOLOGY	15A02805	CO1	Understand different types of sources of energy
				CO2	Estimate the coal requirement and number of units generated in Hydel power generation and Nuclear power generation.
				CO3	Identify Solar and Winds energy as alternate form of energy and to know how it can be tapped

IV YEAR II SEM				CO4	Identify bio gas generation and its impact on environment and Understand the Geothermal & Tidal energy, its mechanism of production and its applications.
				CO5	Understand energy storage and continuity
	3	Technical Seminar	15A02S07	CO1	Spell Out basic concepts of science and technology
				CO2	Contrast the underlying principles of techniques applicable to their
				CO3	Construct the solutions using their own knowledge
				CO4	Improve their Presentation and Communication skills
				CO5	<b>Make up</b> them to pursue their placements and higher studies
	4	Project Work	15A0280S	CO1	Apply knowledge to generate, develop, and evaluate ideas and information to solve the problem in the area of Electrical and Electronics Engineering
				CO2	Identify the basic requirements for the design of application and propose
				CO3	Apply appropriate techniques, resources, modern engineering and IT tools
				CO4	Develop the skills to communicate effectively
				CO5	Construct collaborative skills through working in a team to achieve common

# ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES KADAPA

## DEPARTMENT : MECHANICAL ENGINEERING

### COURSE OUTCOMES

### REGULATION : R15

Year/Sem	S.No.	Subject Name	SUB CODE	COURSE OUTCOMES	
	1	<b>MATHEMATICS -III</b>	15A54301	CO1	To learn evaluation policy of Elementary row transformations-Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations. Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonalization of matrix. Calculation of powers of matrix and inverse of a matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.
				CO2	To determined and calucated by Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout’s triangularisation method, Gauss - Seidal iteration method.
				CO3	To determined and calucated by Newton’s forward and backward interpolation formulae – Lagrange’s formulae. Gauss forward and backward formula, Stirling’s formula, Bessel’s formula.
				CO4	To determined and calucated by Curve fitting: Fitting of a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation for Newton’s interpolation formula. Numerical Integration: Trapezoidal rule – Simpson’s 1/3 Rule – Simpson’s 3/8 Rule.
				CO5	To calculated by Numerical solution of Ordinary Differential equations: Solution by Taylor’s series- Picard’s Method of successive Approximations-Euler’s Method-Runge-Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.
	2	<b>MANAGERIAL ECONOMICS &amp; FINANCIAL ANALYSIS</b>	15A52301	CO1	The aim of the unit to understand the Importance of managerial economics and analyzing of demand.
				CO2	To understand the Production function & Analyzing the cost concepts with the evaluating the BEP.
				CO3	To applying the market structure and creating the new economic environment.
				CO4	To understand the financial accounting and evaluate the ratio analysis.
				CO5	The student understand and Evaluating the capital and capital budgeting.
				CO1	Students will able to understand basic concepts of stress and strain in solids and learn concept stress strain curve for different materials. Students to Analyze the temperature stress in varying of bars and composite bars.

<b>II YEAR I SEM</b>	3	<b>MECHANICS OF SOLIDS</b>	15A01308	CO2	solving complex problems.
				CO3	Students can learn concept of simple bending and determination of stresses in different Sections.
				CO4	Estimate the torsional load over shaft and solve deflection of beams under various loading Conditions.
				CO5	To analyze the cylindrical shells under circumferential and radial loading.
	4	<b>ENGINEERING DRAWING FOR MECHANICAL ENGINEERS</b>	15A03301	CO1	To Analyze the problem to sections and develop the surfaces.
				CO2	To Developing the pictorial views of a given sectional solids.
				CO3	To Developing the orthographic views from pictorial views of a given engineering component.
				CO4	To Identify the views for interpenetration of right regular solids
				CO5	To Draw perspective views of an object/solid using different methods.
	5	<b>ENGINEERING MECHANICS</b>	15A03302	CO1	To understand the basic Concepts of Forces ,and Newton Laws basics of mechanics.
				CO2	Describe basics of Friction and its types and problems on friction and screw jack problems.
				CO3	Describe basic Concepts of Center of Gravity and Movements of Inertia .
				CO4	Formulate and analyze a Kinetics and Kinematics of Mechanics.
				CO5	To understand the basic Concepts of Trusses and problems on Trusses.
	6	<b>THERMODYNAMICS</b>	15A03303	CO1	transfer in the form of Work and Heat with various applications.
				CO2	Understand the Energy transformation occurs from one form into another form in open and closed systems and applying steady flow energy equation and mass balance equation to various applications.
				CO3	Understand the Major difference in working of a heat engine, refrigerator and heat pump. Calculate the maximum efficiency of a cycle. Calculating entropy change for a process, maximum available energy.
				CO4	Understand the method drawing phase equilibrium diagrams like P-v, h-s, T-s and P-T of a pure substance. Usage of steam tables and mollier diagrams in solving problems. The cooling / heating effect of throttling process. Thermodynamic relations.
				CO5	To understand the basic Concepts the concept of ideal cycles for different engines and their working principle. Drawing P-V and T-S diagrams for various air standard cycles and calculating work output, efficiency, mean effective pressure of each cycle.
				CO1	To understand the introduction to Computer Aided Drafting soft ware packages
				CO2	To understand the practice on basic elements of a Computer Aided Drafting packages
				CO3	To understand the practice on features of a Computer Aided Drafting packages

	7	<b>COMPUTER AIDED DRAFTING LAB</b>	15A03304	CO4	To understand the Computer Aided Drafting soft ware Commands Easy to drafting of solids and intersection of solids
				CO5	To understand the Computer Aided Drafting soft ware Commands Easy to drafting of perfective views
				CO6	To understand the Computer Aided Drafting soft ware Commands Easy to drafting of orthographic views of simple parts
	8	<b>MECHANICS OF SOLIDS</b>	15A01309	CO1	Determine Young's Modulus of solids under tensile & compressive loads.
				CO2	Calculate the Young's Modulus of beams under bending loads.
				CO3	Determine the shear modulus of solids under torsional loads.
				CO4	Calculate the strength of solids under impact loads.
				CO5	Evaluate the behavior of helical springs under static loads.
				CO6	Estimate the hardness of solids under gradual loads.
	1	<b>FLUID MECHANICS &amp; HYDRAULIC MACHINES</b>	15A01510	CO1	To understand the Basic concepts of fluid mechanics and, fluid statics, fluid kinematics, fluid dynamics.
				CO2	To understand and apply on major losses and minor losses to find the pressure, velocity from the flow measuring devices measuring devices.
				CO3	To understand and apply the concepts to find the impact in different positions of jets.
				CO4	To understand and create the velocity triangles accordingly the performance in turbines.
				CO5	To understand the basics of centrifugal pump and work done by it.
	2	<b>THERMAL ENGNERRING-II</b>	15A03501	CO1	To acquire knowledge of power cycles and improvement performance of power cycles.
				CO2	Students can able to understand the working of various steam boilers and distinguish mountings and accessories.
				CO3	To understand the working of steam nozzles and apply the principles for finding solutions to engineering problems.
				CO4	To understand the working of impulse and reaction turbines and apply the principles for finding solutions to engineering problems.
				CO5	To understand the working of gas turbines and jet propulsions and apply the principles for finding solutions to engineering problems.
	3	<b>DYNAMICS OF MACHINERY</b>	15A03502	CO1	Understand and explain the basic concepts of friction in pivots and collars with uniform pressure and uniform wear, and also to solve the numerical problems on brakes, clutches and dynamometers
				CO2	Apply gyroscopic principles on Aeroplane, ship, four wheel and two wheel vehicles. Students are able to design a flywheel for IC engine.
				CO3	Explain the basics and definitions related to governors and forces acting on various governors. After completion of this unit students are able to solve numerical problems on different governors.

`III YEAR I SEM				CO4	Solve numerical problems on balancing of rotating masses and reciprocating masses in V-engine and multi cylinder engines.
				CO5	Derive the response of one degree of freedom systems with free and forced vibrations, evaluate the critical speed of the shaft and simple vibration calculations of rotor systems.
	4	MACHINE TOOLS	15A03503	CO1	Explain the concepts of metal cutting and the mechanism of chip formation. Examine the interface in the machining zone between the tool and the work piece with cutting performance.
				CO2	Explain the concepts of turning. Distinguish various tooling accessories used in turning and understand different constructions of lathe depending on the nature of operation.
				CO3	Demonstrate the principle of drilling, shaping and planning operation, parts and tool holding devices, Compare operations performed on drilling, shaping and planning and machining calculations
				CO4	Demonstrate the principle of milling, grinding, Lapping, Honing and Broaching operation, Distinguish parts and types of milling and grinding machines.
				CO5	Design of Jigs and fixtures and uses, Classification of Jigs & Fixtures – Principles of location and clamping.
	5	DESIGN OF MACHINE MEMBERS-I	15A03504	CO1	To Remember the types of stresses and Apply the design procedure by using theories of failure for different elements.
				CO2	To Understand the types of Fluctuating stresses Design the simple components under cyclic loading by using Goodman’s and Soderberg’s criterions.
				CO3	To Understand the functions of Rivets and bolts. Design the Riveted joints with different configuration, boiler shell riveted joint and under eccentric loading design of riveted joints. To Design bolted joints with direct loading and eccentric loading condition.
				CO4	To Discuss the types of cotters and Design and Differentiate cotters and Knuckle joint. Understand the classifications of shafts and Design the shafts under different loading conditions.
				CO5	To Explain the function, classifications of keys & couplings and Design the various rigid and flexible shaft couplings.
	6	ENTREPRENEUR SHIP	15A02503	CO1	To understand the fundamentals of entrepreneurship-marketing, accounting and operations.
				CO2	To understand how to ideate for tangible product or service to think about how your business meets a human need.
				CO3	To analyse financing and managing new venture, venture capital, sources of capital
				CO4	To evaluate joint ventures, mergers,acquisitions, franchising and understand public issues
				CO5	To understand production and marketing management concepts and global aspects of entrepreneurship
	7	SOCIAL VALUES & ETHICS	15A09501	CO1	Explain the Environmental issues and Justify the objectives of civil defense.
				CO2	Demonstrate Gender inequality, Domestic violence and Appraise the government schemes ,laws.
				CO3	Explain the Environmental issues and Justify the objectives of civil defense.
				CO4	Demonstrate Gender inequality, Domestic violence and Appraise the government schemes ,laws.

				CO5	Importance the games ,sports,and benefits of exercise, Recommend the yoga asanas ,mudras and pranayama
8	FLUID MECHANICS AND HYDRAULIC MACHINES LAB	15A01511	CO1	To understand apply analyze Evaluate and Create the Calibration of Venturimeter.	
			CO2	To understand apply analyze Evaluate and Create the Calibration of Orifice meter.	
			CO3		
			CO4	To understand apply analyze Evaluate and Create the Coefficient of discharge for a small orifice by a constant head method.	
			CO5	To understand apply analyze Evaluate and Create the Coefficient of discharge for an external mouth piece by variable head method.	
			CO6	To understand apply analyze Evaluate and Create the Calibration of contracted Rectangular Notch and /or Triangular Notch.	
			CO7	To understand apply analyze Evaluate and Create the Determination of Coefficient of loss of head in a sudden contraction and friction factor.	
			CO8	To understand apply analyze Evaluate and Create the Impact of jet on vanes.	
			CO9	To understand apply analyze Evaluate and Create the Study of Hydraulic jump.	
			CO10	To understand apply analyze Evaluate and Create the Performance test on Pelton wheel turbine.	
			CO11	To understand apply analyze Evaluate and Create the Performance test on Francis turbine.	
			CO12	To understand apply analyze Evaluate and Create the Efficiency test on centrifugal pump.	
9	MACHINE TOOLS LABORATORY	15A03508	CO1	Demonstrate the construction & operations of general purpose machines	
			CO2	Demonstrate Step turning and taper turning, Thread cutting and knurling on lathe machine	
			CO3	Demonstrate Drilling and Tapping operations	
			CO4	Demonstrate Shaping and Planning operations	
			CO5	Demonstrate Slotting Operations	
			CO6	Demonstrate Milling for groove cutting/ gear cutting	
			CO7	Demonstrate Cylindrical and Surface Grinding operations	
			CO8	Demonstrate Grinding of Tool angles	
1	MANAGEMENT SCIENCE	15A52601	CO1	Graduates will be able to understand the basics concepts of management and it will be practicaly applicable in all spheres through theories	
			CO2	Graduates can learn the plant location process and different marketing the techniques to sell the product through advertising.	
			CO3	To tell about HR concepts like HRP, Appraisal, recruitment, grievances and T &D	
			CO4	To know about corporate planning process , environmental scanning, SWOT analysis, PERT and CPM	
			CO5	To elucidate contemporary management practices like JIT, BPO, BSE, CMM TQM Etc,	
2	AUTOMOBILE ENGINEERING	15A03702	CO1	To understand the Basic process of Automotive components and usage of type of wheel drives, supercharger & turbocharger.	
			CO2	To understand the transmission systems like clutch and its types, gear box and its types, propeller shaft, and types of drives.	

**IV YEAR  
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			CO3	To understand the Basic process of Steering system & steering mechanism.
			CO4	To understand the Basic process of suspension system & brake system.
			CO5	To understand the Basic process of emission from automobiles & electrical system.
3	<b>CAD/CAM</b>	15A03702	CO1	To understand and the basic Concepts of CAD/CAM with industrial applications.
			CO2	Students able to learn how use Geometric modeling and solid modeling.
			CO3	Student able to learn to create CNC part programming and APT part programme
			CO4	Student able to get knowledge on Group Technology ,Part family, and coding techniques in Manufacturing
			CO5	Student able to get knowledge on CAQC ,CAPP, Integration of Design and Manufacturing
4	<b>METROLOGY &amp; MEASUREMENTS</b>	15A03703	CO1	To understand the Limits, Fits and Tolerance. Indian standard system – International Standard organization system and know the principles of working of the most commonly Applying instruments for measuring linear and angular distances.
			CO2	Define the Linear, angle, Taper and Flatness Measurement and study the working principles of different types of Linear measuring devices, Angle measuring devices are Sine bar , Bevel protractor and Analyze the flatness measurement methods.
			CO3	To understand the measuring methods of surface roughness. Comparing the Screw thread elements and measuring methods, Gear tooth profile measurement, CMM, Alignment tests on lathe, milling and drilling machine tools.
			CO4	Define the Displacement, Stress, Strain ,Acceleration & Vibration and to understand working of various instruments utilizing for measuring for displacement, Stress-strain and Acceleration and Vibration.
			CO5	To understand working of various instruments Used for measuring for Temperature, Pressure, Force, Torque and Power.
5	<b>MODERN MANUFACTURING METHODS</b>	15A03706	CO1	Explain the need for Non-traditional machining methods and rapid prototyping methods, classification & their relevance for precision and lean manufacturing .
			CO2	Explain the fundamentals of Ultrasonic machining, Abrasive jet and Water jet processes, develop mechanics of material removal.
			CO3	Explain the fundamentals of ECM and Chemical machining processes, Demonstrate their applications and defects.
			CO4	Explain the EDM and Plasma machining working processes, Demonstrate their advantages and disadvantages.
			CO5	Explain the concept of EBM and LBM processes and Demonstrate their applications.
6	<b>PRODUCTION &amp; OPERATIONS MANAGEMENT</b>	15A03709	CO1	To understand Production Planning and Control, generating of new products and strategies of Aggregate Planning.
			CO2	To understand forecasting techniques and able to Analyze accuracy of Forecasting methods.
			CO3	To select the plant location and plant layout and design plant layout using Computerized techniques.
			CO4	To Develop scheduling and material operation using lean enterprise and other concepts.
			CO5	To understand inventory management and scheduling techniques/Policies



	7	<b>CAD/CAM LAB</b>	15A03710	CO1	To develop 2D drafting using Auto CAD or any drafting package
				CO2	To develop the modeling of components in 3D- V block, open bearing, angular block, Dovetail Guide, Dovetail bracket , Tool post by using Auto CAD or PRO -E or CATIA or Solid works
				CO3	To develop the Assembly modeling of screw jack parts, knuckle joint , Oldham” s coupling, foot step bearing, stuffing box, square tool post by using Auto CAD or PRO -E or CATIA or Solid works
				CO4	To develop the machining of simple components on CNC lathe and CNC milling machine
	8	<b>METROLOGY &amp; MEASUREMENT S LABORATORY</b>	15A03711	CO1	Demonstrate and measure the linear, angular and gear profiles.
				CO2	Conduct the alignment test on machine tools.
				CO3	Measure the flatness of the surface by using leveling tools.
				CO4	Measure the temperature& displacement by using transducers.
				CO5	Measure the speed, pressure, and strain by using transducers.
				CO6	Measure the angular measurement &flow measurement by using transducers.
	1	<b>PROBABILITY &amp; STATISTICS</b>	15A54401	CO1	To help the students in getting a thorough understanding of the fundamentals of Basic concepts of Probability – Random variables – Expectation – Discrete and continuous Distributions – Distribution
				CO2	To help the students in getting a thorough understanding of the fundamentals of Test of Hypothesis: Population and Sample - Confidence interval of mean from Normal distribution - Statistical hypothesis - Null and Alternative hypothesis - Level of significance. Test of significance - Test based on normal distribution - Z test for means and proportions.
				CO3	To help the students in getting a thorough understanding of the Small samples - t- test for one sample and two sample problem and paired t-test, F-test and Chi-square test (testing of goodness of fit and independence).
				CO4	To help the students in getting a thorough understanding and calculating of Statistical Quality Control: Concept of quality of a manufactured product -Defects and Defectives - Causes of variations - Random and assignable - The principle of Shewhart Control Chart-Charts for attribute and variable quality
				CO5	To help the students in getting a thorough understanding and calculating of Queuing Theory: Pure Birth and Death process, M/M/1 & M/M/S & their related simple problems
	2	<b>BASIC ELECTRICAL &amp; ELECTRONICS ENGINEERING</b>	15A99301	CO1	Understand & Apply The basic concepts of the currents and voltage by using theorems and two-port networks.
				CO2	Understand& Analyze the performance of DC Machines.
				CO3	Understand &Analyze the performance of AC Machines.
				CO4	Analyze the operating principles of major electronic devices, its characteristics and Explain different rectifiers and filters used in power supply section.
				CO5	Explain and analyze basic transistor amplifier circuits using BJT and FET.
	3	<b>MACHINE DRAWING</b>	15A03401	CO1	To understand the basic Concepts Drawing tools and Dimensioning.
				CO2	To understand and sketch the screws joints ,nut ,bolts,keys and threads.
				CO3	To Understand the functions of engine parts ,machine parts and valves and assembly of these parts

**II YEAR  
II SEM**

II YEAR II SEM	4	<b>KINEMATICS OF MACHINES</b>	15A03402	CO1	To Understand and identify the different mechanisms, inversions of different kinematic chains and also find the Mobility of Mechanisms.
				CO2	To Understand the mechanism of Hooke's joint, steering mechanisms and belt friction. And are also able to solve numerical problems on Hooke's joint, belt and rope drives.
				CO3	To Understand and Design draw the velocity and acceleration diagrams of simple plane mechanisms by using relative velocity method and instantaneous center method.
				CO4	To Explain gears terminology, types of gears, length of path of contact, contact ratio and interference in gears. Further students are also able to design the gears to avoid interference and to calculate train value for gear Trains.
				CO5	To Design and draw displacement diagram and cam profile for different types of motions of the follower. And also to find the displacement, velocity and acceleration of the follower at different positions of cam with specified contours.
	5	<b>THERMAL ENGINEERING - I</b>	15A03403	CO1	Gain the knowledge about Working principle of two stroke and four stroke SI and CI Engines.
				CO2	Gain the knowledge about engine associated systems such as lubricating system, cooling system, fuel feed system, ignition system , their necessity, requirements, construction details, different types and their working.
				CO3	The concept of combustion in Spark ignition engine; Pressure Vs crank angle diagrams, and pre-ignition. the concept of combustion in Compression ignition engine, Pressure Vs crank angle diagrams, Knocking, Detonation.
				CO4	The knowledge about performance calculations in I.C.Engine. The knowledge about engine pollution and working of catalytic converter.
				CO5	About working principle of reciprocating compressors and its efficiencies. Mechanical details of axial flow compressors and its efficiencies
	6	<b>MANUFACTURING TECHNOLOGY</b>	15A03404	CO1	To understand the general casting process for making product and elements used in casting.
				CO2	To understand the various special casting processes with its merits and demerits and associated defects with possible cause and cure.
				CO3	To understand the different types of Welding Processes, weld joints and cutting of Ferrous and Non Ferrous metals.
				CO4	To understand Advanced welding Process, Heat Affected Zone, Defects and various testing method of welds.
				CO5	To understand various surface treatment processes, characteristics and their Applications.
	7	<b>THERMAL ENGINEERING</b>	15A03405	CO1	Sketch the valve and port timing diagrams for single cylinder Petrol and diesel engines.
				CO2	Asses the fuels characterization through experimentation
				CO3	Predict the performance characteristics of 2-stroke and 4-stroke internalcombustion engines.

		<b>LABORATORY</b>		CO4	Predict the 2-stage air compressor performance characteristics.
				CO5	Evaluate the energy distribution in IC engines by conducting heat balance test.
				CO6	Differentiate the water tube and fire tube boilers.
	8	<b>MANUFACTURING TECHNOLOGY LABORATORY</b>		CO1	Develop a wooden pattern for a given casting
				CO2	Determine the sand properties used in foundry.
			15A03406	CO3	Demonstrate the Injection moulding process to produce bottle caps.
				CO4	Demonstrate the Blow moulding process to produce a bottle.
				CO5	Demonstrate Bending operations using hydraulic press.
				CO6	Prepare simple joints using arc, spot and gas welding.
	1	<b>OPERATIONS RESEARCH</b>	15A03601	CO1	Understand and apply simplex method
				CO2	Understand and apply assignment and transportation concepts to real life situations.
				CO3	Get the knowledge of choosing the best strategy out of the available strategies.
				CO4	Represent any project in the form of a network and estimate the parameters like project time ,project cost.
				CO5	Apply the dynamic programming technique to solve the complex problems by breaking them into a series of sub problems.
	2	<b>DESIGN OF MACHINE MEMBERS-II</b>	15A03602	CO1	To understand and able to design crane hooks, C-clamps and various belt, rope and chain drives.
				CO2	Design and Analyze the helical springs for two wheeler vehicle and laminated springs for trucks and Also design & Analyze power screws subjected to loading.
				CO3	Describe basic operation and Design of various types of Bearings.
				CO4	Formulate and analyze a Mechanical Gears and compare the Performance of Spur and Helical Gears.
				CO5	To understand the basic Concepts of IC Engine parts and apply the design parameter for energy storage element and engine components, piston, connecting and crank shaft
	3	<b>HEAT TRANSFER</b>	15A03603	CO1	Understand the basic concept of conduction, convection and radiation heat transfer.
				CO2	Understand how to formulate and be able to solve simple conduction heat transfer problems. Solutions techniques will include both closed form and numerical methods.
				CO3	Will apply empirical correlations for both forced and natural convection to determine values for the convection heat transfer co-efficient.
				CO4	Understand black body and gray surface radiation and evaluate radiation exchange between surfaces.
				CO5	Some students will like to use the knowledge obtained in classes to understand the nature.
		<b>FINITE</b>		CO1	Explain basic principles and approaches for solving FEM problems in different fields.
				CO2	Solve bars, trusses, beams and heat transfer problems using FEM and also to apply boundary conditions in realistic problems.

<b>III YEAR II SEM</b>	4	<b>ELEMENT METHODS</b>	15A03604	CO3	Formulate the FEM model for simple problems.
				CO4	Explain the interpolation functions to higher order Iso-parametric elements.
				CO5	Explain and determine element matrices for applying the principles to find stresses in beams and trusses and temperature distribution in composite walls and fins
	5	<b>METAL FORMING PROCESSES</b>	15A03605	CO1	To Understand the basic concept on one, two and three dimensional stress Analysis, theory of plasticity, strain hardening, hot and cold working process.
				CO2	To Understand the principles of rolling and forging processes, their applications and defects.
				CO3	To Understand the fundamentals of extrusion process and wire drawing processes and their industrial applications.
				CO4	To Understand the various press working processes and compare their advantages and disadvantages.
				CO5	To Understand the concept of plastic manufacturing process, rapid manufacturing process and its applications.
	6	<b>NON- CONVENTIONAL SOURCES OF ENERGY</b>	15A03606	CO1	To create awareness about basic concepts of non-conventional source of energy-Solar energy
				CO2	Identify Solar energy as alternate form of energy and to know how it can be tapped.
				CO3	Identify Solar and Winds energy as alternate form of energy and to know how it can be tapped
				CO4	Identify bio gas generation and its impact on environment and Understand the Geothermal &Tidal energy, its mechanism of production and its applications.
				CO5	Understand energy storage and economy.
	7	<b>HEAT TRANSFER LAB</b>	15A03609	CO1	To understand apply analyze Evaluate and Create the Thermal conductivity of insulating powder material through Concentric Sphere apparatus.
				CO2	To understand apply analyze Evaluate and Create the Thermal conductivity of insulating material through lagged pipe apparatus
				CO3	To understand apply analyze Evaluate and Create the Overall heat transfer co-efficient through Composite Slab Apparatus
				CO4	To understand apply analyze Evaluate and Create the Thermal Conductivity of metal.
				CO5	To understand apply analyze Evaluate and Create the Heat transfer in pin-fin.
				CO6	To understand apply analyze Evaluate and Create the Heat transfer coefficient in forced convection.
				CO7	To understand apply analyze Evaluate and Create the Heat transfer coefficient in natural convection.
				CO8	To understand apply analyze Evaluate and Create the Experiment on Parallel and counter flow heat exchanger.
				CO9	To understand apply analyze Evaluate and Create the Emissivity of a gray body through Emissivity apparatus.

IV YEAR II SEM				CO10	To understand apply analyze Evaluate and Create the Experiment on Stefan Boltzman Apparatus.
	8	<b>COMPUTER AIDED ENGINEERING LABORATORY</b>	15A03610	CO1	Demonstrate the knowledge on various simulation software's
				CO2	Analysis the structural components of various bars and beams
				CO3	Illustrate the thermal analysis of 2D components and composite wall
				CO4	Solve the fluid flow problems by using computational fluid dynamics
				CO5	Evaluate the various research problems in all the fields of engineering by using FEA.
	1	<b>INDUSTRIAL ENGINEERING</b>	15A03801	CO1	To understand the basic Concepts of management, organization structure and Apply the principles of management.
				CO2	Define the plant location, Classify the plant layouts and material handling equipment objectives learned and remembered.
				CO3	To understand the work study and work measurement objectives learned implement operation management functions, and work sampling Applications.
				CO4	To understand the Inventory control systems and Discuss the different types Inventory models.
				CO5	To understand and explain the applied quality control techniques and Total quality management
	2	<b>POWER PLANT ENGINEERING</b>	15A03804	CO1	Discuss environmental and safety aspects of power plant operation. Classify Different types of Power Plants, site selection criteria of each one of them.
				CO2	Summarise Thermal Power Plant operation, Examine different types of high pressure boilers including supercritical and supercharged boilers, Fluidized bed combustion systems.
				CO3	Summarise Diesel Power Plant operation, - Classify the Construction and Layout With Auxiliaries.
				CO4	Demonstration of Hydro-electric Power Plant Economics, Energy Storage pumped hydro etc., Classify the Construction and Layout With Auxiliaries.
				CO5	Summarise Different types of Non-Conventional power plants. Classify Nuclear power plants including Pressurized water reactor, Boiling water reactor, gas cooled reactor, liquid metal fast breeder reactor
	3	<b>TECHNICAL SEMINAR</b>	15A03808	CO1	Define the various existing technological developments currently in use
				CO2	Select the specialized topic of the existing or proposed technology
				CO3	Summarize the information gathered from various resources
				CO4	Prepare a technical report on the selected specialized topic
				CO5	Explain the topic using appropriate presentation tools
				CO6	Show the inert personal, Professional and work with team skills
				CO1	Prepare the abstract represents the outline of the project
				CO2	Understand the literature collected in relevant to the project

# ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES KADAPA

DEPARTMENT: HUMANITIES AND SCIENCES					
COURSE OUTCOMES				REGULATION : R15	
Year/Sem .	S.No.	Subject Name	SUB CODE	COURSE OUTCOMES	
	1	FUNCTIONAL ENGLISH	15A52101	CO1	Have improved communication in listening, speaking, reading and writing skills in general.
				CO2	Have developed their oral communication and fluency in group discussions and interviews.
				CO3	Have improved awareness of English in science and technology context
				CO4	Have achieved familiarity with a variety of technical reports
				CO5	Able to listen attentively and communicate effectively.
	2	ENGINEERING PHYSICS	15A56101	CO1	The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fiber optics.
				CO2	The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques
				CO3	The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.
				CO4	The electronic and magnetic properties of materials were successfully explained by free electron theory and the bases for the band theory are focused.

I YEAR I SEM				<b>C05</b>	The properties and device applications of semiconducting and magnetic materials are illustrated.
	3	COMPUTER PROGRAMMING	15A05101	<b>C01</b>	Apply problem solving techniques in designing solutions for a wide range of problems
				<b>C02</b>	.Choose appropriate control structure depending on the problem to be solved
				<b>C03</b>	Modularize the problem and also solution
				<b>C04</b>	Understanding problem solving techniques
				<b>C05</b>	Learn features of C language.
	4	ENGINEERING DRAWING	15A03101	<b>C01</b>	Drawing 2D and 3D diagrams of various objects.
				<b>C02</b>	Learning conventions of Drawing, which is an Universal Language of Engineers
				<b>C03</b>	Drafting projections of points, planes and solids.
				<b>C04</b>	To gain and understanding of the basics of geometrical constructions of various planes and solids, understanding system of graphical representation of various objects and various views to draft and read the products to be designed and eventually for manufacturing applications.
				<b>C05</b>	.To learn about various projections, to understand complete dimensions and details of object.
	5	MATHEMATICS-1	15A54101	<b>C01</b>	To become familiar with the application of differential and integral calculus
				<b>C02</b>	To become familiar with the application of ODE and Vector calculus
				<b>C03</b>	To attain abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications.
				<b>C04</b>	To develop the skill pertinent to practice of mathematical concept

				<b>C05</b>	To develop the mathematical concepts of ODEs and their applications.
	1	ENGLISH FOR PROFESSIONAL COMMUNICATION	15A52201	<b>C01</b>	Have acquired ability to participate effectively in group discussions.
				<b>C02</b>	Have developed ability in writing in various contexts.
				<b>C03</b>	Have acquired a proper level of competence for employability.
				<b>C04</b>	To develop confidence in the students to use English in everyday situations.
				<b>C05</b>	To enable the students to read different discourses so that they appreciate English for science and technologies.
	2	MATHEMATICS-II	15A54201	<b>C01</b>	To gain the knowledge to tackle the engineering problems using the concepts of Fourier series.
				<b>C02</b>	The students gains the knowledge to tackle the engineering problems using the concepts of Laplace transforms.
				<b>C03</b>	To Understand the concepts of PDEs.
				<b>C04</b>	To Understand the concepts of Fourier sine and cosine integrals, Fourier transforms.
				<b>C05</b>	To understand the applications of Z-transforms.
	3	ENGINEERING CHEMISTRY	15A51101	<b>C01</b>	Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.
				<b>C02</b>	Understand the electrochemical sources of energy
				<b>C03</b>	Understand industrially based polymers, various engineering materials.
				<b>C04</b>	The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.



I YEAR II SEM				<b>CO5</b>	
	4	MATERIAL SCIENCE AND ENGINEERING	15A03201	<b>CO1</b>	To gain and understanding of the relationship between the structure, properties, processing, testing, heat treatment and applications of metallic , non metallic, ceramic and composite materials so as to identify and select suitable materials for various engineering applications.
				<b>CO2</b>	Get knowledge on bonds of solids and knowing the crystallization of metals. By knowing the grain size and shape through the crystallization.
				<b>CO3</b>	Able to construct the equilibrium diagrams by experimental methods and knowing all types of equilibrium diagrams isomorphs alloy systems , electric systems, peritectic systems solid-state transformations etc. while studying all these diagrams he may able to know about lever rule and phase rule.
				<b>CO4</b>	Able to learn the structure and properties of all cast irons, steels and Non-ferrous metal alloys of copper, Al and Titanium. Students are advised to visit any Machine shop in the industries like SAIL, Visakhapatnam steel plant etc., Students are advised to visit the following website. <a href="http://www.buzzle.com">www.buzzle.com</a> , <a href="http://www.mhprofessional.com">www.mhprofessional.com</a> <a href="http://www.eng.sut.ac">www.eng.sut.ac</a> for better understanding of this topic.
				<b>CO5</b>	Able to learn the methods of different heat treatments i.e. annealing, normalizing and hardening.
				<b>CO1</b>	Get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
				<b>CO2</b>	Realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.

	5	ENVIRONMENTAL STUDIES	15A01101	<b>CO3</b>	To become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
				<b>CO4</b>	By studying environmental sciences, students is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.
				<b>CO5</b>	To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.
	6	ELECTRICAL CIRCUITS-1	15A02201	<b>CO1</b>	Given a network, find the equivalent impedance by using network reduction techniques
				<b>CO2</b>	Given a circuit and the excitation, determine the real power, reactive power, power factor etc.,
				<b>CO3</b>	Determine the current through any element and voltage across any element
				<b>CO4</b>	Apply the network theorems suitably
				<b>CO5</b>	To Understand Basic characteristics of R,L,C parameters
	7	NETWORK ANALYSIS	15A04201	<b>CO1</b>	Apply the knowledge of basic circuit law and simplify the network using reduction techniques
				<b>CO2</b>	Analyze the circuit using Kirchhoff's law and Network simplification theorems
				<b>CO3</b>	Infer and evaluate transient response, Steady state response, network functions
				<b>CO4</b>	Obtain the maximum power transfer to the load , and Analyze the series resonant and parallel resonant circuit

				<b>CO5</b>	. Evaluate two-port network parameters , design attenuators and equalizers
	8	DATA STRUCTURES	IFI A05201	<b>CO1</b>	Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are implemented in memory and used in algorithms.
				CO2	Describe common applications for arrays, records, linked structures, stacks, queues, trees, and graphs.
				CO3	Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs.
				CO4	Demonstrate different methods for traversing trees.
				CO5	Compare alternative implementations of data structures with respect to performance.

# ANNAMACHARYA INSITUTE OF TECHNOLOGY AND SCIENCES KADAPA

M.Tech - VLSI SYSTEM DESIGN					
COURSE OUTCOMES				REGULATION: R17	
Year/Sem.	S.No.	Subject Name	SUB CODE	COURSE OUTCOMES	
	1	Advanced MOSFET Modelling	17D57101	CO1	Able to Derive mathematical models for modern MOS devices.
				CO2	To Provide solution to overcome short channel issues.
				CO3	Understand the physics of and design elements of silicon MOSFETs
				CO4	Explain the equations, approximations and techniques available for deriving a model with specified properties, for a general device characteristic with known qualitative theory
				CO5	Understand and analyze the inner working of semiconductor p-n diodes, Schottky barrier diodes and advanced MOSFET technology
	2	CMOS Analog IC Design	17D57102	CO1	Understand significance of different biasing styles and apply them for designing analog ICs.
				CO2	Analyze the functionality of Current Mirrors, Current Sinks.
				CO3	Analyze the Differential amplifiers and Current amplifiers.
				CO4	Design basic building blocks of analog ICs like, current mirrors, current sources, current sinks.
				CO5	Design basic building blocks of Two stage CMOS Power amplifiers and comparators.
				CO1	To determine MOS design with specifications

I M.TECH I SEM	3	CMOS digital IC design	17D5103	CO2	To design combinational MOS logic circuits by using boolean expressions.
				CO3	To realize and implement basic combinational and sequential circuits
				CO4	To design combinational and sequential elements using NMOS & CMOS.
				CO5	To analyze the dynamic Performance of CMOS circuits.
	4	CAD FOR VLSI	17D5105	CO1	Establish comprehensive understanding of the various phases design cycles of CAD for digital electronic systems, from digital logic simulation to physical design, including test and verification
				CO2	Establish comprehensive understanding of the various phases of floor planning and pin assignment algorithms
				CO3	Gain knowledge on the routing algorithms
				CO4	Gain knowledge on the methodologies involved in design, verification and implementation of digital esigns on reconfigurable hardware platform (FPGA)
				CO5	Gain knowledge on the methodologies involved in design, verification and implementation of digital designs on MCMs
	5	CPLD and FPGA Architectur es and Application s	17D06202	CO1	Acquire knowledge about various architectures and device technologies of PLD"s
				CO2	Comprehend the FPGA Architectures
				CO3	Analyze System level Design and their application for Combinational and Sequential Circuits
				CO4	Get familiar with Anti-Fuse Programmed FPGAs
				CO5	Apply knowledge of this subject for various design applications
				CO1	Able to design and comprehend the structural functionality of various sequential and combinational digital blocks.

	6	SDSD	17D06101	CO2	Capable of comprehending the notion of design approaches and representing and realizing their designs in ASM charts.
				CO3	Able to build and implement Synchronous and Asynchronous ASM charts with their synthesis.
				CO4	Understand the concept of Micro program and issues related to micro programming.
				CO5	Able to build various applications and carry out their synthesis with test vectors.
	7	Structural Digital System Design Lab	17D38107	CO1	Different modeling styles available in VHDL and Verilog and difference between them
				CO2	Difference between verilog and VHDL
				CO3	Representation of different digital modules in different modelling styles available in VHDL and Verilog
	8	VLSI System Design Lab - I	17D57107	CO1	Understand syntax of various commands available with verilog and fundamental associated with design of digital systems
				CO2	To design and simulate and implement various digital system like traffic light controller, UART.
				CO3	Able develop problem solving skills and adapt them to solve real world problems
				CO4	Write scripts using perl for building digital blocks
		Low Power		CO1	Acquire the knowledge about various CMOS fabrication process and its modelling infer about the second order effects of MOS transistor characteristics.
				CO2	Analyze and implement various CMOS low voltage and low power static logic circuits.


	1	VLSI Design	17D57201	CO3	learn the design of various CMOS low voltage and low power dynamic logic circuits
				CO4	learn the different types of memory circuits and their design.
				CO5	Design and implementation of various structures for low power applications
	2	CMOS Mixed signal Design	17D57202	CO1	Demonstrate first order filter with least interference
				CO2	Extend the concept of phase locked loop for designing PLL application with minimum jitter by considering non ideal effects.
				CO3	Design different A/D, D/A, modulators, demodulators and different filter for real time applications
				CO4	Apply knowledge of mathematics, science, and engineering to design CMOS analog circuits to achieve performance specifications.
				CO5	Identify, formulates, and solves engineering problems in the area of mixed-signal design.
	3	Embedded System Design	17D06201	CO1	Know the Basic Concept of Embedded Systems.
				CO2	Interpret the difference between Microcontrollers and Microprocessors.
				CO3	Apply the Software for Embedded System Design & concepts of Embedded OS
				CO4	Explain and apply the concept of Embedded Firmware, RTOS Based Embedded System Design and Task function
				CO5	Make significant contribution in the research in applications based on embedded system design
				CO1	Understand different types of faults associated with logic circuits and types of testing by employing fault models to the logic circuits.

I M.TECH II-SEM	4	Test and Testability	17D06109	CO2	Study about different methods of simulation and algorithms associated with testing.
				CO3	Get complete knowledge about different methods of simulation and algorithms associated with testing.
				CO4	Apply randomization concepts in designing testbench.
				CO5	Understand use of multi threading and inter process communication in testbench design.
	5	RF IC Design	17D57204	CO1	Demonstrate in-depth knowledge in Radio Frequency Integrated Circuits.
				CO2	Analyze complex engineering problems critically for conducting research in RF systems.
				CO3	Solve engineering problems with wide range of solutions in Radio Frequency Integrated circuits.
				CO4	Apply appropriate techniques to engineering activities in the field of RFIC Design.
	6	Internet of Things	17D38202	CO1	Able to understand the application areas of IOT
				CO2	Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
				CO3	Able to understand building blocks of Internet of Things and characteristics.
				CO4	Design and program IoT devices
				CO5	Design an IoT device to work with a Cloud Computing infrastructure
	7	Embedded System	17D38208	CO1	Design and Implement basic circuits that are used in Embedded systems.
				CO2	Develop code using appropriate tools.
				CO3	Test the circuit performance with standard benchmark circuits.



II M.TECH I SEM		Design Lab		CO4	Simulate appropriate application/distribution problems.
				CO5	Obtain the value of the point estimators using the method of moments and method of maximum likelihood.
	8	VLSI System Design Lab - II	17D57206	CO1	Design the RTL based digital circuits using HDL.
				CO2	Develop the hardware-software co-design using FPGA.
				CO3	Develop the custom IP using RTL design and/or high level synthesis with FPGA
				CO4	Design the digital system with low power and high throughput VLSI techniques
				CO5	Implement the fault tolerant hardware design and formal hardware verification using HDL & Design the digital circuits using CMOS transistor logic
	1	RESEARC H METHOD OLOGY	17D20301	CO1	Demonstrate knowledge on research approaches, research process and data collection.
				CO2	Identify and analyze research problem.
				CO3	Solve the research problems using statistical methods.
				CO4	Carryout literature survey and apply good research methodologies for the development of scientific/ technological knowledge in one or more domains of engineering.
				CO5	Learn, select and apply modern engineering tools to complex engineering activities & Write effective research reports.
	2	Seminar	17D57303	CO1	Demonstrate capacity to identify an advanced topic for seminar in core and allied areas.
				CO2	Extract information pertinent to the topic through literature survey.
				CO3	Comprehend extracted information through analysis and synthesis critically.
				CO4	Plan, organize, prepare and present effective written and oral technical report on the topic.
				CO5	Adapt to independent and reflective learning for sustainable professional growth
				CO1	Demonstrate capacity to identify an advanced topic for project work in core and allied areas.
				CO2	Gather information related to the topic through literature survey.
				CO3	Comprehend gathered information through critical analysis and synthesis.

I- M.TECH II SECL	Projc* Work Phase I & II	I7D 57305 X I7D57101	4	SOI VO ClllgfilColang )woblcms pertinent to the chosen topic for feasible solutions.
			CO5	Use the techniques, skills and modern engineering tools necessary for project work.
			CO6	Do time and cost analysis on the project.
			CO7	Plan, prepare and present effective written and oral technical report on the topic.
			CO8	Adapt to independent and reflective learning for sustainable professional growth.

  
PRINCIPAL  
 ANNAMACHARYA & SCIENCES  
 TECHNOLOGY (V&M),  
 C.K. DIME (A.P.)  
 KADAPA - 516 003.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
*(Established by Govt. of A.P., Act. No. 30 of 2008)*  
**ANANTHAPURAMU – 515 002 (A.P.) INDIA.**

**Course Structure for B.Tech-R15 Regulations**

**Electronics & Communication Engineering**

**I B.Tech. - I Semester**

S.No	Course code	Subject	L	T	P	C
1.	15A52101	Functional English	3	1	-	3
2.	15A54101	Mathematics – I	3	1	-	3
3.	15A05101	Computer Programming	3	1	-	3
4.	15A51101	Engineering Chemistry	3	1	-	3
5.	15A01101	Environmental Studies	3	1	-	3
6.	15A52102	English Language Communication Skills Lab	-	-	4	2
7.	15A51102	Engineering Chemistry Lab	-	-	4	2
8.	15A05102	Computer Programming Lab	-	-	4	2
Total			15	5	12	21

**I-II Semester**

S.No	Course code	Subject	L	T	P	Drg	C
1.	15A52201	English for Professional Communication	3	1	-	-	3
2.	15A54201	Mathematics – II	3	1	-	-	3
3.	15A04201	Network Analysis	3	1	-	-	3
4.	15A56101	Engineering Physics	3	1	-	-	3
5.	15A03101	Engineering Drawing	0	-	-	6	3
6.	15A04202	Network Analysis Lab	-	-	4	-	2
7.	15A56102	Engineering Physics Lab	-	-	4	-	2
8.	15A99201	Engineering and IT Workshop	-	-	4	-	2
Total			12	4	12	6	21

\* L - Lecture hours

\* T - Tutorial hours

\* P - Practical hours

\* Drg - Drawing

\* C - Credits

**II B. Tech – I sem**

S. No	Course Code	Subject	L	T	P	C
1	15A54301	Mathematics-III	3	1	-	3
2	15A04301	Electronic Devices and Circuits	3	1	-	3
3	15A04302	Switching Theory and Logic Design	3	1	-	3
4	15A04303	Signals and Systems	3	1	-	3
5	15A04304	Probability Theory and Stochastic Processes	3	1	-	3
6	15A02306	Electrical Technology	3	1	-	3
7	15A04305	Electronic Devices and Circuits Laboratory	-	-	4	2
8	15A02307	Electrical Technology and Basic Simulation Laboratory	-	-	4	2
Total			18	06	08	22

**II B. Tech – II sem**

S. No	Course Code	Subject	L	T	P	C
1	15A54402	Mathematics-IV	3	1	-	3
2	15A04401	Electronic Circuit Analysis	3	1	-	3
3	15A04402	Analog Communication Systems	3	1	-	3
4	15A04403	Electromagnetic Theory and Transmission Lines	3	1	-	3
5	15A05201	Data Structures	3	1	-	3
6	15A02303	Control Systems Engineering	3	1	-	3
7	15A04404	Electronic Circuit Analysis Laboratory	-	-	4	2
8	15A04405	Analog Communication Systems Laboratory	-	-	4	2
9	15A04406	Comprehensive Online Examination-I	-	-	-	1
Total			18	06	08	23

**B.Tech III-I Semester (ECE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A04511	Computer Organization	3	1	-	3
2.	15A04501	Antennas and Wave Propagation	3	1	-	3
3.	15A04502	Digital Communication Systems	3	1	-	3
4.	15A04503	Linear Integrated Circuits and Applications	3	1	-	3
5.	15A04504	Digital System Design	3	1	-	3
6.	15A04505 15A04506	<b>MOOCS-I</b> a. Linux Programming & Scripting b. MEMS & Microsystems	3	1	-	3
7.	15A04507	IC Applications Laboratory	-	-	4	2
8.	15A04508	Digital Communication Systems Laboratory	-	-	4	2
9.	15A99501	Audit course – Social Values & Ethics	2	0	2	0
<b>Total</b>			<b>20</b>	<b>06</b>	<b>10</b>	<b>22</b>

**B.Tech III-II Semester(ECE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A52301	Managerial Economics and Financial Analysis	3	1	-	3
2.	15A04601	Microprocessors & Microcontrollers	3	1	-	3
3.	15A04602	Electronic Measurements and Instrumentation	3	1	-	3
4.	15A04603	Digital Signal Processing	3	1	-	3
5.	15A04604	VLSI Design	3	1	-	3
6.	15A04605 15A04606 15A02605 15A01608	<b>CBCC-I</b> a. MATLAB Programming b. Industrial Electronics c. Neural Networks & Fuzzy Logic d. Intellectual Property Rights	3	1	-	3
7.	15A04607	Microprocessors & Microcontrollers Laboratory	-	-	4	2
8.	15A04608	Digital Signal Processing Laboratory	-	-	4	2
9.	15A52602	Advanced English Language Communication (AELCS) Laboratory (Audit Course)	-	-	2	-
10.	15A04609	Comprehensive Online Examination-II	-	-	-	1
<b>Total</b>			<b>18</b>	<b>06</b>	<b>12</b>	<b>23</b>

**B.Tech IV-I Semester(ECE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A04701	Optical Fiber Communication	3	1	-	3
2.	15A04702	Embedded Systems	3	1	-	3
3.	15A04703	Microwave Engineering	3	1	-	3
4.	15A04704	Data Communications and Networking	3	1	-	3
5.	15A04705 15A04706 15A04707	<b>CBCC-II</b> a. Radar Systems b. Adaptive Signal Processing c. FPGA Design	3	1	-	3
6.	15A04708 15A04709 15A04710	<b>CBCC-III</b> a. Digital Image Processing b. Cellular & Mobile Communication c. Real Time Systems	3	1	-	3
7.	15A04711	Microwave and Optical Communication Laboratory	-	-	4	2
8.	15A04712	VLSI & Embedded Systems Laboratory	-	-	4	2
<b>Total</b>			<b>18</b>	<b>06</b>	<b>08</b>	<b>22</b>

**B.Tech IV-II Semester(ECE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A04801 15A04802	<b>MOOCS-II*</b> a. Advanced Digital Signal Processing- Multirate & Wavlet b. Low Power VLSI Circuits & Systems	3	1	-	3
2.	15A04803 15A04804	<b>MOOCS-III *</b> a. Pattern Recognition & Applications b. RF Integrated Circuits	3	1	-	3
3.	15A04805	Comprehensive Viva Voce	-	-	4	2
4.	15A04806	Technical Seminar	-	-	4	2
5.	15A04807	Project Work	-	-	24	12
<b>Total</b>			<b>6</b>	<b>02</b>	<b>32</b>	<b>22</b>

**Minor Discipline in ECE**

<b>S. No.</b>	<b>Course Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	15A04303	Signals & Systems	3	1	-	3
2	15A04304	Probability Theory & Stochastic Processes	3	1	-	3
3	15A04402	Analog Communication Systems	3	1	-	3
4	15A04502	Digital Communication Systems	3	1	-	3
5	15M04101	Minor Discipline Project	-	-	-	8
		<b>Total</b>	<b>12</b>	<b>4</b>	<b>-</b>	<b>20</b>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A52101) FUNCTIONAL ENGLISH****(Common to All Branches)****Preamble:**

English is an international language as well as a living and vibrant one. People have found that knowledge of English is a passport for better career, better pay, and advanced knowledge and for communication with the entire world. As it is a language of opportunities in this global age, English is bound to expand its domain of use everywhere. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**Objectives:**

- To enable the students to communicate in English for academic and social purpose.
- To enable the students to acquire structure and written expressions required for their profession.
- To develop the listening skills of the students.
- To inculcate the habit of reading and critical thinking skills.
- To enhance the study skills of the students with emphasis on LSRW skills.

**UNIT –I**

**Topics:** Paragraph writing, writing letters, role play, reading graphs, prepositions, designing posters, tenses, making recommendations.

Text: ENVIRONMENTAL CONSCIOUSNESS' from *MINDSCAPES*



**UNIT –II**

**Topics:** Compound nouns, imperatives, writing instructions, interpreting charts and pictures, note making, role play, prefixes, subject-verb agreement.

**Text:** EMERGING TECHNOLOGIES from *MINDSCAPES*

Solar Thermal Power - Cloud Computing - Nanotechnology

**UNIT –III**

**Topics:** Making conversations, homonyms and homophones, SMS and use of emotions, past participle for irregular verbs, group discussion, E - mail communication, antonyms, Preparing projects

**Text:** GLOBAL ISSUES from *MINDSCAPES*

Child Labour - Food Crisis - Genetic Modification - E-Waste - Assistive Technology

**UNIT –IV**

**Topics:** Group discussion, affixes, double consonants, debates, writing a book / film review, predicting and problem-solving-future tense, adverbs

**Text:** SPACE TREK from *MINDSCAPES*

Hubble Telescope - Chandrayan-2 - Anusat - Living Quarters - Space Tourism

**UNIT –V**

**Topics:** Compare and contrast, effective writing, group discussion, writing reports, writing advertisements, tweeting and blogging, types of interviews, framing questions.

**Text:** MEDIA MATTERS from *MINDSCAPES*

History of Media - Language and Media - Milestone in Media - Manipulation by Media - Entertainment Media - Interviews

**Text Books:**

1. MINDSCAPES: English for Technologists and Engineers, Orient Blackswan, 2014.

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**References:**

1. A Practical Course in Effective English Speaking Skills by J.K.Gangal, PHI Publishers, New Delhi.2012
2. Technical Communication, Meenakshi Raman, Oxford University Press,2011.
3. Spoken English, R.K. Bansal & JB Harrison, Orient Longman,2013, 4<sup>Th</sup> edition.
4. Murphy's English Grammar with CD, Murphy, Cambridge University Press,3<sup>Rd</sup> edition.
5. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO,2008.

**Outcomes:**

- Have improved communication in listening, speaking, reading and writing skills in general.
- Have developed their oral communication and fluency in group discussions and interviews.
- Have improved awareness of English in science and technology context.
- Have achieved familiarity with a variety of technical reports.

B. Tech I-I Sem. (ECE)

L	T	P	C
3	1	0	3

**(15A54101) MATHEMATICS – I****(Common to All Branches)****Objectives:**

- To train the students thoroughly in Mathematical concepts of ordinary differential equations and their applications.
- To prepare students for lifelong learning and successful careers using mathematical concepts of differential and Integral calculus, ordinary differential equations and vector calculus.
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate and modeling the problems, to think creatively and to synthesize information.

**UNIT – I**

Exact, linear and Bernoulli equations, Applications to first order equations; Orthogonal trajectories, Simple electric circuits.

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax} V(x)$ ,  $xV(x)$ .

**UNIT – II**

Method of variation of parameters, linear equations with variable coefficients: Euler-Cauchy Equations, Legendre's linear equation. Applications of linear differential equations- Mechanical and Electrical oscillatory circuits and Deflection of Beams.

**UNIT – III**

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature.

**UNIT – IV**

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes in Cartesian and polar coordinates using double and triple integral.

## **UNIT – V**

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's, Stoke's and Gauss's Theorems.

### **Text Books:**

1. Engineering Mathematics-I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher
2. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.

### **References:**

1. Engineering Mathematics Volume-I, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

### **Outcomes:**

- The students become familiar with the application of differential and integral calculus, ordinary differential equations and vector calculus to engineering problems.
- The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A05101) COMPUTER PROGRAMMING****(Common to All Branches)****Objectives:**

- Understand problem solving techniques
- Understand representation of a solution to a problem
- Understand the syntax and semantics of C programming language
- Understand the significance of Control structures
- Learn the features of C language

**UNIT - I**

Overview of Computers and Programming - Electronic Computers Then and Now - Computer Hardware - Computer Software - Algorithm - Flowcharts - Software Development Method - Applying the Software Development Method.

Types, Operators and Expressions: Variable Names - Data Types and Sizes - Constants - Declarations - Arithmetic Operators - Relational and Logical Operators - Type Conversions - Increment and Decrement Operators - Bitwise Operators - Assignment Operators and Expressions - Conditional Expressions - Precedence and Order of Evaluation.

**UNIT - II**

Selections Statements – Iteration Statements – Jump Statements- Expression Statements - Block Statements.

Single Dimensional Arrays – Generating a Pointer to an Array – Passing Single Dimension Arrays to Functions – Strings – Two Dimensional Arrays – Indexing Pointers – Array Initialization – Variable Length Arrays

**UNIT - III**

Pointer Variables – Pointer Operators - Pointer Expressions – Pointers And Arrays – Multiple Indirection – Initializing Pointers – Pointers to Functions – C's Dynamic Allocation Functions – Problems with Pointers.

Understanding the scope of Functions – Scope Rules – Type Qualifiers – Storage Class Specifiers- Functions Arguments –The Return Statement.

## **UNIT - IV**

Command line arguments – Recursion – Function Prototypes – Declaring Variable Length Parameter Lists

Structures – Arrays of Structures – Passing Structures to Functions – Structure Pointers – Arrays and Structures within Structures – Unions – Bit Fields – Enumerations – typedef

## **UNIT - V**

Reading and Writing Characters – Reading and Writing Strings – Formatted Console I/O – Printf - Scanf – Standard C Vs Unix File I/O – Streams and Files – File System Basics – Fread and Fwrite – Fseek and Random Access I/O – Fprintf ( ) and Fscanf( ) – The Standard Streams – The Preprocessor Directives #define and #include.

### **Text Books:**

1. “The Complete Reference C”- Fourth Edition- Herbert Schildt- McGrawHill Education.
2. “The C Programming Language” Second Edition- Brian W. Kernighan- Dennis M. Ritchie- Prentice Hall-India. (UNIT- I)

### **References:**

1. Programming in C, Second Edition – Pradip Dey, Manas Ghosh, Oxford University Press.
2. “C From Theory to Practice”- George S. Tselikis- Nikolaos D. Tselikas- CRC Press.
3. “Programming with C”- R S Bichkar- University Press.
4. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education. (UNIT-I)
5. Computer Fundamentals and C Programming- Second Edition- P.Chenna Reddy- Available at Pothi.com (<http://pothi.com/pothi/book/dr-p-chenna-reddy-computer-fundamentals-and-c-programming>).

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**Outcomes:**

- Apply problem solving techniques in designing the solutions for a wide-range of problems
- Choose appropriate control structure depending on the problem to be solved
- Modularize the problem and also solution

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A51101) ENGINEERING CHEMISTRY****(Common to ECE/EIE/ME/IT)****Objectives:**

- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.
- After the completion of the course, the student would understand the concepts of chemistry and apply to various materials for engineering applications.

**UNIT – I WATER QUALITY AND TREATMENT**

Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ozonisation)

Industrial Use of water:

For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water:

Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.

External Treatment: Ion-Exchange and Permutit processes.



**UNIT – II                      POLYMERS**

i) Introduction: Basic concepts of polymerisation, Types of polymerisation (Chain Growth (Addition), Step growth (Condensation)), Mechanism: cationic, anionic, free radical and coordination covalent.

Plastomers: Thermosetting and Thermoplastics, Preparation, properties and Engineering applications of PVC, Teflon, Bakelite and nylons.

Elastomers

Natural Rubber; Processing of natural rubbers, Compounding of Rubber

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, Buna-N, Polyurethane, Polysulfide (Thiokol) rubbers

ii) Conducting polymers: Mechanism, synthesis and applications of polyacetylene, polyaniline.

iii) Inorganic Polymers: Basic Introduction, Silicones, Polyphosphazenes ( $-(R)_2P=N-$ ) applications

**UNIT – III                      ELECTROCHEMISTRY**

i) Galvanic cells, Nernst Equation, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries), Fuel cells: (Hydrogen-Oxygen and Methanol-Oxygen, Solid oxide)

ii) Corrosion: Introduction, type of corrosion (Concentration cell corrosion, Galvanic corrosion), Chemical (Dry) and Electrochemical (Wet) Theory of corrosion. Galvanic series, factors affecting the corrosion (Metal and environment). Prevention: Cathodic protection (Sacrificial anode and impressed current), Inhibitors (Anodic and cathodic), electroplating (Copper, nickel and chromium) and electroless plating (Copper and nickel)

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**UNIT – IV                      FUELS AND COMBUSTION**

Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems.

Solid Fuels: Coal-Classification and Analysis (proximate and ultimate), Coke :Characteristics of metallurgical coke, Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

Liquid Fuels:

Petroleum: Refining of Petroleum, Gasoline- Octane Number, Diesel -Cetane Number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

Gaseous Fuels: Natural gas, Producer gas, Water gas, Coal gas and Biogas. Determination calorific value of Gases fuels by Junker's calorimeter.

Combustion: Basic principles and numerical problems, Flue Gas analysis by Orsat's apparatus.

**UNIT – V                      CHEMISTRY OF ENGINEERING MATERIALS**

i) Cement: Composition, Classification, preparation (Dry and Wet processes), Setting and Hardening (Hydration and Hydrolysis)

ii) Refractories: Introduction, Classification , properties and applications

iii) Lubricants: Introduction, classification (Solid, liquid, semi solid, emulsion and synthetic),Theory of lubrication (Thin film, Thick film & Extreme pressure) , properties of lubricants and applications.

iv) Carbon clusters: Fullerenes and Carbon Nano Tubes (CNT)

**Text Books:**

1. Engineering Chemistry, First Edition, Jayaveera KN, Subba Reddy GVand Ramachandraiah C, McGraw Hill Higher Education, New Delhi, 2013.

2. A Text Book of Engineering Chemistry, 15<sup>th</sup> Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013.

**References:**

1. A Text book of Engineering Chemistry, 12<sup>th</sup> Edition, SS Dhara,Uma, S. Chand Publications, New Delhi, 2010.
2. Engineering Chemistry, First edition, K.B. Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited, 2010.
3. Engineering Chemistry, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson Education, 2013.

**Outcomes:** The student is expected to:

- Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.
- Understand the electrochemical sources of energy
- Understand industrially based polymers, various engineering materials.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A01101) ENVIRONMENTAL STUDIES****(Common to ECE/EIE/ME/IT)****Objectives:**

To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

**UNIT – I****MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: –**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem

- 
- c. Desert ecosystem
  - d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION :** Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### UNIT – III

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

**SOLID WASTE MANAGEMENT:** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

### UNIT – IV

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

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**UNIT – V**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK:** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

**Text Books:**

1. Text Book of Environmental Studies for Undergraduate Courses, Erach Bharucha, Universities Press Pvt Ltd, Hyderabad. 2<sup>nd</sup> Edition 2013.
2. Environmental Studies by Kaushik, New Age Publishers.

**References:**

1. Environmental Studies by Rajagopalan, Oxford Publishers.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

**Outcomes:**

- Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
- Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
- Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
- By studying environmental sciences, students are exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.
- At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these

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problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(15A52102) ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB****(Common to All Branches)**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

**Objectives:**

- To enable students to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

**UNIT - 1**

1. Phonetics -importance
2. Introduction to Sounds of Speech
3. Vowels and consonants sounds
4. Phonetic Transcription

**UNIT - II**

5. Word Stress
6. Syllabification
7. Rules of word stress
8. Intonation

**UNIT - III**

9. Situational Dialogues
10. Role Plays
11. JAM
12. Describing people/objects/places



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**UNIT - IV**

13. Debates
14. Group Discussions
15. Interview skills

**UNIT - V**

16. Video speech writing
17. Book reviews -oral and written

**Minimum Requirements for ELCS Lab:**

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab: The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.  
System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

**Suggested Software:**

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – part II
3. K-Van Advanced Communication Skills
4. Walden InfoTech Software.

**References:**

1. A Textbook of English Phonetics for Indian Students 2<sup>nd</sup> Ed T. Balasubramanian. (Macmillan),2012.
2. A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd
3. Speaking English Effectively, 2<sup>nd</sup> Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. A Hand book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books,2011
5. Spring Board Succes, Sharada Kouhik, Bindu Bajwa, Orient Blackswan, Hyderabad, 2010.

**Outcomes:**

- Become active participants in the learning process and acquire proficiency in spoken English.
- Speak with clarity and confidence thereby enhance employability skills.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (ECE)**

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**(15A51102) ENGINEERING CHEMISTRY LAB****(Common to ECE/EIE/ME/IT)****Objectives:**

- Will learn practical understanding of the redox reaction
- Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications
- Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology.

**List of Experiments:**

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
5. Determination of Alkalinity of Water
6. Determination of acidity of Water
7. Preparation of Phenol-Formaldehyde (Bakelite)
8. Determination of Viscosity of oils using Redwood Viscometer I
9. Determination of Viscosity of oils using Redwood Viscometer II
10. Determination of calorific value of gaseous fuels by Junker's Calorimeter
11. Conductometric estimation of strong acid using standard sodium hydroxide solution

12. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
13. Potentio metric determination of iron using standard potassium dichromate
14. Colorometric estimation of manganese.
15. pH meter calibration and measurement of pH of water and various other samples.

(Any 10 experiments from the above list)

**References:**

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. Chemistry Practical– Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.

**Outcomes:**

- Would be confident in handling energy storage systems and would be able combat chemical corrosion
- Would have acquired the practical skill to handle the analytical methods with confidence.
- Would feel comfortable to think of design materials with the requisite properties
- Would be in a position to technically address the water related problems.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ECE)**

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**(15A05102) COMPUTER PROGRAMMING LAB****(Common to All branches)****Objectives:**

- Learn C Programming language
- To make the student solve problems, implement algorithms using C language.

**List of Experiments/Tasks**

1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. Study of the Editors, Integrated development environments, and Compilers in chosen platform.
3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.
4. Practice programs: Finding the sum of three numbers, exchange of two numbers, maximum of two numbers, To read and print variable values of all data types of C language, to find the size of all data types, to understand the priority and associativity of operators using expressions, to use different library functions of C language.
5. Write a program to find the roots of a Quadratic equation.
6. Write a program to compute the factorial of a given number.
7. Write a program to check whether the number is prime or not.
8. Write a program to find the series of prime numbers in the given range.
9. Write a program to generate Fibonacci numbers in the given range.
10. Write a program to find the maximum of a set of numbers.
11. Write a program to reverse the digits of a number.
12. Write a program to find the sum of the digits of a number.
13. Write a program to find the sum of positive and negative numbers in a given set of numbers.
14. Write a program to check for number palindrome.
15. Write a program to evaluate the sum of the following series up to 'n' terms  

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$$
16. Write a program to generate Pascal Triangle.
17. Write a program to read two matrices and print their sum and product in the matrix form.
18. Write a program to read matrix and perform the following operations.
  - i. Find the sum of Diagonal Elements of a matrix.
  - ii. Print Transpose of a matrix.

- 
- iii. Print sum of even and odd numbers in a given matrix.
19. Write a program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters.
  20. Write a program to insert a substring in to a given string and delete few characters from the string. Don't use library functions related to strings.
  21. Write a program to perform the operations addition, subtraction, multiplication of complex numbers.
  22. Write a program to split a 'file' in to two files, say file1 and file2. Read lines into the 'file' from standard input. File1 should consist of odd numbered lines and file2 should consist of even numbered lines.
  23. Write a program to merge two files.
  24. Write a program to implement numerical methods Lagrange's interpolation, Trapezoidal rule.
  25. Write a program to read a set of strings and sort them in alphabetical order.
  26. Write a program to read two strings and perform the following operations without using built-in string Library functions and by using your own implementations of functions.
    - i. String length determination
    - ii. Compare Two Strings
    - iii. Concatenate them, if they are not equal
    - iv. String reversing
  27. Write programs using recursion for finding Factorial of a number, GCD, LCM, and solving Towers of Hanoi problem.
  28. Write a program to exchange two numbers using pointers.
  29. Write a program to read student records into a file. Record consists of rollno, name and marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per JNTUA rules. Write the first class, second class, third class and failed students lists separately to another file.
  30. A file consists of information about employee salary with fields employeeid, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employeeid, name, and basic have valid values. HRA is taken as 10% of the basic, DA is taken as 80% of basic, IT is 20% of the basic, other deductions is user specified. Compute the Gross and Net salary of the employee and update the file.
  31. Write a program to perform Base (decimal, octal, hexadecimal, etc) conversion.
  32. Write a program to find the square root of a number without using built-in library function.
  33. Write a program to convert from string to number.
  34. Write a program to implement pseudo random generator.
  35. Write a program to generate multiplication tables from 11 to 20.
  36. Write a program to express a four digit number in words. For example 1546 should be written as one thousand five hundred and forty six.

37. Write a program to generate a telephone bill. The contents of it and the rate calculation etc should be as per BSNL rules. Student is expected to gather the required information through the BSNL website.
38. Write a program to find the execution time of a program.
39. Design a file format to store a person's name, address, and other information. Write a program to read this file and produce a set of mailing labels

**Note:**

1. Instructors are advised to conduct the lab in LINUX/UNIX environment also
2. The above list consists of only sample programs. Instructors may choose other programs to illustrate certain concepts, wherever is necessary. Programs should be there on all the concepts studied in Theory. Instructors are advised to change atleast 25% of the programs every year until the next syllabus revision.

**References:**

1. “How to Solve it by Computer”, R.G. Dromey, Pearson.
2. “The C Programming Language”, Brian W. Kernighan, Dennis M. Ritchie, Pearson.
3. “Let us C”, Yeswant Kanetkar, BPB publications
4. “Pointers in C”, Yeswant Kanetkar, BPB publications.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education.

**Outcomes:**

- Apply problem solving techniques to find solutions to problems
- Able to use C language features effectively and implement solutions using C language.
- Improve logical skills.

B. Tech I-II Sem. (ECE)

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**(15A52201) ENGLISH FOR PROFESSIONAL  
COMMUNICATION**

**1. INTRODUCTION:**

English is a global language and has international appeal and application. It is widely used in a variety of contexts and for varied purposes. The students would find it useful both for social and professional development. There is every need to help the students acquire skills useful to them in their career as well as workplace. They need to write a variety of documents and letters now extending into professional domain that cuts across business and research also. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**2. OBJECTIVES:**

1. To develop confidence in the students to use English in everyday situations.
2. To enable the students to read different discourses so that they appreciate English for science and technologies.
3. To improve familiarity with a variety of technical writings.
4. To enable the students to acquire structure and written expressions required for their profession.
5. To develop the listening skills of the students.

**3. SYLLABUS:**



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**UNIT –I**

**Topics:** Group discussion, cause and effect, events and perspectives, debate, if conditional, essay writing.

**Text: LESSONS FROM THE PAST** from *MINDSCAPES*

Importance of History - Differing Perspectives - Modern Corporatism - Lessons From The Past

**UNIT-II**

**Topics:** Idioms, essay writing, power point presentation, modals, listening and rewriting, preparing summary, debate, group discussion, role play, writing a book review, conversation

**Text: ‘ENERGY’** from *MINDSCAPES*

Renewable and Non-Renewable Sources - Alternative Sources - Conservation -Nuclear Energy

**UNIT-III**

**Topics:** Vocabulary, impromptu speech, creative writing, direct and indirect speech, fixed expressions, developing creative writing skills, accents, presentation skills, making posters, report writing

**Text: ‘ENGINEERING ETHICS’** from *MINDSCAPES*

Challenger Disaster - Biotechnology - Genetic Engineering - Protection From Natural Calamities

**UNIT-IV**

**Topics:** Vocabulary, Conversation, Collocation, Group discussion, Note-making, Clauses, Interpreting charts and tables , Report writing.

**Text: 'TRAVEL AND TOURISM' from *MINDSCAPES***

Advantages and Disadvantages of Travel - Tourism - Atithi Devo Bhava - Tourism in India

**UNIT-V**

**Topics:** Vocabulary, phrasal verbs, writing a profile, connectives, discourse markers, problem-solving, telephone skills, application letters, curriculum vitae, interviews (telephone and personal)

**Text: 'GETTING JOB-READY' from *MINDSCAPES***

SWOT Analysis - Companies And Ways Of Powering Growth - Preparing For Interviews

**Prescribed Text**

***MINDSCAPES*:** English for Technologists and Engineers, Orient Blackswan, 2014.

**REFERENCES:**

1. **Effective Tech Communication**, Rizvi, Tata McGraw-Hill Education, 2007.
2. **Technical Communication**, Meenakshi Raman, Oxford University Press.
3. **English Conversations Practice**, Grant Taylor, Tata Mc GrawHill publications, 2013.
4. **Practical English Grammar**. Thomson and Martinet, OUP, 2010.

**Expected Outcomes:**

At the end of the course, students would be expected to:

1. Have acquired ability to participate effectively in group discussions.
2. Have developed ability in writing in various contexts.
3. Have acquired a proper level of competence for employability.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

B. Tech I-II Sem. (ECE)

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**(15A54201) MATHEMATICS – II****(Common to All Branches)**

**Objectives:** Our emphasis will be more on conceptual understanding and application of Fourier series, Fourier, Z and Laplace transforms and solution of partial differential equations.

**UNIT – I**

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

**UNIT – II**

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions- Parseval's formula- Complex form of Fourier series.

**UNIT – III**

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

**UNIT – IV**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

### **UNIT – V**

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

### **TEXT BOOKS:**

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.

### **REFERENCES:**

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
2. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

**Outcomes:** The student gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and partial differential equations.

B. Tech I-II Sem. (ECE)

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**(15A04201) NETWORK ANALYSIS****(Common to ECE & EIE)****Objective:**

To help students develop an understanding on analyzing electrical circuits using various techniques. To make the student familiarize with the fundamental concepts of coupled circuits, resonance, filters and to analyze the transient response in electric circuits.

**UNIT I**

**Circuit Analysis Techniques:** Voltage and Current Laws, Basic Nodal and Mesh Analysis, Network Theorems- Linearity and Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's theorems. Source Transformation.

**UNIT II**

**DC Transient Circuits :** The Source free RL, RC & RLC Circuits. Natural & Forced Response of RL, RC & RLC Circuits. RC & RL Circuit responses to Pulse and Exponential signals.

**Unit III**

**Sinusoidal steady state analysis:** Characteristics of Sinusoids, Forced Response of Sinusoidal Functions, The Complex forcing Function, The Phasor, Phasor relationships for R, L, and C, Impedance, Admittance. Instantaneous Power, Average Power, Effective Values of Current and Voltage, Apparent Power, Power Factor, Complex Power.

**UNIT IV**

**Resonance:** Introduction, Definition of 'quality factor **Q**' of inductor and capacitor, Series resonance, Bandwidth of the series resonant circuits, Parallel resonance (or anti-resonance), Conditions for maximum impedance, Currents in parallel resonance, , Bandwidth of parallel

resonant circuits, General case of parallel resonance circuit.

**Magnetically Coupled Circuits:** Mutual Inductance, Energy Considerations, The Linear Transformer, The Ideal Transformer

## Unit V

**Two Port Networks & Filters:** Relationship of two port variables, Short circuit Admittance parameters, Open circuit Impedance parameters, Transmission Parameters, Hybrid Parameters, Relationship between parameter sets, Parallel connection of two port networks.

**Filters:** Introduction, the neper & decibel, Characteristic Impedance of symmetrical networks, Currents & voltage ratios as exponentials; the propagation constant, Hyperbolic trigonometry, Properties of symmetrical networks, Filter fundamentals; pass and stop bands,

Behavior of characteristic impedance, The constant – k low pass filter, the constant – k high pass filter, band Pass Filters ,band reject filters - illustrated problems.

### Text Books:

1. W H Hayt, J E Kemmerly and S M Durbin, “Engineering Circuit Analysis”, Tata McGraw-Hill, 7<sup>th</sup> edition, 2010.
2. John D. Ryder, “Networks, Lines, and Fields,” PHI publications, Second Edition, 2012.

### Reference Books:

1. Van Valkenburg, “Network Analysis”, PHI, 3<sup>rd</sup> Edition, 2011.  
N C Jagan & C Lakshminarayana "Network Analysis" BS Publications 3rd Edn.2014

B. Tech I-II Sem. (ECE)

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**(15A56101) ENGINEERING PHYSICS****(Common to All Branches)****Objectives:**

- To evoke interest on applications of superposition effects like interference and diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric waveguides along with engineering applications.
- To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays and non-destructive evaluation using ultrasonic techniques.
- To get an insight into the microscopic meaning of conductivity , classical and quantum free electron model, the effect of periodic potential on electron motion, evolution of band theory to distinguish materials and to understand electron transport mechanism in solids.
- To open new avenues of knowledge and understanding semiconductor based electronic devices , basic concepts and applications of semiconductors and magnetic materials have been introduced which find potential in the emerging micro device applications.
- To give an impetus on the subtle mechanism of superconductors in terms of conduction of electron pairs using BCS theory, different properties exhibited by them and their fascinating applications. Considering the significance of microminiaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties and applications in emerging technologies are elicited.

**UNIT - I****PHYSICAL OPTICS, LASERS AND FIBRE OPTICS**



*Physical Optics:* Interference (Review) – Interference in thin film by reflection – Newton's rings – Diffraction (Review) - Fraunhofer diffraction due to single slit, double slit and diffraction grating.

*Lasers:* Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients — Population inversion – Excitation mechanism and optical resonator – Nd:YAG laser - He-Ne laser – Semiconductor Diode laser - Applications of lasers

*Fiber optics:* Introduction - construction and working principle of optical fiber – Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in Optical fibers – Block diagram of Optical fiber communication system – Applications of optical fibers

## **UNIT – II**

### **CRYSTALLOGRAPHY AND ULTRASONICS**

*Crystallography:* Introduction – Space lattice – Unit cell – Lattice parameters – Bravais lattice – Crystal systems – Packing fractions of SC, BCC and FCC - Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction - Bragg's law – Powder method.

*Ultrasonics:* Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

## **UNIT – III**

### **QUANTUM MECHANICS AND ELECTRON THEORY**

*Quantum Mechanics:* Matter waves – de Broglie hypothesis and properties - Schrodinger's time dependent and independent wave

equations – Physical significance of wave function - Particle in one dimensional infinite potential well.

*Electron theory:* Classical free electron theory – Equation for electrical conductivity - Quantum free electron theory – Fermi-Dirac distribution – Source of electrical resistance – Kronig-Penny model (qualitative treatment) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

## **UNIT – IV**

### **SEMICONDUCTORS AND MAGNETIC MATERIALS**

*Semiconductors:* Intrinsic and extrinsic semiconductors (Qualitative treatment) – Drift & diffusion currents and Einstein's equation – Hall effect - Direct and indirect band gap semiconductors – Formation of p-n junction.

*Magnetic materials:* Introduction and basic definitions – Origin of magnetic moments – Bohr magneton – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials (Qualitative treatment) – Hysteresis - Soft and hard magnetic materials, applications of magnetic materials.

## **UNIT – V**

### **SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS**

*Superconductivity:* Introduction - Effect of magnetic field - Meissner effect – Type I and Type II superconductors – Flux quantization – Penetration depth - BCS theory (qualitative treatment) — Josephson effects –Applications of superconductors.

*Physics of Nanomaterials:* Introduction - Significance of nanoscale and types of nanomaterials – Physical properties: optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials by Top down and bottom up approaches: ball mill, chemical vapour deposition, and sol gel –Applications of nanomaterials.

**Text Books:**

1. Engineering Physics – K.Thyagarajan, 5<sup>th</sup> Edition, MacGraw Hill Publishers, NewDelhi, 2014.
2. Physics for Engineers - N.K Verma, 1<sup>st</sup> Edition, PHI Learning Private Limited, New Delhi, 2014.

**References:**

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, 10<sup>th</sup> Edition, S.Chand and Company, New Delhi, 2014.
2. Engineering Physics – D K Pandey, S. Chaturvedi, 2<sup>nd</sup> Edition, Cengage Learning, New Delhi, 2013.
3. Engineering Physics – D.K Bhattacharya, Poonam Tandon, 1<sup>nd</sup> Edition, Oxford University Press, New Delhi, 2015.

**Outcomes:**

- The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics.
- The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques.
- The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.
- The electronic and magnetic properties of materials were successfully explained by free electron theory and the bases for the band theory are focused.
- The properties and device applications of semiconducting and magnetic materials are illustrated.

The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.

B. Tech I-II Sem. (ECE)

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**(15A03101) ENGINEERING DRAWING****(Common to All Branches)****Objectives:**

- To gain and understanding of the basics of geometrical constructions of various planes and solids, understanding system of graphical representation of various objects and various views to draft and read the products to be designed and eventually for manufacturing applications.
- To learn about various projections, to understand complete dimensions and details of object.
- Ultimately student must get imaginary skill to put an idea of object, circuit, assembly of parts in black & white, to design a product and to understand the composition, which can be understood universally.

**UNIT I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their Significance- Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice. a) Conic Sections including the Rectangular Hyperbola- General method only, b) Cycloid, Epicycloid and Hypocycloid

**UNIT II**

**Scales:** Plain, Diagonal and Vernier;

**Projection of Points:** Principles of orthographic projection – Convention – First angle projections, projections of points.

**UNIT III**

**Projections of Lines:** lines inclined to one or both planes, Problems on projections, Finding True lengths.

**Projections of Planes:** Projections of regular plane surfaces- plane surfaces inclined to both planes.

#### **UNIT IV**

**Projections of Solids:** Projections of Regular Solids with axis inclined to both planes.

**Developments of Solids:** Development of Surfaces of Right Regular Solids-Prism, Cylinder, Pyramid, Cone.

#### **UNIT V**

**Isometric and Orthographic Projections:** Principles of isometric projection- Isometric Scale- Isometric Views- Conventions- Isometric Views of lines, Planes, Simple solids (cube, cylinder and cone). Isometric projections of spherical parts. Conversion of isometric Views to Orthographic Views.

#### **Text Books:**

1. *Engineering Drawing*, N.D. Bhatt, Charotar Publishers
2. *Engineering Drawing*, K.L. Narayana & P. Kannaih, Scitech Publishers, Chennai

#### **References:**

1. *Engineering Drawing*, Johle, Tata McGraw-Hill Publishers
2. *Engineering Drawing*, Shah and Rana, 2/e, Pearson Education
3. *Engineering Drawing and Graphics*, Venugopal/ New age Publishers
4. *Engineering Graphics*, K.C. John, PHI, 2013
5. *Engineering Drawing*, B.V.R. Gupta, J.K. Publishers

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**Outcomes:**

- Drawing 2D and 3D diagrams of various objects.
- Learning conventions of Drawing, which is an Universal Language of Engineers.
- Drafting projections of points, planes and solids.

B. Tech I-II Sem. (ECE)

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**(15A04202) NETWORK ANALYSIS LAB****(Common to ECE & EIE)**

1. Verification of KCL & KVL for any network.
2. Verification of Superposition Theorem with analysis.
3. Verification of Thevenin's Theorem with analysis.
4. Verification of Maximum Power Transfer Theorem with analysis.
5. Analysis of RL & RC circuits for pulse excitation.
6. Frequency response of series resonance circuit with analysis and design.
7. Frequency response of parallel resonance circuit with analysis and design.
8. Design and frequency response of constant 'k' low pass & high pass filters.
9. Design and frequency response of Band pass filter.
10. Design and frequency response of Notch filter.
11. Determination of phase of a sinusoidal signal when passed through RL or RC circuits.
12. Impedance transformation through transformer.

**Note:-** Ten experiments must be conducted in the semester.

**Components & Equipment required:-**

1. Bread boards, passive components, R, L, and C with different ratings.
2. Dual power supplies, function generators, CROs.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-II Sem. (ECE)**

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**(15A56102) ENGINEERING PHYSICS LABORATORY****(Common to All Branches)****Objectives:**

- Will recognize the important of optical phenomenon like Interference and diffraction.
- Will understand the role of optical fiber parameters and signal losses in communication.
- Will recognize the importance of energy gap in the study of conductivity and hall effect in a semiconductor
- Will understand the applications of B H curve.
- Will acquire a practical knowledge of studying the crystal structure in terms of lattice constant.
- Will recognize the application of laser in finding the particle size and its role in diffraction studies.
- Will learn to synthesis of the nanomaterials and recognize its importance by knowing its nano particle size and its impact on its properties.

**Any 10 of the following experiments has to be performed during the I year I semester**

1. Determination of radius of curvature of a Plano-convex lens by forming Newton's rings.
3. Determination of wavelength of given source using diffraction grating in normal incidence method.
4. Determination of Numerical aperture, acceptance angle of an optical fiber.
5. Energy gap of a Semiconductor diode.
6. Hall effect – Determination of mobility of charge carriers.
7. B-H curve – Determination of hysteresis loss for a given magnetic material.
8. Determination of Crystallite size using X-ray pattern (powder) using debye-scheerer method.
9. Determination of particle size by using laser source.

10. Determination of dispersive power of a prism.
11. Determination of thickness of the thin wire using wedge Method.
12. Laser : Diffraction due to single slit
13. Laser : Diffraction due to double slit
14. Laser: Determination of wavelength using diffraction grating
15. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
16. Synthesis of nanomaterial by any suitable method.

**References:**

1. Engineering Physics Practicals – NU Age Publishing House, Hyderabad.
2. Engineering Practical physics – Cengage Learning, Delhi.

**Outcomes:**

- Would recognize the important of optical phenomenon like Interference and diffraction.
- Would have acquired the practical application knowledge of optical fiber, semiconductor, dielectric and magnetic materials, crystal structure and lasers by the study of their relative parameters.

Would recognize the significant importance of nanomaterials in various engineering fields.

B. Tech I-II Sem. (ECE)

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**(15A99201) ENGINEERING & I.T. WORKSHOP****ENGINEERING WORKSHOP****Course Objective:**

*The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.*

**1. TRADES FOR EXERCISES:**

- Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
- Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock
- Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet
- House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
- Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.

- f. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

## **2. TRADES FOR DEMONSTRATION:**

- a. Plumbing
- b. Machine Shop
- c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

### **References:**

1. *Engineering Work shop practice for JNTU*, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009
2. *Work shop Manual* / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. *Engineering Practices Lab Manual*, Jeyapoovan, SaravanaPandian, 4/e Vikas
4. *Dictionary of Mechanical Engineering*, GHF Nayler, Jaico Publishing House.

## **I.T. WORKSHOP**

### **Course Objective:**

- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- To learn about Networking of computers and use Internet facility for Browsing and Searching.

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**Learning Outcome:**

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors
- Prepare Slide presentations using the presentation tool
- Interconnect two or more computers for information sharing
- Access the Internet and Browse it to obtain the required information
- Install single or dual operating systems on computer

**Preparing your Computer ( 5 weeks)**

**Task 1: Learn about Computer:** Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

**Task 2: Assembling a Computer:** Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

**Task 3: Install Operating system:** Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

**Task 4: Operating system features:** Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

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**Networking and Internet (4 weeks)**

**Task 5: Networking:** Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimping activity, logical configuration etc should be done by the student. The entire process has to be documented.

**Task 6: Browsing Internet:** Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc.

If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

**Task 7: Antivirus:** Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

**Productivity tools (6 weeks)**

**Task 8: Word Processor:** Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the

images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

**Task 9: Spreadsheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

**Task 10: Presentations :** creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

### **Optional Tasks:**

**Task 11: Laboratory Equipment:** Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material
- Air conditioner

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- UPS and Inverter
  - RO system
  - Electrical Rectifier
  - CRO
  - Function Generator
  - Microwave benches

**Task 12: Software:** Students may submit a report on specifications of various software that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. The software may be proprietary software or Free and Open source software. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop operating system
- Server operating system
- Antivirus software
- MATLAB
- CAD/CAM software
- AUTOCAD

### References:

1. Introduction to Computers, Peter Norton, Mc Graw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams”, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs”, Bigelows, TMH



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A54301) MATHEMATICS-III****OBJECTIVES:**

- This course aims at providing the student with the concepts of Matrices, Numerical Techniques and Curve fitting.

**OUTCOMES:**

- The student will be able to analyze engineering problems using the concepts of Matrices and Numerical methods

**UNIT – I**

Elementary row transformations-Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations. Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonalization of matrix. Calculation of powers of matrix and inverse of a matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

**UNIT – II**

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout's triangularisation method, Gauss - Seidal iteration method.

**UNIT – III**

**Interpolation:** Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

**UNIT – IV**

Curve fitting: Fitting of a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation for Newton's interpolation formula. Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

**UNIT – V**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.

**TEXT BOOKS:**

3. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
4. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

**REFERENCES:**

2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
3. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (ECE)

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3	1	0	3

### (15A04301) ELECTRONIC DEVICES AND CIRCUITS

#### Course Objectives:

To give understanding on semiconductor physics of the intrinsic, p and n materials, characteristics of the p-n junction diode, diode's application in electronic circuits, Characteristics of BJT, FET, MOSFET, characteristics of special purpose electronic devices. To familiarize students with dc biasing circuits of BJT, FET and analyzing basic transistor amplifier circuits.

#### Course Outcomes:

Upon completion of the course, students will:

- Analyze the operating principles of major electronic devices, its characteristics and applications.
- Design and analyze the DC bias circuitry of BJT and FET.
- Design and analyze basic transistor amplifier circuits using BJT and FET.

#### UNIT- I

**Junction Diode Characteristics :** Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

**Special Semiconductor Diodes:** Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, DIAC, TRIAC, SCR, UJT. Construction, operation and characteristics of all the diodes is required to be considered.

#### UNIT- II

**Rectifiers and Filters:** Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, L- section filter,  $\Pi$ -section filter, Multiple L- section and Multiple  $\Pi$  section filter, comparison of various filter circuits in terms of ripple factors.

#### UNIT- III

**Transistor Characteristics:**

**BJT:** Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

**FET:** FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

## **UNIT- IV**

**Transistor Biasing and Thermal Stabilization :** Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in  $V_{BE}$ ,  $I_c$ , and  $\beta$ , Stability factors, ( $S$ ,  $S'$ ,  $S''$ ), Bias compensation, Thermal runaway, Thermal stability.  
FET Biasing- methods and stabilization.

## **UNIT- V**

### **Small Signal Low Frequency Transistor Amplifier Models:**

**BJT:** Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

**FET:** Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

### **TEXT BOOKS:**

1. J. Millman, C. Halkias, "Electronic Devices and Circuits", Tata Mc-Graw Hill, 4<sup>th</sup> Edition, 2010.
2. David A. Bell, "Electronic Devices and Circuits", Fifth Edition, Oxford University Press, 2009.
3. Salivahanan, Kumar, Vallavaraj, "Electronic Devices and Circuits", Tata Mc-Graw Hill, Second Edition

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**REFERENCES:**

1. Jacob Millman, C. Halkies, C.D.Parikh, “Integrated Electronics”, Tata Mc-Graw Hill, 2009.
2. R.L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits”, Pearson Publications,,9thEdition,2006.
3. BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, “Electronic Devices and Circuits”, Pearson, 2<sup>nd</sup> edition.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (ECE)

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3	1	0	3

### (15A04302) SWITCHING THEORY AND LOGIC DESIGN

#### Course Objectives:

- To provide fundamental concepts used in the design of digital systems and learn the methods for the design of digital circuits.

#### Course Outcomes:

- To introduce basic postulates of Boolean algebra and the methods for simplifying Boolean expressions
- To illustrate the concepts and study the procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concepts of programmable logic devices.

#### UNIT I

##### Number System & Boolean Algebra:

Digital Systems, Binary Numbers, Number base conversions, Complements of numbers, Signed binary numbers, Binary codes.

Boolean Algebra-Basic definition, Basic theorems and properties, Boolean Functions, Canonical & Standard forms, other logic operations & Logic gates.

#### UNIT II

##### Gate Level Minimization:

The map method, four variable & Five variable K-map, POS & SOP Simplification, Don't care conditions, NAND & NOR Implementation, Other two level Implementation, Ex-or Function, Tabular Method- Simplification of Boolean function using tabulation Method.

#### UNIT III

##### Combinational Logic Circuits:

Combinational circuits, Analysis & Design procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude comparator, Decoder, Encoders, Multiplexers.

#### UNIT IV

##### Sequential Logic Circuits:

Sequential Circuits, Latches, Flips-Flops - RS, JK, Master-Slave JK, D & T flip flops, Analysis of Clocked sequential circuits, State Reduction & Assignment, Design procedure, Registers & Counters – Registers, Shift Registers, Ripple Counters, Synchronous counters, asynchronous counters.

Asynchronous sequential circuits - Introduction, Analysis Procedure, Design Procedure, Reduction of State flow tables, Race-free State Assignment, Hazards.

## **UNIT V**

### **Programmable Devices:**

Memory organization, classification of semiconductor memories, ROM, PROM, DROM, EPROM, EEPROM, RAM, expansion of memory, CCD, Flash memories, content addressable memory, programmable logic devices, PROM at PLD, programmable logic array (PLA) programmable array logic (PAL), field programmable gate array (FPGA).

### **Text Books:**

1. M.Morris Mano & Michel D. Ciletti, "Digital Design", 5<sup>th</sup> Edition Pearson.
2. Zvi Kohavi and Nirah K.Jha, "Switching theory and Finite Automata Theory", 3<sup>rd</sup> Edition Cambridge.

### **References:**

1. Subratha Goshal, "Digital Electronics", Cambridge
2. Comer, "Digital & State Machine Design", Third Indian edition, OXFORD

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (ECE)

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### (15A04303) SIGNALS AND SYSTEMS

#### *Course objectives:*

- To study about signals and systems.
- To do analysis of signals & systems (continuous and discrete) using time domain & frequency domain methods.
- To understand the stability of systems through the concept of ROC.
- To know various transform techniques in the analysis of signals and systems.

#### *Learning Outcomes:*

- For integro-differential equations, the students will have the knowledge to make use of Laplace transforms.
- For continuous time signals the students will make use of Fourier transform and Fourier series.
- For discrete time signals the students will make use of Z transforms.
- The concept of convolution is useful for analysis in the areas of linear systems and communication theory.

#### UNIT I

**SIGNALS & SYSTEMS:** Definition and classification of Signal and Systems (Continuous time and Discrete time), Elementary signals such as Dirac delta, unit step, ramp, sinusoidal and exponential and operations on signals. Analogy between vectors and signals-orthogonality-Mean Square error-Fourier series: Trigonometric & Exponential and concept of discrete spectrum

#### UNIT II

**CONTINUOUS TIME FOURIER TRANSFORM:** Definition, Computation and properties of Fourier Transform for different types of signals. Statement and proof of sampling theorem of low pass signals

#### UNIT III

**SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS:** Linear system, impulse response, Response of a linear system, linear time-invariant (LTI) system, linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, Relationship between bandwidth and rise time. Energy and Power Spectral Densities

#### UNIT IV



**DISCRETE TIME FOURIER TRANSFORM:** Definition, Computation and properties of Fourier Transform for different types of signals.

## **UNIT V**

**LAPLACE TRANSFORM:** Definition-ROC-Properties-Inverse Laplace transforms-the S-plane and BIBO stability-Transfer functions-System Response to standard signals-Solution of differential equations with initial conditions.

**The Z–TRANSFORM:** Derivation and definition-ROC-Properties-Linearity, time shifting, change of scale, Z-domain differentiation, differencing, accumulation, convolution in discrete time, initial and final value theorems-Poles and Zeros in Z - plane-The inverse Z-Transform-System analysis-Transfer function-BIBO stability-System Response to standard signals-Solution of difference equations with initial conditions. .

## **TEXT BOOKS:**

1. B. P. Lathi, “Linear Systems and Signals”, Second Edition, Oxford University press,
2. A.V. Oppenheim, A.S. Willsky and S.H. Nawab, “Signals and Systems”, Pearson, 2nd Edn.
3. A. Ramakrishna Rao, “Signals and Systems”, 2008, TMH.

## **REFERENCES:**

1. Simon Haykin and Van Veen, “Signals & Systems”, Wiley, 2nd Edition.
2. B.P. Lathi, “Signals, Systems & Communications”, 2009, BS Publications.
3. Michel J. Robert, “Fundamentals of Signals and Systems”, MGH International Edition, 2008.
4. C. L. Philips, J. M. Parr and Eve A. Riskin, “Signals, Systems and Transforms”, Pearson education. 3rd

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (ECE)**

L	T	P	C
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**(15A04304) PROBABILITY THEORY & STOCHASTIC PROCESSES*****Course Objectives:***

- To understand the concepts of a Random Variable and operations that may be performed on a single Random variable.
- To understand the concepts of Multiple Random Variables and operations that may be performed on Multiple Random variables.
- To understand the concepts of Random Process and Temporal & Spectral characteristics of Random Processes.

***Learning Outcomes:***

- A student will be able to determine the temporal and spectral characteristics of random signal response of a given linear system.

**UNIT-I**

**Probability:** Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Mathematical Model of Experiments, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events:

**The Random Variable :** Definition of a Random Variable, Conditions for a Function to be a Random Variable, Discrete and Continuous, Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Raleigh, Conditional Distribution, Methods of defining Conditioning Event, Conditional Density, Properties.

**UNIT-II**

**Multiple Random Variables :** Vector Random Variables, Joint Distribution Function, Properties of Joint Distribution, Marginal Distribution Functions, Conditional Distribution and Density – Point Conditioning, Conditional Distribution and Density – Interval conditioning, Statistical Independence, Sum of Two Random Variables, Sum of Several Random Variables, Central Limit Theorem, (Proof not expected). Unequal Distribution, Equal Distributions.

**Operations on Multiple Random Variables:** Expected Value of a Function of Random Variables, Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

**UNIT-III**

**Random Processes – Temporal Characteristics:** The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean-Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross-Correlation Function and its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process.

**UNIT-IV**

**Random Processes – Spectral Characteristics:** The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, the Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function.

**UNIT-V**

**Linear Systems with Random Inputs:** Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output, Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output, Band pass, Band-Limited and Narrowband Processes, Properties.

**Text Books:**

1. Peyton Z. Peebles, "Probability, Random Variables & Random Signal Principles", TMH, 4th Edition, 2001.
2. Athanasios Papoulis and S. Unnikrishna Pillai, "Probability, Random Variables and Stochastic Processes", PHI, 4th Edition, 2002.

**References:**

1. R.P. Singh and S.D. Sapre, "Communication Systems Analog & Digital", TMH, 1995.
2. Henry Stark and John W. Woods, "Probability and Random Processes with Application to Signal Processing", Pearson Education, 3rd Edition.
3. George R. Cooper, Clive D. MC Gillem, "Probability Methods of Signal and System Analysis", Oxford, 3rd Edition, 1999.
4. S.P. Eugene Xavier, "Statistical Theory of Communication", New Age Publications, 2003.
5. B.P. Lathi, "Signals, Systems & Communications", B.S. Publications, 2003.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**B. Tech II-I Sem. (ECE)**

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3	1	0	3

### (15A02306) ELECTRICAL TECHNOLOGY

#### **Objective:**

Electrical Technology contains Single phase transformers, Induction motors, Synchronous Machines, DC generators and motors. The objective is to study their performance aspects.

#### **UNIT- I DC GENERATORS**

D.C. Generators – Principle of Operation – Constructional Features – E. M.F Equation– Numerical Problems – Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Load Characteristics of Shunt, Series and Compound Generators- Applications

#### **UNIT – II D.C. MOTORS**

D.C Motors – Principle of Operation – Back E.M.F. –Torque Equation – Characteristics and Application of Shunt, Series and Compound Motors-Speed Control of D.C. Motors: Armature Voltage and Field Flux Control Methods. Three Point Starter-Losses – Constant & Variable Losses – Calculation of Efficiency - Swinburne's Test.

#### **UNIT-III SINGLE PHASE TRANSFORMERS**

Single Phase Transformers - Constructional Details- Emf Equation - Operation on No Load and on Load - Phasor Diagrams-Equivalent Circuit - Losses and Efficiency- Regulation-OC and SC Tests – Sumpner's Test - Predetermination of Efficiency and Regulation.

#### **UNIT-IV 3-PHASE INDUCTION MOTORS**

Polyphase Induction Motors-Construction Details of Cage and Wound Rotor Machines- Principle of Operation – Slip- Rotor Emf and Rotor Frequency - Torque Equation- Torque Slip Characteristics.

#### **UNIT – V SYNCHRONOUS MACHINES**

Principle And Constructional Features of Salient Pole and Round Rotor Machines – E.M.F Equation- Voltage Regulation by Synchronous Impedance Method- Theory of Operation of Synchronous Motor.

#### **OUTCOME:**

After going through this course the student acquires knowledge on basics of DC generators and motors, Transformers, Induction motors and Synchronous Machines.

**TEXT BOOKS:**

1. Basic Electrical Engineering, V. N. Mittle and Arvind Mittle, Mc Graw Hill (India) Pvt. Ltd., 2<sup>nd</sup> Edition, 2005.
2. Basic Electrical Engineering, T.K.Nagsarkar and M.S. Sukhija, Oxford University Press, 2<sup>nd</sup> Edition, 2011.

**REFERENCES:**

1. Basic Electrical Engineering, M.S.Naidu and S. Kamakshiah, Tata Mc Graw Hill, 3<sup>rd</sup> Edition, 2009.
2. Electrical and Electronic Technology, Hughes, Pearson Education.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(15A04305) ELECTRONIC DEVICES AND CIRCUITS LABORATORY****Objectives:**

- This Lab provides the students to get an electrical model for various semiconductor devices. Students can find and plot  $V_I$  characteristics of all semiconductor devices. Student learns the practical applications of the devices. They can learn and implement the concept of the feedback and frequency response of the small signal amplifier

**Outcomes:**

- Students able to learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices

**PART A: Electronic Workshop Practice**

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

**PART B: List of Experiments****(For Laboratory Examination-Minimum of Ten Experiments)**

1. P-N Junction Diode Characteristics  
Part A: Germanium Diode (Forward bias & Reverse bias)  
Part B: Silicon Diode (Forward bias only)
2. Zener Diode Characteristics  
Part A: V-I Characteristics

Part B: Zener Diode act as a Voltage Regulator

3. Rectifiers (without and with c-filter)

Part A: Half-wave Rectifier

Part B: Full-wave Rectifier

4. BJT Characteristics(CE Configuration)

Part A: Input Characteristics

Part B: Output Characteristics

5. FET Characteristics(CS Configuration)

Part A: Drain (Output) Characteristics

Part B: Transfer Characteristics

6. SCR Characteristics

7. UJT Characteristics

8. Transistor Biasing

9. CRO Operation and its Measurements

10. BJT-CE Amplifier

11. Emitter Follower-CC Amplifier

12. FET-CS Amplifier

### **PART C:Equipment required for Laboratory**

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards
11. Connecting Wires
12. CRO Probes etc.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(15A02307) ELECTRICAL TECHNOLOGY AND BASIC SIMULATION****LABORATORY****PART-A**

1. Magnetization Characteristics of D.C.Shunt Generator. Determination of Critical Field Resistance.
2. Swinburne's Test on DC Shunt Machine (Predetermination of Efficiency of a Given DC Shunt Machine Working as Motor and Generator).
3. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
4. OC & SC Tests on Single-Phase Transformer (Predetermination of Efficiency and Regulation at Given Power Factors and Determination of Equivalent Circuit).
5. Load Test on Single Phase Transformer.

**PART-B****List of Experiments:**

1. Generation of Various signals and Sequences (Periodic and Aperiodic), Such as Unit Impulse, Unit Step, Square, Saw Tooth, Triangular, Sinusoidal, Ramp, Sinc.
2. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
3. Convolution between Signals and Sequences.
4. Autocorrelation and Cross correlation between Signals and Sequences.
5. Verification of Linearity and Time Invariance Properties of a Given Continuous / Discrete System.
6. Finding the Fourier Transform of a given Signal and plotting its Magnitude and Phase Spectrum.
7. Waveform Synthesis using Laplace Transform.
8. Generation of Gaussian Noise (Real and Complex), Computation of its Mean, M.S.Values and its Skew, Kurtosis, and PSD, Probability Distribution Function.
9. Sampling Theorem Verification.
10. Removal of Noise by Auto Correlation / Cross correlation in a given signal corrupted by noise.



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11. Impulse response of a raised cosine filter.
  12. Checking a Random Process for Stationary in Wide Sense.

Note: All five (5) Experiments from part-A and any Eight (8) Experiments from Part-B are to be conducted.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ECE)**

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**(15A54402) MATHEMATICS -IV**

(Common to ECE, EEE)

**OBJECTIVES:**

To enable the students to understand the mathematical concepts of special functions & complex variables and their applications in science and engineering.

**OUTCOMES:**

The student achieves the knowledge to analyse the problems using the methods of special functions and complex variables

**UNIT – I:**

Special Functions: Gamma and Beta Functions – their properties – Evaluation of improper integrals. Series Solutions of ordinary differential equations (Power series and Frobenius Method).

**UNIT – II:**

Bessel functions – Properties – Recurrence relations – Orthogonality. Legendre polynomials – Properties – Rodrigue’s formula – Recurrence relations – Orthogonality.

**UNIT – III**

Functions of a complex variable – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thomson method. Conformal mapping: Transformation of  $ez$ ,  $\ln z$ ,  $z^2$ ,  $\sin z$ ,  $\cos z$ , Bilinear transformation - Translation, rotation, magnification and inversion – Fixed point – Cross ratio – Determination of bilinear transformation.

**UNIT – IV**

Complex integration: Line integral – Evaluation along a path and by indefinite integration – Cauchy’s integral theorem – Cauchy’s integral formula – Generalized integral formula. Complex power series: Radius of convergence – Expansion in Taylor’s series, Maclaurin’s series and Laurent series. Singular point – Isolated singular point – Pole of order  $m$  – Essential singularity.

**UNIT – V**

Residue – Evaluation of residue by formula and by Laurent's series – Residue theorem.

Evaluation of integrals of the type

(a) Improper real integrals  $\int_{-\infty}^{\infty} f(x) dx$  (b)  $\int_{-\infty}^{\infty} f(x) \cos ax dx$  (c)

$\int_{-\infty}^{\infty} e^{imx} f(x) dx$

**TEXT BOOKS:**

- 1.Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
- 2.Engineering Mathematics, Volume - III, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher

**REFERENCES:**

1. Mathematics III by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.
2. Advanced Engineering Mathematics, Peter V.O'Neil, CENGAGE publisher.
3. Advanced Engineering Mathematics by M.C. Potter, J.L. Goldberg, Edward F.Aboufadel, Oxford.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ECE)**

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<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A04401) ELECTRONIC CIRCUIT ANALYSIS****Course Objectives:**

The aim of this course is to familiarize the student with the analysis and design of multistage amplifiers with compound connections, feedback amplifiers, oscillators, power amplifiers and tuned amplifiers. To study and analyze the frequency response of amplifier circuits.

**Course Outcomes:**

Upon completion of this course, student will be able to :

- Analyze the frequency response of the BJT amplifiers at low and high frequencies.
- Analyze and design multistage amplifiers with compound connections, feedback amplifiers, oscillators, power amplifiers and tuned amplifiers.

**UNIT -I**

**Feedback Amplifiers :** Feedback principle and concept, types of feedback, classification of amplifiers, feedback topologies, Characteristics of negative feedback amplifiers, Generalized analysis of feedback amplifiers, Performance comparison of feedback amplifiers, Method of Analysis of Feedback Amplifiers.

**Oscillators:** Oscillator principle, condition for oscillations, types of oscillators, RC-phase shift and Wein bridge oscillators with BJT and FET with the relevant analysis, Generalized analysis of LC Oscillators, Hartley and Colpitt's oscillators with BJT and FET with relevant analysis, Crystal oscillators, Frequency and amplitude stability of oscillators.

**UNIT- II****Small Signal High Frequency Transistor Amplifier models:**

**BJT:** Transistor at High Frequencies, Hybrid-  $\pi$  Common Emitter transistor model, Hybrid  $\pi$  conductances, Hybrid  $\pi$  capacitances, Validity of hybrid  $\pi$  model, determination of high-frequency parameters in terms of low-frequency parameters , CE short circuit current gain, Current gain with resistive load, Cut-off frequencies, Frequency Response and Gain Bandwidth product.

**FET:**Analysis of Common Source and Common Drain Amplifier circuits at High frequencies.

### **UNIT – III**

**Multistage Amplifiers :** Classification of amplifiers, Methods of coupling, Cascaded transistor amplifier and its analysis, Analysis of two stage RC coupled amplifier, High input resistance transistor amplifier circuits and their analysis-Darlington pair amplifier, Cascode amplifier, Boot-strap emitter follower, Analysis of multi stage amplifiers using FET, Differential amplifier using BJT.

### **UNIT- IV**

**Power Amplifiers:** Class A large signal Amplifiers, Second harmonic Distortions, Higher order harmonic Distortion, Transformer Coupled Audio power amplifier, Efficiency, Push-pull amplifiers, Class B Amplifiers, Class AB operation, Efficiency of Class B Amplifier, Complementary Symmetry push pull amplifier, Class D amplifier, Class S amplifier, MOSFET power amplifier, Thermal stability and Heat sink.

### **UNIT -V**

**Tuned Amplifiers :** Introduction, Q-Factor, Small Signal Tuned Amplifier – Capacitance single tuned amplifier, Double Tuned Amplifiers, Effect of Cascading Single tuned amplifiers on Band width, Effect of Cascading Double tuned amplifiers on Band width, Staggered tuned amplifiers, Stability of tuned amplifiers

### **Text Books:**

1. J. Millman and C.C. Halkias, “Integrated Electronics”, McGraw-Hill, 1972.
2. Donald A. Neaman, “Electronic Circuit Analysis and Design”, McGraw Hill.
3. Salivahanan, N.Suresh Kumar, A. Vallavaraj, “Electronic Devices and Circuits”, Tata McGraw Hill, Second Edition.

### **References:**

1. Robert T. Paynter, “Introductory Electronic Devices and Circuits”, Pearson Education, 7<sup>th</sup> Edition
2. Robert L. Boylestad and Louis Nashelsky, “Electronic Devices and Circuits Theory” Pearson/Prentice Hall, 9th Edition, 2006.
3. Sedra A.S. and K.C. Smith, “Micro Electronic Circuits”, Oxford University Press, 5th Edition.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ECE)**

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**(15A04402) ANALOG COMMUNICATION SYSTEMS****Course Objectives:**

- To study the fundamental concept of the analog communication systems.
- To analyze various analog modulation and demodulation techniques.
- To know the working of various transmitters and receivers.
- To understand the influence of noise on the performance of analog communication systems, and to acquire the knowledge about information and capacity.

**Learning Outcomes:**

This course provides the foundational education in Analog Communication systems, and applications. The students are provided the learning experience through class room teaching and solving assignment & tutorial problems. At the end of course, students should be able to:

- Acquire knowledge on the basic concepts of Analog Communication Systems.
- Analyze the analog modulated and demodulated systems.
- Verify the effect of noise on the performance of communication systems.
- Know the fundamental concepts of information and capacity.

**UNIT- I**

**Introduction:** Elements of communication systems, Information, Messages and Signals, Modulation, Modulation Methods, Modulation Benefits and Applications.

**Amplitude Modulation & Demodulation:** Baseband and carrier communication, Amplitude Modulation (AM), Rectifier detector, Envelope detector, Double sideband suppressed carrier (DSB-SC) modulation & its demodulation, Switching modulators, Ring modulator, Balanced modulator, Frequency mixer, sideband and carrier power of AM, Generation of AM signals, Quadrature amplitude modulation (QAM), Single sideband (SSB) transmission, Time domain representation of SSB signals & their demodulation schemes (with carrier, and suppressed carrier), Generation of SSB signals, Vestigial sideband (VSB) modulator & demodulator, Illustrative Problems.

**UNIT- II**

**Angle Modulation & Demodulation:** Concept of instantaneous frequency, Generalized concept of angle modulation, Bandwidth of angle modulated waves – Narrow band frequency modulation (NBFM); and Wide band FM (WBFM), Phase modulation, Verification of Frequency modulation bandwidth relationship, Features of angle modulation, Generation of FM waves – Indirect method, Direct generation; Demodulation of FM, Bandpass limiter, Practical frequency demodulators, Small error analysis, Pre-emphasis, & De-emphasis filters, FM receiver, FM Capture Effect, Carrier Acquisition- phased locked loop (PLL), Costas loop, Frequency division

multiplexing (FDM), and Super-heterodyne AM receiver, Illustrative Problems.

### UNIT- III

**Noise in Communication Systems:** Types of noise, Time domain representation of narrowband noise, Filtered white noise, Quadrature representation of narrowband noise, Envelope of narrowband noise plus sine wave, Signal to noise ratio & probability of error, Noise equivalent bandwidth, Effective noise temperature, and Noise figure, Baseband systems with channel noise, Performance analysis (i.e. finding SNR expression) of AM, DSB-SC, SSB-SC, FM, PM in the presence of noise, Illustrative Problems.

### UNIT- IV

**Analog pulse modulation schemes:** Pulse amplitude modulation – Natural sampling, flat top sampling and Pulse amplitude modulation (PAM) & demodulation, Pulse-Time Modulation – Pulse Duration and Pulse Position modulations, and demodulation schemes, PPM spectral analysis, Illustrative Problems.

**Radio Receiver measurements:** Sensitivity, Selectivity, and fidelity.

### UNIT- V

**Information & Channel Capacity:** Introduction, Information content of message, Entropy, Entropy of symbols in long independent and dependent sequences, Entropy and information rate of Markoff sources, Shannon's encoding algorithm, Discrete communication channels, Rate of information over a discrete channel, Capacity of discrete memoryless channels, Discrete channels with memory, Shannon – Hartley theorem and its implications, Illustrative problems.

#### Text books:

1. B. P. Lathi, "Modern Digital and Analog Communication Systems," Oxford Univ. press, 3<sup>rd</sup> Edition, 2006.
2. Sham Shanmugam, "Digital and Analog Communication Systems", Wiley-India edition, 2006.
3. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5<sup>th</sup> Edition, 2010.

#### References:

1. Simon Haykin, "Communication Systems", Wiley-India edition, 3<sup>rd</sup> edition, 2010.
2. Herbert Taub & Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3<sup>rd</sup> Edition, 2009.
3. R.E. Ziener & W.H. Tranter, "Principles of Communication-Systems Modulation & Noise", Jaico Publishing House, 2001.
4. George Kennedy and Bernard Davis, "Electronics & Communication System", TMH, 2004.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ECE)**

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**(15A04403) ELECTROMAGNETIC THEORY & TRANSMISSION  
LINES**
**LEARNING OUTCOMES:**

This course provides the foundational education in static electromagnetic fields, and time varying electromagnetic waves. Through lecture, and out-of-class assignments, students are provided learning experiences that enable them to:

- Analyze and solve the problems of electric and magnetic fields that vary with three dimensional spatial co-ordinates as well as with time.
- Become proficient with analytical skills for understanding propagation of electromagnetic waves in different media.
- Understand the concept of transmission lines & their applications.
- Develop technical & writing skills important for effective communication.
- Acquire team-work skills for working effectively in groups.

**UNIT-I**

**Electrostatics:** Review of Vector algebra, Co-ordinate systems & transformation, Vector calculus, Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Electric dipole, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

**UNIT-II**

**Magnetostatics:** Biot-Savart Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Magnetic torque and moment, Magnetic dipole, Inductances and Magnetic Energy, Illustrative Problems.



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**UNIT-III**

**Maxwell's Equations ( for Time Varying Fields):** Faraday's Law and Transformer e.m.f, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements. Boundary Conditions of Electromagnetic fields: Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems.

**UNIT-IV**

**EM Wave Characteristics:** Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Reflection and Refraction of Plane Waves – Normal and Oblique Incidences, for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector, and Poynting Theorem – Applications, Power Loss in a Plane Conductor, Illustrative Problems.

**UNIT-V**

**Transmission Lines:** Types, Transmission line parameters (Primary and Secondary), Transmission line equations, Input impedance, Standing wave ratio & power, Smith chart & its applications, Applications of transmission lines of various lengths, Micro-strip transmission lines – input impedance, Illustrative Problems.

**TEXT BOOKS:**

1. Matthew N.O. Sadiku, "Elements of Electromagnetics," Oxford Univ. Press, 4<sup>th</sup> ed., 2008.
2. William H. Hayt Jr. and John A. Buck, "Engineering Electromagnetics," TMH, 7th ed., 2006.

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**REFERENCES:**

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2<sup>nd</sup> Ed., 2000.
2. Electromagnetics – John D. Krauss, McGraw- Hill publications, 3<sup>rd</sup> ed., 1988.
3. John D. Ryder, “Networks, Lines, and Fields,” PHI publications, Second Edition, 2012.
4. Schaum’s out – lines, “Electromagnetics,” Second Edition, Tata McGraw-Hill publications, 2006.
5. G. S. N. Raju, “Electromagnetic Field Theory and Transmission Lines,” Pearson Education, 2013
6. N. NarayanaRao, “Fundamentals of Electromagnetics for Engineering,” Pearson Edu. 2009.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ECE)**

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**(15A05201) DATA STRUCTURES**

Objectives:

Understand different Data Structures

Understand Searching and Sorting techniques

## Unit-1

Introduction and overview: Asymptotic Notations, One Dimensional array- Multi Dimensional array- pointer arrays.

Linked lists: Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list- Application of linked lists.

## Unit-2

Stacks: Introduction-Definition-Representation of Stack-Operations on Stacks- Applications of Stacks.

Queues: Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues. Tables: Hash tables.

## Unit-3

Trees: Basic Terminologies- Definition and Concepts- Representations of Binary Tree- Operation on a Binary Tree- Types of Binary Trees-Binary Search Tree, Heap Trees, Height Balanced Trees, B. Trees, Red Black Trees.

Graphs: Introduction- Graph terminologies- Representation of graphs- Operations on Graphs- Application of Graph Structures: Shortest path problem- topological sorting.

## Unit-4

Sorting : Sorting Techniques- Sorting by Insertion: Straight Insertion sort- List insertion sort- Binary insertion sort- Sorting by selection: Straight selection sort- Heap Sort- Sorting by Exchange- Bubble Sort- Shell Sort-Quick Sort-External Sorts: Merging Order Files-Merging Unorder Files- Sorting Process.

## Unit-5

Searching: List Searches- Sequential Search- Variations on Sequential Searches- Binary Search- Analyzing Search Algorithm- Hashed List Searches- Basic Concepts- Hashing Methods- Collision Resolutions- Open Addressing- Linked List Collision Resolution- Bucket Hashing.

Text Books:

1. "Classic Data Structures", Second Edition by Debasis Samanta, PHI.
2. "Data Structures A Pseudo code Approach with C", Second Edition by

Reference Books:

1. Fundamentals of Data Structures in C – Horowitz, Sahni, Anderson-Freed, Universities Press, Second Edition.
2. Schaum's Outlines – Data Structures – Seymour Lipschutz – McGrawHill-Revised First Edition.
3. Data structures and Algorithms using C++, Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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(15A02303) CONTROL SYSTEMS ENGINEERING

**OBJECTIVES:**

To make the students learn about:

- Merits and demerits of open loop and closed loop systems; the effects of feedback
- The use of block diagram algebra and Mason's gain formula to find the effective transfer function between two nodes
- Transient and steady state responses , time domain specifications
- The concept of Root loci
- Frequency domain specifications, Bode diagrams and Nyquist plots
- The fundamental aspects of modern control

**UNIT – I INTRODUCTION**

Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback Characteristics, Effects of positive and negative feedback. Mathematical models – Differential equations of Translational and Rotational mechanical systems, and Electrical Systems, Block diagram reduction methods – Signal flow graph - Reduction using Mason's gain formula. Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver

**UNIT-II TIME RESPONSE ANALYSIS**

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants

**UNIT – III STABILITY**

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci- effects of adding poles and zeros to  $G(s)H(s)$  on the root loci.

**UNIT – IV                      FREQUENCY RESPONSE ANALYSIS**

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis.

Compensation techniques – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

**UNIT – V                      STATE SPACE ANALYSIS**

Concepts of state, state variables and state model, derivation of state models from differential equations. Transfer function models. Block diagrams. Diagonalization. Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability.

**OUTCOMES:**

After completing the course, the student should be able to do the following:

- Evaluate the effective transfer function of a system from input to output using (i) block diagram reduction techniques (ii) Mason's gain formula
- Compute the steady state errors and transient response characteristics for a given system and excitation
- Determine the absolute stability and relative stability of a system
- Draw root loci
- Design a compensator to accomplish desired performance
- Derive state space model of a given physical system and solve the state equation

**TEXT BOOKS:**

1. Modern Control Engineering, Katsuhiko Ogata, PEARSON, 1<sup>st</sup> Impression 2015.
2. Control Systems Engineering, I. J. Nagrath and M. Gopal, New Age International Publishers, 5<sup>th</sup> edition, 2007, Reprint 2012.

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**REFERENCE BOOKS:**

1. Automatic Control Systems, Farid Golnaraghi and Benjamin. C. Kuo, WILEY, 9<sup>th</sup> Edition, 2010.
2. Control Systems, Dhanesh N. Manik, CENGAGE Learning, 2012.
3. John J D'Azzo and C. H. Houpis , "Linear Control System Analysis and Design: Conventional and Modern", McGraw - Hill Book Company, 1988.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**B. Tech II-II Sem. (ECE)**

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### (15A04404) ELECTRONIC CIRCUIT ANALYSIS LABORATORY

**Note:** The students are required to design the electronic circuit and they have to perform the analysis through simulator using Multisim/Pspice/Equivalent Licensed simulation software tool. Further they are required to verify the result using necessary hardware in the hardware laboratory.

#### Objectives

- Help students make transition from analysis of electronic circuits to design of electronic circuits.
- To understand the Analysis of transistor at high frequencies.
- To understand the concept of designing of tuned amplifier.
- The student will construct and analyze voltage regulator circuits.
- To understand the circuit configuration and the principle operation of converters, including diode rectifiers, controlled AC-DC converters and DC choppers

#### Outcomes:

- The ability to analyze and design single and multistage amplifiers at low, mid and high frequencies.
- Designing and analyzing the transistor at high frequencies.
- Determine the efficiencies of power amplifiers.
- Determine Frequency response and design of tuned amplifiers.
- Able to Analyze all the circuits using simulation software and Hardware.

#### **PART A: List of Experiments :( Minimum of Ten Experiments has to be performed)**

1. Determination of  $f_T$  of a given transistor.
2. Voltage-Series Feedback Amplifier
3. Current-Shunt Feedback Amplifier
4. RC Phase Shift/Wien Bridge Oscillator
5. Hartley/Colpitt's Oscillator
6. Two Stage RC Coupled Amplifier
7. Darlington Pair Amplifier
8. Bootstrapped Emitter Follower



9. Class A Series-fed Power Amplifier
10. Transformer-coupled Class A Power Amplifier
11. Class B Push-Pull Power Amplifier
12. Complementary Symmetry Class B Push-Pull Power Amplifier
13. Single Tuned Voltage Amplifier
14. Double Tuned Voltage Amplifier

## **PART B: Equipment required for Laboratory**

### **Software:**

- i. Multisim/ Pspice/Equivalent Licensed simulation software tool
- ii. Computer Systems with required specifications

### **Hardware:**

13. Regulated Power supplies
14. Analog/Digital Storage Oscilloscopes
15. Analog/Digital Function Generators
16. Digital Multimeters
17. Decade Résistance Boxes/Rheostats
18. Decade Capacitance Boxes
19. Ammeters (Analog or Digital)
20. Voltmeters (Analog or Digital)
21. Active & Passive Electronic Components
22. Bread Boards
23. Connecting Wires
24. CRO Probes etc.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ECE)**

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**(15A04405) ANALOG COMMUNICATION SYSTEMS  
LABORATORY**
**Course Outcomes:**

After completion of the course the students will be able

- To experience real time behavior of different analog modulation schemes
- Technically visualize spectra of different analog modulation schemes
- Analyze practical behavior of different elements available in analog communication system such as filters, amplifiers etc.
- Measure characteristics of radio receiver and antenna measurements.

**List of Experiments: (All Experiments are to be conducted)**

1. Amplitude modulation and demodulation.
2. Frequency modulation and demodulation.
3. a. Characteristics of Mixer.  
b. Pre-emphasis & de-emphasis.
4. Pulse amplitude modulation & demodulation.
5. Pulse width modulation & demodulation
6. Pulse position modulation & demodulation.
7. Radio receiver measurements – sensitivity selectivity and fidelity.
8. Measurement of half power beam width (HPBW) and gain of a half wave dipole antenna.
9. Measurement of radiation pattern of a loop antenna in principal planes.

**Equipment required for the Laboratory:**

1. Regulated Power Supply equipments    0 – 30 V
2. CROs    0 – 20 M Hz.
3. Function Generators    0 – 3 M Hz
4. RF Signal Generators    0 – 1000 M Hz
5. Multimeters
6. Required electronic components ( active and passive) for the design of experiments from 1 - 7
7. Radio Receiver Demo kits or Trainers.
8. RF power meter    frequency range 0 – 1000 MHz
9. Spectrum Analyzer
10. Dipole antennas (2 Nos.)    850 MHz – 1GHz
11. Loop antenna    (1 no.)    850 MHz – 1GHz

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (ECE)**

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**15A04511 COMPUTER ORGANIZATION****Course Objectives:**

- To understand the structure, function, characteristics and performance issues of computer systems.
- To understand I/O transfer mechanism, design of I/O circuit interfaces and example bus standards (like PCI, SCSI, USB)
- To understand the basic processing unit and how they are connected and how it generates control signals (using hardwired and micro programmed approaches)

**Course Outcomes:**

- Identify functional units, bus structure and addressing modes
- Design the hardwired and micro-programmed control units.
- Understand pipelined execution and instruction scheduling

**UNIT-I**

Computer types, Functional units, basic operational concepts, Bus structures, Data types, Software: Languages and Translators, Loaders, Linkers, Operating systems.

Memory locations – addresses and encoding of information – main memory operations – Instruction formats and instruction sequences – Addressing modes and instructions – Simple input programming – pushdown stacks – subroutines.

**UNIT-II**

Register transfer Language, Register transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, shift Micro operations, Arithmetic Logic Shift Unit.

Stack organization, instruction formats, Addressing modes, Data transfer and manipulation, Execution of a complete instruction, Sequencing of control signals, Program Control.

**UNIT-III**

Control Memory, address Sequencing, Micro Program Example, Design of Control Unit.

Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

#### **UNIT-IV**

Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor (IOP), Serial Communication.

Memory hierarchy, main memory, auxiliary memory, Associative memory, Cache memory, Virtual memory, Memory management hardware.

#### **UNIT-V**

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.

Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence.

#### **Text Books:**

1. M. Morris Mano, "Computer system Architecture", Prentice Hall of India (PHI), Third edition.
2. William Stallings, "Computer organization and programming", Prentice Hall of India (PHI) Seventh Edition, Pearson Education (PE) Third edition, 2006.

#### **Reference Books:**

1. Carl Hamacher, Zvonks Vranesic, Safwat Zaky, "Computer Organization" 5<sup>th</sup> Edition, McGraw Hill, 2002.
2. Andrew S. Tanenbaum, "Structured Computer Organization", 4<sup>th</sup> Edition PHI/Pearson
3. John L. Hennessy and David A. Patterson, "Computer Architecture a quantitative approach", Fourth Edition Elsevier
4. Joseph D. Dumas II, "Computer Architecture: Fundamentals and Principles of Computer Design", BS Publication.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-ISem. (ECE)**

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**15A04501 ANTENNAS & WAVE PROPAGATION****Course Objectives:**

- Fundamentals of electromagnetic radiation: Maxwell's equations, potential functions, wave equation, retarded potential, short current element, near and far fields, Poynting's theorem.
- Design of antenna arrays: principle of pattern multiplication, broadside and end fire arrays, array synthesis, coupling effects and mutual impedance, parasitic elements, Yagi-Uda antenna.

**Course Outcomes:**

Upon successful completion of the course, students will be able to:

- Approximate parametric equations for the calculation in the farfield region.
- Write parametric integral expressions for a given current source.
- Calculate electromagnetic fields for a given vector potential.
- Discover pattern multiplication principle for array antennas.

**UNIT - I**

**Antenna Basics & Dipole antennas:** Introduction, Basic antenna parameters- patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective height, Fields from oscillating dipole, Field Zones, Shape-Impedance considerations, Polarization – Linear, Elliptical, & Circular polarizations, Antenna temperature, Antenna impedance, Front-to-back ratio, Antenna theorems, Radiation – Basic Maxwell's equations, Retarded potential-Helmholtz Theorem, Radiation from Small Electric Dipole, Quarter wave Monopole and Half wave Dipole – Current Distributions, Field Components, Radiated power, Radiation Resistance, Beam width, Natural current distributions, far fields and patterns of Thin Linear Center-fed Antennas of different lengths, Illustrative problems.

**UNIT- II**

**VHF, UHF and Microwave Antennas - I:** Loop Antennas - Introduction, Small Loop, Comparison of far fields of small loop and short dipole, Radiation Resistances and Directives of small and large loops (Qualitative Treatment), Arrays with Parasitic Elements - Yagi - Uda Arrays, Folded Dipoles & their characteristics. Helical Antennas-

Helical Geometry, Helix modes, Practical Design considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas- Types, Fermat's Principle, Optimum Horns, Design considerations of Pyramidal Horns, Illustrative Problems.

### UNIT - III

**VHF, UHF and Microwave Antennas - II:** Micro strip Antennas- Introduction, features, advantages and limitations, Rectangular patch antennas- Geometry and parameters, characteristics of Micro strip antennas, Impact of different parameters on characteristics, reflector antennas - Introduction, Flat sheet and corner reflectors, parabola reflectors- geometry, pattern characteristics, Feed Methods, Reflector Types - Related Features, Lens Antennas - Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications, Illustrative Problems.

### UNIT- IV

**Antenna Arrays:** Point sources - Definition, Patterns, arrays of 2 Isotropic sources- Different cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their characteristics and comparison, BSA with Non-uniform Amplitude Distributions - General considerations and Binomial Arrays, Illustrative problems.

**Antenna Measurements:** Introduction, Concepts- Reciprocity, Near and Far Fields, Coordination system, sources of errors, Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by comparison, Absolute and 3-Antenna Methods).

### UNIT – V

**Wave Propagation:** Introduction, Definitions, Characterizations and general classifications, different modes of wave propagation, Ray/Mode concepts, Ground wave propagation (Qualitative treatment) - Introduction, Plane earth reflections, Space and surface waves, wave tilt, curved earth reflections, Space wave propagation - Introduction, field strength variation with distance and height, effect of earth's curvature, absorption, Super refraction, M-curves and duct propagation, scattering phenomena, tropospheric propagation, fading and path loss calculations, Sky wave propagation - Introduction, structure of Ionosphere, refraction and reflection of sky waves by Ionosphere, Ray path, Critical frequency, MUF, LUF, OF, Virtual height and Skip distance, Relation between MUF and Skip distance, Multi-HOP propagation, Energy loss in Ionosphere, Summary of Wave Characteristics in different frequency ranges, Illustrative problems.

**TEXT BOOKS:**

1. John D. Kraus and Ronald J. Marhefka and Ahmad S.Khan, "Antennas and wave propagation," TMH, New Delhi, 4th Ed., (special Indian Edition), 2010.
2. E.C. Jordan and K.G. Balmain, "Electromagnetic Waves and Radiating Systems," PHI, 2<sup>nd</sup>Edn, 2000.

**REFERENCES:**

1. C.A. Balanis, "Antenna Theory- Analysis and Design," John Wiley & Sons, 2<sup>nd</sup>Edn., 2001.
2. K.D. Prasad, SatyaPrakashan, "Antennas and Wave Propagation," Tech. India Publications, New Delhi, 2001.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-ISem. (ECE)**

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**15A04502 DIGITAL COMMUNICATION SYSTEMS****Course Objectives:**

- The students to be able to understand, analyze, and design fundamental digital communication systems.
- The course focuses on developing a thorough understanding of digital communication systems by using a series of specific examples and problems.

**Course Outcomes:**

After the completion of the course, student will be able to:

- Understand the elements of DCS & the fundamentals concepts of sampling theorem along with different coding and modulation techniques
- Understand the basic principles of baseband and passband digital modulation schemes
- Analyze probability of error performance of digital systems and are able to design digital communication systems

**UNIT – I**

Source Coding Systems: Introduction, sampling process, quantization, quantization noise, conditions for optimality of quantizer, encoding, Pulse-Code Modulation (PCM), Line codes, Differential encoding, Regeneration, Decoding & Filtering, Noise considerations in PCM systems, Time-Division Multiplexing (TDM), Synchronization, Delta modulation (DM), Differential PCM (DPCM), Processing gain, Adaptive DPCM (ADPCM), Comparison of the above systems.

**UNIT – II**

Baseband Pulse Transmission: Introduction, Matched filter, Properties of Matched filter, Matched filter for rectangular pulse, Error rate due to noise, Inter-symbol Interference (ISI), Nyquist's criterion for distortion less baseband binary transmission, ideal Nyquist channel, Raised cosine filter & its spectrum, Correlative coding – Duo binary & Modified duo binary signaling schemes, Partial response signaling, Baseband M-array PAM transmission, Eye diagrams.



**UNIT – III**

Signal Space Analysis: Introduction, Geometric representation of signals, Gram-Schmidt orthogonalization procedure, Conversion of the Continuous AWGN channel into a vector channel, Coherent detection of signals in noise, Correlation receiver, Equivalence of correlation and Matched filter receivers, Probability of error, Signal constellation diagram.

**UNIT - IV**

Passband Data Transmission: Introduction, Passband transmission model, Coherent phase-shift keying – binary phase shift keying (BPSK), Quadrature shift keying (QPSK), Binary Frequency shift keying (BFSK), Error probabilities of BPSK, QPSK, BFSK, Generation and detection of Coherent BPSK, QPSK, & BFSK, Power spectra of above mentioned modulated signals, M-array PSK, M-array quadrature amplitude modulation (M-array QAM), Non-coherent orthogonal modulation schemes -Differential PSK, Binary FSK, Generation and detection of non-coherent BFSK, DPSK, Comparison of power bandwidth requirements for all the above schemes.

**UNIT – V**

Channel Coding: Error Detection & Correction - Repetition & Parity Check Codes, Interleaving, Code Vectors and Hamming Distance, Forward Error Correction (FEC) Systems, Automatic Retransmission Query (ARQ) Systems, Linear Block Codes – Matrix Representation of Block Codes, Convolutional Codes – Convolutional Encoding, Decoding Methods.

**TEXT BOOKS:**

1. Simon Hakin, "Communication Systems," Wiley India Edition, 4<sup>th</sup> Edition, 2011.
2. B.P. Lathi, & Zhi Ding, "Modern Digital & Analog Communication Systems", Oxford University Press, International 4<sup>th</sup> edition, 2010.

**REFERENCES:**

1. Sam Shanmugam, "Digital and Analog Communication Systems", John Wiley, 2005.
2. A. Bruce Carlson, & Paul B. Crilly, "Communication Systems – An Introduction to Signals & Noise in Electrical Communication", McGraw-Hill International Edition, 5<sup>th</sup> Edition, 2010
3. Bernard Sklar, "Digital Communications", Prentice-Hall PTR, 2<sup>nd</sup> edition, 2001.
4. Herbert Taub & Donald L Schilling, "Principles of Communication Systems", Tata McGraw-Hill, 3<sup>rd</sup> Edition, 2009.
5. J. G. Proakis, M Salehi, Gerhard Bauch, "Modern Communication Systems Using MATLAB," CENGAGE, 3<sup>rd</sup> Edition, 2013.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-ISem. (ECE)**

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15A04503     **LINEAR INTEGRATED CIRCUITS AND APPLICATIONS****Course Objectives:**

- Design of OPAMPS, Classification of OPAMPS.
- To study and design various linear applications of OPAMPS.
- To study and design various non linear applications of OPAMPS

**Course Outcomes:**

- Understand the basic building blocks of linear integrated circuits and its characteristics.
- Analyze the linear, non-linear and specialized applications of operational amplifiers.
- Understand the theory of ADC and DAC.
- Realize the importance of Operational Amplifier.

**UNIT – I**

**Differential Amplifiers:** Differential amplifier configurations, Balanced and unbalanced output differential amplifiers, current mirror, level Translator.

**Operational amplifiers:** Introduction, Block diagram, Ideal op-amp, Equivalent Circuit, Voltage Transfer curve, open loop op-amp configurations. Introduction to dual OP-AMP TL082 as a general purpose JFET-input Operational Amplifier.

**UNIT-II**

Introduction, feedback configurations, voltage series feedback, voltage shunt feedback and differential amplifiers, properties of Practical op-amp.

**Frequency response:** Introduction, compensating networks, frequency response of internally compensated op-amps and non compensated op-amps, High frequency op-amp equivalent circuit, open loop gain Vs frequency, closed loop frequency response, circuit stability, slew rate.

**UNIT-III**

DC and AC amplifiers, peaking amplifier, summing, scaling and averaging amplifiers, instrumentation amplifier, voltage to current converter, current to voltage converter, integrator, differentiator, active filters, First, Second and Third order Butterworth filter and its frequency response, Tow-Thomas biquad filter.

**UNIT-IV**

Oscillators, Phase shift and wein bridge oscillators, Square, triangular and sawtooth wave generators, Comparators, zero crossing detector, Schmitt trigger, characteristics and limitations.

**Specialized applications:** 555 timer IC (monostable&astable operation) & its applications, PLL, operating principles, Monolithic PLL, applications, analog multiplier and phase detection, Wide bandwidth precision analog multiplier MPY634 and its applications.

**UNIT V**

Analog and Digital Data Conversions, D/A converter – specifications – weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications – Flash type – Successive Approximation type – Single Slope type – Dual Slope type – A/D Converter using Voltage-to-Time Conversion – Over-sampling A/D Converters,

**TEXT BOOKS:**

1. D. Roy Chowdhury, “Linear Integrated Circuits”, New Age International (p) Ltd, 2nd Edition, 2003.
2. K.LalKishore, “Operational Amplifiers and Linear Integrated Circuits”, Pearson Education, 2007.

**REFERENCES:**

1. Ramakanth A. Gayakwad, “Op-Amps & Linear ICs”, PHI, 4<sup>th</sup> edition, 1987.
2. R.F.Coughlin& Fredrick Driscoll, “Operational Amplifiers & Linear Integrated Circuits”, 6<sup>th</sup> Edition, PHI.
3. David A. Bell, “Operational Amplifiers & Linear ICs”, Oxford University Press, 2<sup>nd</sup> edition, 2010.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-ISem. (ECE)**

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**15A04504 DIGITAL SYSTEM DESIGN****Course Objectives:**

- To be able to use computer-aided design tools for development of complex digital logic circuits
- To be able to model, simulate, verify, analyze, and synthesize with hardware description languages
- To be able to design and prototype with standard cell technology and programmable logic
- To be able to design tests for digital logic circuits, and design for testability

**Course Outcomes:**

- Capable of using Computer-aided design tools to model, simulate, verify, analyze, and synthesize complex digital logic circuits.
- Efficient designing of any Digital System using basic structure ICs .
- Able to design and prototype with standard cell technology and programmable logic.
- Apply design test for digital logic circuits, and design for testability.

**UNIT-I**

CMOS LOGIC: Introduction to logic families, CMOS logic, CMOS logic families; BIPOLAR LOGIC AND INTERFACING: Bipolar logic, Transistor logic, TTL families, CMOS/TTL interfacing, low voltage CMOS logic and interfacing, Emitter coupled logic, Comparison of logic families, Familiarity with standard 74-series and CMOS 40-series-ICs – Specifications.

**UNIT-II**

**HARDWARE DESCRIPTION LANGUAGES:** HDL Based Digital Design, The VHDL Hardware Description Language–Program Structure, Types, Constants and Arrays, Functions and procedures, Libraries and Packages, Structural design elements, Dataflow design elements, Behavioral design elements, The Time Dimension, Simulation, Test Benches, VHDL Features for Sequential Logic Design, Synthesis

**UNIT-III**

**COMBINATIONAL LOGIC DESIGN PRACTICES:** Description of basic structures like Decoders, Encoders, Comparators, Multiplexers ( 74 –series MSI); Design of complex Combinational circuits using the basic structures; Designing Using combinational PLDs like PLAs, PALs ,PROMs CMOS PLDs; Adders & sub tractors, ALUs, Combinational multipliers; VHDL models for the above standard building block ICs.

**UNIT-IV**

**SEQUENTIAL MACHINE DESIGN PRACTICES:** Review of design of State machines; Standard building block ICs for Shift registers, parallel / serial conversion , shift register counters, Ring counters; Johnson counters, LFSR counter ; VHDL models for the above standard building block ICs.Synchronous Design example using standard ICs

**UNIT –V**

**Design Examples (using VHDL):** Barrel shifter, comparators, floating-point encoder, and dual parity encoder.

**Sequential logic Design:** Latches & flip flops, PLDs, counters, shift register and their VHDL models.

**Text Books:**

1. John F.Wakerly ,“Digital Design Principles and Practices” 4<sup>th</sup> edition, Pearson Education., 2009
2. Charles H.Roth,Jr., “Fundamentals of Logic Design” 5<sup>th</sup> edition , CENGAGE Learning 2012.

**References:**

1. M.Morris Mano and Michael D. Ciletti., “Digital Logic Design” 4<sup>th</sup> edition Pearson Education., 2013
2. Stephen Brown and ZvonkoVranesic, “Fundamentals of digital logic with VHDL design” 2<sup>nd</sup> edition McGraw Hill Higher Education.
3. J. Bhasker, “A VHDL PRIMER” 3<sup>rd</sup> edition Eastern Economy Edition, PHI Learning,2010.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (ECE)**

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15A04505     **LINUX PROGRAMMING & SCRIPTING**  
**(MOOCS-I)**

**Course Objectives:**

- The goal of the course is the study of scripting languages such as PERL, TCL/TK, Python and BASH
- Creation of programs in the Linux environment
- The study of the principles of scripting languages
- The study of usage of scripting languages in IC design flow

**Learning Outcomes:**

- Ability to create and run scripts using Perl / TCL / Python in IC design flow
- Ability to use Linux environment and write programs for automation of scripts in VLSI tool design flow

**UNIT I**

**LINUX BASICS:** Introduction to Linux, File System of the Linux, General usage of Linux kernel & basic commands, Linux users and group, Permissions for file, directory and users, Searching a file & directory, zipping and unzipping concepts

**UNIT II**

**LINUX NETWORKING:** Introduction to Networking in Linux, Network basics & tools, File transfer protocol in Linux, Network file system, Domain Naming Services, Dynamic hosting configuration Protocol & Network information Services.

**UNIT III**

**PERL SCRIPTING:** Introduction to Perl Scripting, Working with Simple Values, Lists and Hashes, Loops and Decisions, Regular Expressions, Files and Data in Perl Scripting, References & Subroutines, Running and Debugging Perl, Modules, Object-Oriented Perl.

**UNIT IV**

**TCL/ TK SCRIPTING:** TCL Fundamentals, String and Pattern Matching, TCL Data Structures, Control Flow Commands, Procedures and Scope, EVAL, Working With UNIX, Reflection and Debugging, Script Libraries, TK Fundamentals, TK by Examples, The Pack Geometry Manager, Binding Commands to X Events, Buttons and Menus, Simple TK Widgets, Entry and List box Widgets Focus, Grabs and Dialogs

**UNIT V**

**PYTHON SCRIPTING:** Introduction to Python, Using the Python Interpreter, More Control Flow Tools, Data Structures, Modules, Input and Output, Errors and Exceptions, Classes, Brief Tour of the Standard Library.

**Text Books:**

1. Instructor reference material
  2. Python Tutorial by Guido van Rossum, and Fred L. Drake, Jr., editor, Release 2.6.4
  3. Practical Programming in Tcl and Tk by Brent Welch , Updated for Tcl 7.4 and Tk 4.0
  4. Teach Yourself Perl 5 in 21 days by David Till.
- Red Hat Enterprise Linux 4: System Administration Guide Copyright © 2005 Red Hat, Inc

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**B. Tech III-ISem. (ECE)**

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15A04506    **MEMS & MICRO SYSTEMS**  
**(MOOCS-I)**

**UNIT I**

**Introduction:** Introduction to MEMS & Microsystems, Introduction to Microsensors, Evaluation of MEMS, Microsensors, Market Survey, Application of MEMS, MEMS Materials, MEMS Materials Properties, MEMS Materials Properties.

**UNIT II**

**Microelectronic Technology for MEMS:** Microelectronic Technology for MEMS, Micromachining Technology for MEMS, Micromachining Process, Etch Stop Techniques and Microstructure, Surface and Quartz Micromachining, Fabrication of Micromachined Microstructure, Microstereolithography,

**UNIT III**

**Micro Sensors:** MEMS Microsensors, Thermal Microsensors, Mechanical Micromachined Microsensors, MEMS Pressure Sensor, MEMS Flow Sensor, Micromachined Flow Sensors, MEMS Inertial Sensors, MEMS Gyro Sensor

**UNIT IV**

**MEMS Accelerometers:** Micromachined Micro accelerometers for MEMS, MEMS Accelerometers for Avionics, Temperature Drift and Damping Analysis, Piezoresistive Accelerometer Technology, MEMS Capacitive Accelerometer, MEMS Capacitive Accelerometer Process, MEMS for Space Application.

**UNIT V**

**MEMS Applications:** Polymer MEMS & Carbon Nano Tubes CNT, Wafer Bonding & Packaging of MEMS, Interface Electronics for MEMS, Introduction to BioMEMS and Micro Fluidics, Introduction to Bio Nano Technology, Bio Sensors, Fluidics, MEMS for Biomedical Applications (Bio-MEMS)

**Text Books:**

1. Nadim Maluf Kirt Williams "An Introduction to Microelectromechanical Systems Engineering", Second Edition, Artech House, Inc. Boston London, International Standard Book Number: 1-58053-590-9.
2. Varadan, V Kand Varadan "Microsensors, actuators, MEMS, and electronics for smart structures" Rai-Choudhury P (ed.) Handbook of Microlithography, Micromachining, and Microfabrication, SPIE Optical Engineering Press



B. Tech III-ISem. (ECE)

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15A04507 IC APPLICATIONS LABORATORY

***All experiments are based upon 741 / TL 082/ASLK Kits.***

1. Study the characteristics of negative feedback amplifier

**Aim:** Design the following amplifiers:

- A unity gain amplifier
- A non-inverting amplifier with a gain of 'A'
- An inverting amplifier with a gain of 'A'

Apply a square wave of fixed amplitude and study the effect of slew rate on the three type of amplifiers.

**Applications:**

- Amplifying bioelectric potentials (ECG, EEG, EMG, EOG) and piezoelectric with high output impedance.
- Amplifying sensor output signals (temperature sensors, humidity sensors, pressure sensors etc.)

**Sample questions**

Explain the need for two stages in any instrumentation amplifier.

Why CMRR is high for instrumentation amplifiers?

Give some examples for low voltage, low frequency and higher output impedance signals.

How does the tolerances of resistors affect the gain of the instrumentation amplifier?

\*\*\*\*\*

2. Design of an instrumentation amplifier

**Aim:** Design an instrumentation amplifier of a differential mode gain of 'A' using three amplifiers.**Applications:**

- Used in measuring instruments designed for achieving high accuracy and high stability.
- Used for amplifying low voltage, low frequency and higher output impedance signals.

**Sample questions**

Explain the need for two stages in any instrumentation amplifier.

Why CMRR is high for instrumentation amplifiers?

Give some examples for low voltage, low frequency and higher output impedance signals.

How does the tolerances of resistors affect the gain of the instrumentation amplifier?

\*\*\*\*\*

3. Study the characteristics of regenerative feedback system with extension to design an astablemultivibrator

**Aim:**Design and test an astablemultivibrator for a given frequency.

**Applications**

- It can be used in signal generators and generation of timing signals.
- It can be used in code generators and trigger circuits.

**Sample question**

Discuss the difference between astable and bi-stable multivibrator.

Discuss the frequency limitation of astablemultivibrator.

Discuss the various applications of bi-stable multivibrator.

\*\*\*\*\*

4. Study the characteristics of integrator circuit

**Aim:**Design and test the integrator for a given time constant.

**Applications**

- Used in function generators, PI/PID controllers.
- Used in analog computers, analog-to-digital converters and wave-shaping circuits.
- Used as a charge amplifier.

**Sample questions**

Compare the output with that of ideal integrator.

How will you design a differentiator and mention its drawback.

Discuss the limitation of the output voltage of the integrator.

How will you obtain drift compensation in an inverting integrator?

\*\*\*\*\*

5. Design of Analog filters – I

**Aim:**Design a second order butterworth band-pass filter for the given higher and lower cut-off frequencies.

**Applications:**

- Used in signal conditioning circuits for processing audio signals.
- Used in measuring instruments.
- Used in radio receivers.

**Sample questions**

Discuss the effect of order of the filter on frequency response.

How will you vary Q factor of the frequency response.

Discuss the need for going to Sallen Key circuit.

Compare the performance of Butterworth filter with that of Chebyshev filter.

\*\*\*\*\*

## 6. Design of Analog filters – II

**Aim:** Design and test a notch filter to eliminate the 50Hz power line frequency.

**Applications**

- Used for removing power supply interference.
- Used for removing spur in RF signals.

**Sample questions**

Explain the effect of supply frequency interference while amplifying sensor signals.

Suggest a method for adjusting the Q factor of the frequency response of notch filter.

What is the purpose of going for Twin T notch filter circuit?

\*\*\*\*\*

## 7. Design of a self-tuned Filter

**Aim:** Design and test a high-Q Band pass self-tuned filter for a given center frequency.

**Applications:**

- Used in spectrum analyzers

**Sample Question:**

Discuss the effect of the harmonics when a square wave is applied to the filter

Determine the lock range of the self-tuned filter

\*\*\*\*\*

## 8. Design of a function generator

**Aim:** Design and test a function generator that can generate square wave and triangular wave output for a given frequency.

**Applications:**

- Used in testing, measuring instruments and radio receivers.
- Used for obtaining frequency response of devices and circuits.
- Used for testing and servicing of Electronic equipments.
- Used in Electronic musical instruments.
- Used for obtaining audiograms (Threshold of audibility Vs frequency)

### Sample questions

Discuss typical specifications of a general purpose function generator.

How can you obtain reasonably accurate sine wave from triangular wave.

Discuss the reason for higher distortion in sine wave produced by function generators.

What do you mean by Duty cycle and how can you vary the same in a function generator?

\*\*\*\*\*

### 9. Design of a Voltage Controlled Oscillator

**Aim:** Design and test voltage controlled oscillator for a given specification (voltage range and frequency range).

#### Applications:

- Used in Phase Lock Loop (PLL) circuits.
- Used in frequency modulation circuits.
- Used in Function generators
- Used in frequency Synthesizers of Communication equipments.

#### Sample Questions

Discuss the following characteristics of a voltage controlled Oscillator.

- i) Tuning range
- ii) Tuning gain and
- iii) Phase noise

Compare the performances VCO based Harmonic Oscillators and Relaxation Oscillators

What are the various methods adopted in controlling the frequency of oscillation in VCOs

Discuss any one method of obtaining FM demodulation using a VCO.

\*\*\*\*\*

### 10. Design of a Phase Locked Loop(PLL)

**Aim:** Design and test a PLL to get locked to a given frequency 'f'. Measure the locking range of the system and also measure the change in phase of the output signal as input frequency is varied with in the lock range.

#### Applications:

- Used in tracking Band pass filter for Angle Modulated signals.
- Used in frequency divider and frequency multiplier circuits.
- Used as Amplifiers for Angle Modulated signals.
- Used in AM and FM Demodulators
- Used in Suppressed Carrier Recovery Circuits

**Sample Questions:**

Draw the block diagram of a PLL based divider and multiplier and explain the functions performed by each block.

Distinguish between Lock range and Capture Range, Explain the method of estimating the same for a given PLL circuit.

Discuss the differences between Analog Phase Lock Loop and Digital Phase Lock Loop.

\*\*\*\*\*

11. Automatic Gain Control (AGC) Automatic Volume Control (AVC)

**Aim:** Design and test an AGC system for a given peak amplitude of sine-wave output.

**Applications**

- Used in AM Receivers
- Used as Voice Operated Gain Adjusting Device ( VOGAD) in Radio Transmitters
- Used in Telephone speech Recorders
- Used in Radar Systems

**Sample Questions**

Explain clearly the need for AGC in AM Receivers.

Draw the block diagram of feedback and feed forward AGC systems and explain the functions of each block.

Discuss any one gain control mechanism present in biological systems.

How can you use AGC in a Received Signal Strength Indicator (RSSI)

\*\*\*\*\*

12. Design of a low drop out regulator

**Aim:** Design and test a Low Dropout regulator using op-amps for a given voltage regulation characteristic and compare the characteristics with TPS7250 IC

**Applications:**

- Used in Power Supply of all Electronic Instruments and Equipment's
- Used as Reference Power Supply in Comparators
- Used in Emergency Power Supplies
- Used in Current Sources

**Sample Questions**

Distinguish between Load Regulation and Line Regulation.

Mention some of the other important parameters in selecting a LDO.

What is power supply rejection ratio (PSRR)?

\*\*\*\*\*

### 13. DC-DC Converter

**Aim:** Design of a switched mode power supply that can provide a regulated output voltage for a given input range using the TPS40200 IC

**Applications:**

- Used in DSL/Cable Modems
- Used in Distributed Power Systems

**Sample Questions**

Discuss the effect of varying the input voltage for a fixed regulated output voltage over the duty cycle of PWM.

**References:**

1. TL082: Data Sheet: <http://www.ti.com/lit/ds/symlink/tl082.pdf>  
Application Note: <http://www.ti.com/lit/an/sloa020a/sloa020a.pdf>
2. MPY634: Data Sheet: <http://www.ti.com/lit/ds/symlink/mpy634.pdf>  
Application Note: <http://www.ti.com/lit/an/sbfa006/sbfa006.pdf>
3. ASLK Pro Manual: [ASLK Manual](#)

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-ISem. (ECE)**

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15A04508

**DIGITAL COMMUNICATIONS SYSTEMS LABORATORY****Course Outcomes:**

- After completion of the course the students will be able to experience real time behavior of different digital modulation schemes and technically visualize spectra of different digital modulation schemes

**Minimum of Ten experiments to be conducted (Five from each Part-A&B)****HARDWARE EXPERIMENTS (PART – A)**

1. Time division multiplexing.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Delta modulation.
5. Frequency shift keying.
6. Differential phase shift keying.
7. QPSK modulation and demodulation.

**SOFTWARE EXPERIMENTS (PART-B)****Methoding of Digital Communications using MATLAB**

1. Sampling Theorem – verification.
2. Pulse code modulation.
3. Differential pulse code modulation.
4. Frequency shift keying.
5. Phase shift keying.
6. Differential phase shift keying.
7. QPSK modulation and demodulation.

**Equipment required for Laboratories:**

1. RPS - 0 – 30 V
2. CROs - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. RF Generators (3 Nos.) 0 – 1000 M Hz.
5. Multimeters
6. Lab Experimental kit for Pulse Code Modulation ( Experiment No.3 of part – A)
7. Required Electronic Components (Active and Passive) which include required ICs

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8. Arbitrary Wave form generators/ PNS generators – 2 Nos. ( to generate digital data at required data rates)
  9. Licensed MATLAB software for 30 users with required tool boxes.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-ISem. (ECE)**

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15A99501    **SOCIAL VALUES & ETHICS (AUDIT COURSE)**  
 (Common to all Branches)

**UNIT - I**

**Introduction and Basic Concepts of Society: Family and Society:** Concept of family, community, PRIs and other community based organizations and society, growing up in the family – dynamics and impact, Human values, Gender Justice.

**Channels of Youth Moments for National Building:NSS & NCC:** History, philosophy, aims & objectives; Emblems, flags, mottos, songs, badge etc.; Organizational structure, roles and responsibilities of various NSS functionaries. **Nehru Yuva Kendra (NYK):** Activities – Socio Cultural and Sports.

**UNIT – II**

Activities of NSS, NCC, NYK:

**Citizenship:** Basic Features Constitution of India, Fundamental Rights and Fundamental Duties, Human Rights, Consumer awareness and the legal rights of the consumer, RTI.

**Youth and Crime:** Sociological and psychological Factors influencing youth crime, Peer Mentoring in preventing crimes, Awareness about Anti-Ragging, Cyber Crime and its prevention, Juvenile Justice

**Social Harmony and National Integration:** Indian history and culture, Role of youth in peace-building and conflict resolution, Role of youth in Nation building.

**UNIT – III**

**Environment Issues:** Environment conservation, enrichment and Sustainability, Climate change, Waste management, Natural resource management (Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation).

**Health, Hygiene & Sanitation:** Definition, needs and scope of health education, Food and Nutrition, Safe drinking water, Sanitation, Swachh Bharat Abhiyan.

**Disaster Management:** Introduction to Disaster Management, classification of disasters, Role of youth in Disaster Management. Home Nursing, First Aid.

**Civil/ Self Defense:** Civil defense services, aims and objectives of civil defense, Need for self defense training – Teakwondo, Judo, karate etc.,

**UNIT – IV**

**Gender Sensitization:** Understanding Gender – Gender inequality – Role of Family, Society and State; Challenges – Declining Sex Ratio – Sexual Harassment – Domestic

Violence; Gender Equality – Initiatives of Government – Schemes, Law; Initiates of NGOs – Awareness, Movements;

## **UNIT - V**

**Physical Education** :Games & Sports: Health and Recreation – Biological basis of Physical activity – benefits of exercise – Physical, Psychological, Social; Physiology of Muscular Activity, Respiration, Blood Circulation.

**Yoga:** Basics of Yoga – Yoga Protocol, Postures, Asanas, Pranayama: Introduction of Kriyas, Bandhas and Mudras.

### **TEXT BOOKS:**

1. NSS MANUAL
2. SOCIETY AND ENVIRONMENT: A.S.Chauha, Jain Brothers Publications, 6<sup>th</sup> Edition, 2006
3. INDIAN SOCIAL PROBLEM: G.R.Madan, Asian Publisher House
4. INDIAN SOCIAL PROBLEM: Ram Ahuja, Rawat Publications
5. HUMAN SOCIETY: Kingsley Davis, Macmillan
6. SOCIETY: Mac Iver D Page, Macmillan
7. SOCIOLOGY – THEMES AND PERSPECTIVES: Michael Honalambos, Oxford University Press
8. CONSTITUTION OF INDIA: D.D.Basu, Lexis Nexis Butterworth Publishers
9. National Youth Policy 2014 (available on [www.yas.nic.in](http://www.yas.nic.in))
10. TOWARDS A WORLD OF EQUALS: A.Suneetha, Uma Bhrugudanda, DuggiralaVasantha, Rama Melkote, VasudhaNagraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu
10. LIGHT ON YOGA :B.K.S.Iyengar, Penguin Random House Publishers

[www.un.org](http://www.un.org)

[www.india.gov.in](http://www.india.gov.in)

[www.yas.nic.in](http://www.yas.nic.in)

<http://www.who.int/countries/ind/en/>

<http://www.ndma.gov.in>

<http://ayush.gov.in/event/common-yoga-protocol-2016-0>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ECE)**

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**15A52301 MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**Course Objectives:** The objective of this course is to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to impart analytical skills in helping them take sound financial decisions for achieving higher organizational productivity.

**Unit I****INTRODUCTION TO MANAGERIAL ECONOMICS**

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Relationship of Managerial Economics with Financial Accounting and Management. **Demand Analysis:** Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of elasticity of demand - Demand Forecasting- factors governing demand forecasting- methods of demand forecasting.

**UNIT II****THEORY OF PRODUCTION AND COST ANALYSIS**

**Production Function-** Least cost combination- Short-run and Long- run production function- Isoquants and Isocosts, MRTS - Cobb-Douglas production function - Laws of returns - Internal and External economies of scale - **Cost Analysis:** Cost concepts and cost behavior- Break-Even Analysis (BEA) -Determination of Break Even Point (Simple Problems)-Managerial significance and limitations of Break- Even Point.

**UNIT III****INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT**

**Market structures:** Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition- Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization.

**UNIT IV****INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS**

Financial Accounting – Concept - Emerging need and Importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

**UNIT V****CAPITAL AND CAPITAL BUDGETING**

Concept of Capital - Over and Undercapitalization – Remedial Measures - Sources of Short term and Long term Capital - Estimating Working Capital Requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

**Learning Outcome:** After completion of this course, the student will be able to understand various aspects of Managerial Economics and analysis of financial statements and inputs therein will help them to make sound and effective decisions under different economic environment and market situations.

**TEXT BOOKS:**

1. Managerial Economics 3/e, Ahuja H.L, S.Chand, 2013.
2. Financial Management, I.M.Pandey, Vikas Publications, 2013.

**REFERENCES**

1. Managerial Economics and Financial Analysis, 1/e, Aryasri, TMH, 2013.
2. Managerial Economics and Financial Analysis, S.A. Siddiqui and A.S. Siddiqui, New Age International, 2013.
3. Accounting and Financial Management, T.S.Reddy & Y. Hariprasad Reddy, Margham Publishers.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ECE)**

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**15A04601 MICROPROCESSORS AND MICROCONTROLLERS****Course Objectives:**

- To understand the architecture of 8086 MICROPROCESSOR.
- To learn various 8086 Instruction set and Assembler Directives.
- To learn 8051 assembly Language programming

**Course Outcomes :****After completion of this subject the students will be able to :**

1. Do programming with 8086 microprocessors
2. Understand concepts of Intel x86 series of processors
3. Program MSP 430 for designing any basic Embedded System
4. Design and implement some specific real time applications  
Using MSP 430 low power microcontroller.

**UNIT I**

Introduction-8086 Architecture-Block Diagram, Register Organization, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagrams, Memory Segmentation, Interrupt structure of 8086 and Interrupt Vector Table. Memory organization and memory banks accessing.

**UNIT II**

Instruction Formats -Addressing Modes-Instruction Set of 8086, Assembler Directives-Macros and Procedures.- Sorting, Multiplication, Division and multi byte arithmetic code conversion. String Manipulation instructions-Simple ALPs.

**UNIT III**

Low power RISC MSP430 – block diagram, features and architecture, Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, MSP430x5x series block diagram, Addressing modes, Instruction set Memory address space, on-chip peripherals (analog and digital), and Register sets. Sample embedded system on MSP430 microcontroller.

**UNIT-IV**

I/O ports pull up/down resistors concepts, Interrupts and interrupt programming. Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability.

Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

**UNIT-V:**

Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices. Implementing Embedded Wi-Fi using CC3100

**Text Books:**

1. "Microprocessor and Microcontrollers", N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Oxford Publishers. 1 st Edition, 2010
2. "The X86 Microprocessors , Architecture, Programming and Inerfacing" , Lyla B. Das, Pearson Publications, 2010
3. MSP430 microcontroller basics. John H. Davies, Newnes Publication, I st Edition, 2008

**References:**

[http://processors.wiki.ti.com/index.php/MSP430\\_LaunchPad\\_Low\\_Power\\_Mode](http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode)  
[http://processors.wiki.ti.com/index.php/MSP430\\_16-Bit\\_Ultra-Low\\_Power\\_MCU\\_Training](http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training)

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ECE)**

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**15A04602 ELECTRONIC MEASUREMENTS AND INSTRUMENTATION****Course Objectives:**

- Studies on various analyzers and signal generators and can analyze the frequency component of a wave generated and its distortion levels.
- Studies on the difference between the various parameters which are to be measured that are getting out from the different sensors.

**Course Outcomes:**

After the completion of the course the students will be able to

- Understand basic principles involved in the meters for measuring voltage, current, resistance, frequency and so on.
- Employ CRO for measuring voltage, current, resistance, frequency and so on.
- Understand principles of measurements associated with different bridges.
- Get complete knowledge regarding working of advanced instruments such as logic analyzers and spectrum analyzers.

**UNIT-I**

Performance characteristics of Instruments: Static characteristics, Accuracy, Precision, Resolution, Sensitivity, static and dynamic calibration, Errors in Measurement, and their statistical analysis, dynamic characteristics-speed of Response, fidelity, Lag and dynamic error. DC ammeters, DC voltmeters-multirange, range extension/solid state and differential voltmeters, AC voltmeters –multirange, range extension. Thermocouple type RF ammeter, ohm meters, series type, shunt type, multimeter for voltage, current and resistance measurements.

**UNIT-II**

Oscilloscopes: Standard specifications of CRO, CRT features, derivation of deflection sensitivity, vertical and horizontal amplifiers, horizontal and vertical deflection systems, sweep trigger pulse, delay line, sync selector circuits, probes for CRO – active, passive, and attenuator type, triggered sweep CRO, and Delayed sweep, dual trace/beam CRO, Measurement of amplitude, frequency and phase (Lissajous method). Principles of sampling oscilloscope, storage oscilloscope, and digital storage oscilloscope, Digital frequency counters, time & Period measurements.

**UNIT-III**

Signal generators-fixed and variable, AF oscillators, function generators, pulse, random noise, sweep, and arbitrary waveform generators, their standards, specifications and principles of working (Block diagram approach). Wave analyzers, Harmonic distortion analyzers, Spectrum analyzers, and Logic analyzers.

**UNIT-IV**

Review of DC Bridges: Wheatstone bridge, Wein Bridge, errors and precautions in using bridges, AC bridges: Measurement of inductance-Maxwell's bridge, Anderson Bridge. Measurement of capacitance- Schearing Bridge. Kelvin Bridge, Q-meter, EMI and EMC, Interference and noise reduction techniques.

**UNIT-V**

Sensors and Transducers - Active and passive transducers: Measurement of displacement (Resistance, capacitance, inductance; LVDT) Force (strain gauges) Pressure (piezoelectric transducers) Temperature (resistance thermometers, thermocouples, and thermistors), Velocity, Acceleration, Vibration, pH measurement Signal Conditioning Circuits.

**TEXT BOOKS:**

1. A.D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 5<sup>th</sup> Edition, 2002.
2. H.S.Kalsi, "Electronic instrumentation", second edition, Tata McGraw Hill, 2004.
3. K. Lal Kishore, "Electronic Measurements & Instrumentations", Pearson Education, 2009.

**REFERENCES:**

1. H.S.Kalsi, "Electronic instrumentation", second edition, Tata McGraw Hill, 2004.
2. Ernest O Doebelin and Dhanesh N Manik, "Measurement Systems Application and Design", TMH, 5<sup>th</sup> Edition, 2009.
3. Oliver and Cage, "Electronic Measurement and Instrumentation", TMH.
4. Robert A.Witte, "Electronic Test Instruments, Analog and Digital Measurements", Pearson Education, 2<sup>nd</sup> Ed., 2004.
5. David A. Bell, "Electronic Instrumentation & Measurements", PHI, 2<sup>nd</sup> Edition, 2003.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ECE)**

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**15A04603 DIGITAL SIGNAL PROCESSING****Course Objectives:**

- Program a DSP chip to filter signals using either assembly language or a C compiler for the chip.
- Use Z transforms and discrete time Fourier transforms to analyze a digital system.

**Course Outcomes:**

At the end of the course, the student should be able to:

- Formulate engineering problems in terms of DSP tasks.
- Apply engineering problems solving strategies to DSP problems.
- Design and test DSP algorithms.
- Analyze digital and analog signals and systems.
- Analyze and compare different signal processing strategies.

**UNIT-I**

Review of discrete-time signals and systems – Time domain analysis of discrete-time signals & systems, Frequency domain analysis of discrete-time signals and systems.

**Discrete Fourier Transform:** Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Linear filtering methods based on DFT, Frequency analysis of signals using the DFT.

**UNIT-II**

Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2, Radix-4, and Split radix FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, A linear filtering approach to computation of the DFT- the Goertzel, and the Chirp-z transform algorithms, Quantization errors in the computation of DFT.

**UNIT-III**

Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Frequency sampling, and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, Conversion from Lattice structure to direct form, lattice – Ladder structure.

**UNIT-IV**

General considerations – Causality and its implications, Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters – Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR filters by the frequency sampling method, Design of optimum equi-ripple linear phase FIR filters, Comparison of design methods for linear phase FIR filters, Design of Impulse Invariance Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

**UNIT-V**

Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of bandpass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

**TEXT BOOKS:**

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4<sup>th</sup> ed., 2007.
2. Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3<sup>rd</sup> edition, 2009.

**REFERENCES:**

1. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2<sup>nd</sup> ed., Pearson Education, 2012.
2. B. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.
3. Li Tan, Jean Jiang, "Digital Signal Processing, Fundamentals and Applications," Academic Press, Second Edition, 2013.

B. Tech III-II Sem. (ECE)

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15A04604 VLSI DESIGN

**Course Objectives:**

- To understand VLSI circuit design processes.
- To understand basic circuit concepts and designing Arithmetic Building Blocks.
- To have an overview of Low power VLSI.

**Course Outcomes:**

- Complete Knowledge about Fabrication process of ICs
- Able to design VLSI circuits as per specifications given.
- Capable of optimizing the design of Arithmetic / logic building Blocks at all levels of Design/Fabrication.
- Can implement circuit through various design styles ( semi- Custom, Full Custom)

**UNIT-I**

**Introduction:** Basic steps of IC fabrication, PMOS, NMOS, CMOS & BiCMOS, and SOI process technologies, MOS transistors - MOS transistor switches – Basic gate using switches, working polar transistor Resistors and Capacitors.

**Basic Electrical Properties of MOS and BiCMOS Circuits:** Working of MOS transistors – threshold voltage; MOS design equations:  $I_{ds}-V_{ds}$  relationships, Threshold Voltage, Body effect, Channel length modulation,  $g_m$ ,  $g_{ds}$ , figure of merit  $\omega_0$ ; Pass transistor, NMOS Inverter, CMOS Inverter analysis and design, Various pull ups loads, Bi-CMOS Inverters.

**UNIT-II**

**Basic Circuit Concepts:** Capacitance, resistance estimations- Sheet Resistance  $R_s$ , MOS Device Capacitances, routing Capacitance, Analytic Inverter Delays, Driving large Capacitive Loads, Fan-in and fan-out.

**VLSI Circuit Design Processes:** VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout,  $2\mu m$  CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits, Limitations of Scaling.

**UNIT-III**

**Gate level Design:** Logic gates and other complex gates, Switch logic, Alternate gate circuits.

**Physical Design:** Floor-Planning, Placement, routing, Power delay estimation, Clock and Power routing

**UNIT-IV**

**Subsystem Design:** Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Counters, High Density Memory Elements.

**VLSI Design styles:** Full-custom, Standard Cells, Gate-arrays, FPGAs, CPLDs and Design Approach for Full-custom and Semi-custom devices.

**UNIT-V**

**VHDL Synthesis:** VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools.

**Test and Testability:** Fault-modeling and simulation, test generation, design for testability, Built-in-self-test.

**TEXT BOOKS:**

1. Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, "Essentials of VLSI circuits and systems", PHI, 2013 Edition.
2. K.Lal Kishore and V.S.V. Prabhakar, "VLSI Design", IK Publishers

**REFERENCES:**

1. Weste and Eshraghian, "Principles of CMOS VLSI Design", Pearson Education, 1999.
2. Wayne Wolf, "Modern VLSI Design", Pearson Education, 3<sup>rd</sup> Edition, 1997.
3. John P. Uyemura, "Chip Design for Submicron VLSI: CMOS layout and Simulation", Thomson Learning.
4. John P. Uyemura, "Introduction to VLSI Circuits and Systems", John Wiley, 2003.
5. John M. Rabaey, "Digital Integrated Circuits", PHI, 1997.

B. Tech III-II Sem. (ECE)

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**15A04605    MATLAB PROGRAMMING  
(CBCC-I)**

**Objectives:**

- Understand the MATLAB Desktop, Command window and the Graph Window
- Be able to do simple and complex calculation using MATLAB
- Be able to carry out numerical computations and analyses
- Understand the mathematical concepts upon which numerical methods rely
- Ensure you can competently use the MATLAB programming environment
- Understand the tools that are essential in solving engineering problems

**1. UNIT-I: Introduction to MATLAB**

MATLAB Interactive Sessions, Menus and the toolbar, computing with MATLAB, Script files and the Editor Debugger, MATLAB Help System, Programming in MATLAB.

**2. UNIT-II: Arrays**

Arrays, Multidimensional Arrays, Element by Element Operations, Polynomial Operations Using Arrays, Cell Arrays, Structure Arrays.

**3. UNIT-III: Functions & Files**

Elementary Mathematical Functions, User Defined Functions, Advanced Function Programming, Working with Data Files.

**4. UNIT-IV: Programming Techniques**

Program Design and Development, Relational Operators and Logical Variables, Logical Operators and Functions, Conditional Statements, Loops, the Switch Structure, Debugging Mat Lab Programs.

Plotting :XY- plotting functions, Subplots and Overlay plots, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

**5. UNIT-V: Linear Algebraic Equations**

Elementary Solution Methods, Matrix Methods for (Linear Equations), Cramer's Method, Undetermined Systems, Order Systems.

**TEXT BOOKS:**

1. G. H. Golub and C. F. Van Loan, Matrix Computations, 3rd Ed., Johns Hopkins University Press, 1996.
2. B. N. Datta, Numerical Linear Algebra and Applications, Brooks/Cole, 1994 (out of print)
3. L. Elden, Matrix Methods in Data Mining and Pattern Recognition, SIAM Press, 2007

**Misc. Useful Information:**

- NA-digest, <http://www.netlib.org/na-digest-html>
- Society for Industrial and Applied Mathematics (SIAM), see <http://www.siam.org>
- Google “MATLAB Primer” or “MATLAB Tutorial” and you should be able to access lots of free MATLAB.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ECE)**

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**15A04606 INDUSTRIAL ELECTRONICS  
(CBCC-I)**
**Course Outcome:**

After completion of the course the students will be able to

- Get an overview of semi-conductor devices (such as PN junction diode & Transistor) and their switching characteristics.
- Understand the characteristics of AC to DC converters.
- Understand about the practical applications Electronics in industries.

**UNIT I**

Scope of industrial Electronics, Semiconductors, Merits of semiconductors, crystalline structure, Intrinsic semiconductors, Extrinsic semiconductors, current flow in semiconductor, Open-circuited p-n junction, Diode resistance, Zener diode, Photoconductors and junction photo diodes, Photo voltaic effect, Light emitting diodes (LED)

**UNIT II**

Introduction, The junction transistor, Conventions for polarities of voltages and currents, Open circuited transistor, Transistor biased in the active region, Current components in transistors, Currents in a transistor, Emitter efficiency, Transport factor and transistor- $\alpha$ , Dynamic emitter resistance, Transistor as an amplifier, Transistor construction, Letter symbols for semiconductor Devices, Characteristic curves of junction transistor in common configuration, static characteristic curves of PNP junction transistor in common emitter configuration, The transistor in common collector Configuration.

**UNIT III**

AC to DC converters- Introduction, Classification of Rectifiers, Half wave Rectifiers, Full wave Rectifiers, Comparison of Half wave and full wave rectifiers, Bridge Rectifiers, Bridge Rectifier meter, Voltage multiplying Rectifier circuits, Capacitor filter, LC Filter, Metal Rectifiers, Regulated Power Supplies, Classification of Voltage Regulators, Short period Accuracy of Regulators, Long period .Accuracy of Voltage Regulator, Principle of automatic voltage Regulator, Simple D.C. Voltage stabilizer using Zener diode, D.C. Voltage Regulators, Series Voltage Regulators, Complete series voltage regulator circuit, Simple series voltage regulator.

## UNIT IV

**Resistance welding controls:** Introduction, Resistance welding process, Basic Circuit for A.C. resistance welding, Types of Resistance welding, Electronic welding control used in Resistance welding, Energy storage welding. **Induction heating:** Principle of induction heating, Theory of Induction heating merits of induction heating, Application of induction heating, High frequency power source of induction heating. **Dielectric heating:** Principle of dielectric heating, theory of dielectric heating, dielectric properties of typical materials, electrodes used in dielectric heating, method of coupling of electrodes to the R.F. generator, Thermal losses in Dielectric heating, Applications.

## UNIT V :

**Ultrasonics:** Introduction, Generation of Ultrasonic waves, Application of Ultrasonic waves, Ultrasonic stroboscope, ultrasonic as means of communication, ultrasonic flaw detection, Optical image on non-homogeneities, ultrasonic study of structure of matter, Dispersive study of structure of matter, Dispersive and colloidal effect of Ultrasonic, Coagulating action of Ultrasonic, separation of mixtures by ultrasonic waves, cutting and machining of hard materials by ultrasonic vibrations, Degassing of liquids by ultrasonic waves, Physico-chemical effects of ultrasonics, chemical effects of ultrasonics, Thermal effects of Ultrasonics, soldering and welding by ultrasonics, Ultrasonic Drying

### Text Books:

1. G. K. Mithal, "Industrial Electronics", Khanna Publishers, Delhi, 2000.
2. J. Gnanavadeivel, R. Dhanasekaran, P. Maruthupandi, "Industrial Electronics", Anuradha Publications, 2011.

### Reference Books:

1. F. D. Petruzella, "Industrial Electronics", McGraw Hill, Singapore, 1996.
2. M. H. Rashid, "power Electronics Circuits, Devices and Application", PHI, 3rd edition, 2004.
3. G. M. Chute and R. D. Chute, "Electronics in Industry", McGraw Hill Ltd, Tokyo, 1995.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech III-II Sem. (ECE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>15A02605 NEURAL NETWORKS &amp; FUZZY LOGIC</b>				
<b>(CBCC-I)</b>				

**Course Objectives:**

- To analyze basic neural computational models.
- To get in detail knowledge regarding different algorithms related to neural learning
- To study about different issues related probability and fuzziness and different types of fuzzy associative memories.

**Course Outcomes:**

After completion of the course the students will be able to

- Get an overview of different types of neural network models.
- Understand the functioning of single; multi-layer feed forward neural networks, associative memories and their rules and algorithms.
- Understand about fundamentals of fuzzy logic, their rules and applications.

**UNIT I**

Introduction to Neural Networks: Biological neuron, McCulloch-pitts neuron model, Neuron Modelling for Artificial Neural Systems, Models of Artificial Neural Networks- feedforward and feedback networks, Neural Processing, Learning as approximation, Supervised and unsupervised learning, Neural Network Learning rules- Hebbian, Perceptron, Delta, Widrow-Hoff, Correlation, Winner-Take-All learning rules.

**UNIT II**

Single-Layer Neural Networks: Classification Model, Features and Decision Regions, Discriminant Functions, Linear Machine and Minimum Distance Classification, Training and Classification using Discrete Perceptron, Single-Layer Continuous Perceptron Networks, Multicategory Single-Layer Perceptron Networks, Hopfield Network – Discrete-time, Gradient type.

Multi-Layer Neural Networks: Linearly Nonseparable Pattern Classification, Delta Learning Rule for Multiperceptron Layer, Generalized Delta Learning Rule, Feed forward Recall and Error Back-propagation training, Learning Factors.

**UNIT III**

Associative Memories: Basic concepts, Linear Associator, Recurrent Auto associate Memory, Performance Analysis of Recurrent Auto associate Memory, Bidirectional Associate Memory(BAM): Memory Architecture, Association Encoding and Decoding, Stability Considerations, Memory Example and Performance Evaluation, Improved coding of memories, Multidirectional Associative Memory, Associative Memory of Spatial-Temporal Patterns.

**UNIT IV**

Fuzzy Set– Introduction: Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

**UNIT V**

Fuzzy Logic - Fuzzy Membership, Rules: Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzifications&Defuzzificataions, Fuzzy Controller, Industrial applications.

**Text Books:**

1. JacekM.Zurada," Introdtution to Artificial Neural Systems", West Publishing Company
2. Timothy J.Ross, " Euuzzy Logic with Engineering Applications", Wiley Indian 3<sup>rd</sup> Edition

**Reference Books:**

1. George J.Klir/Bo Yuan, "Fuzzy Sets and Fuzzy Logic : Theory and apllications", Prentice-Hall Edition
2. S.N.Sivanandam, S.Sumathi, S.N.Deepa, "Introduction to Neural Networks using MATLAB 6.0", TMH, 2006.
3. S.N.Sivanandam, S.Sumathi, S.N.Deepa, "Introduction to Fuzzy Logic using MATLAB 6.0", TMH, 2006
4. Simon Haykins, "Neural Networks", Pearson Education.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ECE)**

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**15A01608 INTELLECTUAL PROPERTY RIGHTS  
(CBCC – I)**
**COURSE OBJECTIVE:**

*This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.*

**UNIT – I**

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

**UNIT – II**

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

**UNIT – III**

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.

Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

**UNIT – IV**

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.

Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

**UNIT – V**

New Developments Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.

International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual Property Rights, Deborah. E. Bouchoux, Cengage Learning.
2. Intellectual Property Rights– UnleashmyThe Knowledge Economy, PrabuddhaGanguli, Tate Mc Graw Hill Publishing Company Ltd.,

**Course Outcomes:**

*On completion of this course, the student will have an understanding of the following:*

- a) *Intellectual Property Rights and what they mean*
- b) *Trade Marks and Patents and how to register them*
- c) *Laws Protecting the Trade Marks and Patents*
- d) *Copy Right and laws related to it.*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ECE)**

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**15A04607 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY****Part A : 8086 Microprocessor Programs using NASM/8086 microprocessor kit.**

1. Introduction to MASM Programming.
2. Programs using arithmetic and logical operations
3. Programs using string operations and Instruction prefix: Move Block, Reverse string, Sorting, String comparison
4. Programs for code conversion
5. Multiplication and Division programs
6. Sorting and multi byte arithmetic
7. Programs using CALL and RET instructions

**Part B Embedded C Experiments using MSP430 Microcontroller**

1. Interfacing and programming GPIO ports in C using MSP430 (blinking LEDs , push buttons)
2. Usage of Low Power Modes: ( Use MSPEXP430FR5969 as hardware platform and demonstrate the low power modes and measure the active mode and standby mode current)
3. Interrupt programming examples through GPIOs
4. PWM generation using Timer on MSP430 GPIO
5. Interfacing potentiometer with MSP430
6. PWM based Speed Control of Motor controlled by potentiometer connected to MSP430 GPIO
7. Using ULP advisor in Code Composer Studio on MSP430
8. Low Power modes and Energy trace++:
  - a. Enable Energy Trace and Energy Trace ++ modes in CCS
  - b. Compute Total Energy, and Estimated lifetime of an AA battery.

**Note : Any six experiment from Part A and Six experiments from Part B are to be conducted**

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**B. Tech III-II Sem. (ECE)**

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**15A04608 DIGITAL SIGNAL PROCESSING LABORATORY****Course Outcomes:**

- Able to design real time DSP systems and real world applications.
- Able to implement DSP algorithms using both fixed and floating point processors.

**List of Experiments: (Minimum of 5 experiments are to be conducted from each part) Software Experiments (PART – A)**

1. Generation of random signal and plot the same as a waveform showing all the specifications.
2. Finding Power and (or) Energy of a given signal.
3. Convolution and Correlation (auto and cross correlation) of discrete sequences without using built in functions for convolution and correlation operations.
4. DTFT of a given signal
5. N – point FFT algorithm
6. Design of FIR filter using windowing technique and verify the frequency response of the filter.
7. Design of IIR filter using any of the available methods and verify the frequency response of the filter.
8. Design of analog filters.

**Using DSP Processor kits (Floating point) and Code Composer Studio (CCS) (PART – B)**

1. Generation of random signal and plot the same as a waveform showing all the specifications.
2. Finding Power and (or) Energy of a given signal.
3. Convolution and Correlation (auto and cross correlation) of discrete sequences without using built in functions for convolution and correlation operations.
4. DTFT of a given signal
5. N – point FFT algorithm
6. Design of FIR filter using windowing technique and verify the frequency response of the filter.
7. Design of IIR filter using any of the available methods and verify the frequency response of the filter.
8. Design of analog filters.

**Equipment/Software Required:**

1. Licensed MATLAB software with required tool boxes for 30 users.
2. DSP floating Processor Kits with Code Composer Studio (8 nos.)
3. Function generators
4. CROs
5. Regulated Power Supplies.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ECE)**

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**15A52602 ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS  
(AELCS) LAB (Audit Course)**
**1. INTRODUCTION**

With increased globalization and rapidly changing industry expectations, employers are looking for the wide cluster of skills to cater to the changing demand. The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information and to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Taking part in social and professional communication.

**2. OBJECTIVES:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

**3. SYLLABUS:**

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:



**UNIT-I: COMMUNICATION SKILLS**

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary Development
4. Common Errors

**UNIT-II: WRITING SKILLS**

1. Report writing
2. Resume Preparation
3. E-mail Writing

**UNIT-III: PRESENTATION SKILLS**

1. Oral presentation
2. Power point presentation
3. Poster presentation

**UNIT-IV: GETTING READY FOR JOB**

1. Debates
2. Group discussions
3. Job Interviews

**UNIT-V: INTERPERSONAL SKILLS**

1. Time Management
2. Problem Solving & Decision Making
3. Etiquettes

**4. LEARNING OUTCOMES:**

- Accomplishment of sound vocabulary and its proper use contextually
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

**5. MINIMUM REQUIREMENT:**

The Advanced English Communication Skills (AECS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

**6. SUGGESTED SOFTWARE:**

The software consisting of the prescribed topics elaborated above should be procured and G

1. **Walden Infotech: Advanced English Communication Skills Lab**
2. **K-VAN SOLUTIONS-Advanced English Language Communication Skills lab**
3. **DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.**
4. **TOEFL & GRE( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)**
5. **Train2success.com**

**7. BOOKS RECOMMENDED:**

1. **Objective English for Competitive Exams**, Hari Mohana Prasad, 4<sup>th</sup> edition, Tata Mc Graw Hill.
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, O U Press 3<sup>rd</sup>Edn. 2015.
3. **Essay Writing for Exams**, AudroneRaskauskiene, Irena Ragaisience&RamuteZemaitience,OUP, 2016
4. **Soft Skills for Everyone**, Butterfield Jeff, Cengage Publications, 2011.
5. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. **Campus to Corporate**, Gangadhar Joshi, Sage Publications, 2015
7. **Communicative English**,E Suresh Kumar &P.Sreehari, Orient Blackswan, 2009.
8. **English for Success in Competitive Exams**, Philip Sunil Solomon OUP, 2015

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**15A04701 OPTICAL FIBRE COMMUNICATION**
**Course Objectives:**

- The course gives an account of optical Communication starting with the basic of fiberoptics.
- To give clear understanding of various components such as Optical fibers, Photo detectors, connectors, coupling devices and optical amplifiers Knowledge of various components used in optical networks.
- Knowledge about Various topologies used to construct an optical networks.

**Course Outcomes:**

- Analyze the performance of both digital and analog optical fiber systems
- Calculate the system bandwidth, noise, probability of error and maximum usable bit rate of a digital fiber system
- Calculate the system link loss, distortion and dynamic range of an RF photonic link
- To perform characteristics of fiber sources and detectors, design as well as conduct experiment in software and hardware, and analyze the results to provide valid conclusions.

**UNIT-I**

**Introduction to Optical Fibers:** Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –Mode theory of Circular Wave guides- Overview of Modes-Key Modal concepts- Linearly Polarized Modes –Single Mode Fibers-Graded Index fiber structure.

**UNIT-II**

**Signal Degradation Optical Fibers:** Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides - Information Capacity determination –Group Delay- Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers-Mode Coupling –Design Optimization of SM fibers-RI profile and cut-off wavelength.

**UNIT-III**

**Fiber Optical Sources and Coupling** : Direct and indirect Band gap materials-LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes-Modes and Threshold condition –Rate equations –External Quantum efficiency –Resonant frequencies –Temperature effects, Introduction to Quantum laser, source-to-fiber Power Launching, Lensing schemes, Fiber –to- Fiber joints, Fiber splicing.

**UNIT-IV**

**Fiber Optical Receivers** : PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors – Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error – Quantum Limit.

**UNIT-V**

**System Design and Applications**: Design of Analog Systems: system specification, power budget, bandwidth budget.

**Design of Digital Systems**: system specification, rise time budget, power budget, Receiver sensitivity.

**Text Books:**

1. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3<sup>rd</sup> ed., 2000.
2. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.

**References:**

1. Max Ming-Kang Liu, "Principles and Applications of Optical Communications", TMH, 2010.
2. S.C.Gupta, "Text book on optical fiber communication and its applications", PHI, 2005.
3. Satish Kumar, "Fundamentals of Optical Fiber communications", PHI, 2009.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-ISem. (ECE)**

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**15A04702 EMBEDDED SYSTEMS****Course Objectives:**

- To understand the fundamental concepts of Embedded systems.
- To learn the kernel of RTOS, architecture of ARM processor.

**Course Outcomes:****After completion the students will be able to**

- Design of embedded systems leading to 32-bit application development.
- Understand hardware-interfacing concepts to connect digital as well as analog sensors while ensuring low power considerations.
- Review and implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.
- Understand Embedded Networking and IoT concepts based upon connected MCUs

**UNIT-I****Introduction to Embedded Systems**

Embedded system introduction, host and target concept, embedded applications, features and architecture considerations for embedded systems- ROM, RAM, timers; data and address bus concept, Embedded Processor and their types, Memory types, overview of design process of embedded systems, programming languages and tools for embedded design

**UNIT-II****Embedded processor architecture**

CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture. Introduction to ARM architecture and Cortex – M series, Introduction to the TM4C family viz. TM4C123x & TM4C129x and its targeted applications. TM4C block diagram, address space, on-chip peripherals (analog and digital) Register sets, Addressing modes and instruction set basics.

**UNIT- III****Overview of Microcontroller and Embedded Systems**

Embedded hardware and various building blocks, Processor Selection for an Embedded System , Interfacing Processor, Memories and I/O Devices, I/O Devices and

I/O interfacing concepts, Timer and Counting Devices, Serial Communication and Advanced I/O, Buses between the Networked Multiple Devices. Embedded System Design and Co-design Issues in System Development Process, Design Cycle in the Development Phase for an Embedded System, Uses of Target System or its Emulator and In-Circuit Emulator (ICE), Use of Software Tools for Development of an Embedded System Design metrics of embedded systems - low power, high performance, engineering cost, time-to-market.

## **UNIT-IV**

### **Microcontroller fundamentals for basic programming**

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on TM4C, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming. Basic Timer, Real Time Clock (RTC), Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

## **Unit-V**

### **Embedded communications protocols and Internet of things**

Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, Implementing and programming UART, SPI and I2C, SPI interface using TM4C. Case Study: Tiva based embedded system application using the interface protocols for communication with external devices “Sensor Hub BoosterPack” Embedded Networking fundamentals, IoT overview and architecture, Overview of wireless sensor networks and design examples. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API.

Case Study: Tiva based Embedded Networking Application: “Smart Plug with Remote Disconnect and Wi-Fi Connectivity”

### **Text Books:**

1. Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers, 2014, Create space publications ISBN: 978-1463590154.
2. Embedded Systems: Introduction to ARM Cortex - M Microcontrollers, 5th edition  
Jonathan W Valvano, Createspace publications ISBN-13: 978-1477508992
3. Embedded Systems 2E Raj Kamal, Tata McGraw-Hill Education, 2011 ISBN-0070667640, 9780070667648
- 4.

**References:**

1. [http://processors.wiki.ti.com/index.php/HandsOn\\_Training\\_for\\_TI\\_Embedded\\_Processors](http://processors.wiki.ti.com/index.php/HandsOn_Training_for_TI_Embedded_Processors)
2. [http://processors.wiki.ti.com/index.php/MCU\\_Day\\_Internet\\_of\\_Things\\_2013\\_Workshop](http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop)
3. [http://www.ti.com/ww/en/simplelink\\_embedded\\_wi-fi/home.html](http://www.ti.com/ww/en/simplelink_embedded_wi-fi/home.html)
4. CC3100/CC3200 SimpleLink™ Wi-Fi® Internet-on-a-Chip User Guide Texas Instruments Literature Number: SWRU368A April 2014–Revised August 2015.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-ISem. (ECE)**

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**15A04703****MICROWAVE ENGINEERING****Course objectives:**

The Objectives of the course are:

- TO develop the knowledge on transmission lines for microwaves, cavity resonators and wave guide components and applications.
- To understand the scattering matrix parameters and its use.
- To introduce the student the microwave test bench for measure different parameters like attenuation, VSWR, etc.,

**Course Outcomes:**

- Ability to analyze micro-wave circuits incorporating hollow, dielectric and planar waveguides, transmission lines, filters and other passive components, active devices.
- Ability to Use S-parameter terminology to describe circuits and to explain how microwave devices and circuits are characterized in terms of their "S"-Parameters.
- Ability to understanding of microwave transmission lines and how to Use microwave components such as isolators, Couplers, Circulators, Tees, Gytrators etc.

**UNIT-I**

**MICROWAVE TRANSMISSION LINES:** Introduction, Microwave spectrum and bands, applications of Microwaves. Rectangular Waveguides- Solution of Wave Equation in Rectangular Coordinates, TE/TM mode analysis, Expressions for fields, Characteristic equation and cutoff frequencies, filter characteristics, dominant and degenerate modes, sketches of TE and TM mode fields in the cross-section. Mode characteristics- Phase and Group velocities, wavelengths and impedance relations, Illustrative Problems.

**Rectangular Waveguides**– Power Transmission and Power Losses, Impossibility of TEM Modes, Micro strip lines-introduction,  $Z_0$  relations, effective dielectric constant, losses, Q-factor, Cavity resonators-introduction, Rectangular and cylindrical cavities, dominant modes and resonant frequencies, Q-factor and coupling coefficients, Illustrative Problems.



**UNIT-II**

**WAVEGUIDE COMPONENTS AND APPLICATIONS:** Coupling mechanisms- probe, loop, aperture types. Wave guide discontinuities-waveguide Windows, tuning screws and posts, matched loads. Waveguide attenuators-resistive card, rotary vane Attenuators; waveguide phase shifters-dielectric, rotary vane phase shifters. Wave guide multiport junctions-E plane and H plane Tees, Magic Tee, Directional couplers-2 hole, Both hole types, Illustrative Problems.

Ferrites-composition and characteristics, Faraday rotation; Ferrite components-Gyrator, Isolator, Circulator.

**UNIT-III**

**MICROWAVE TUBES:** Limitations and losses of conventional tubes at microwave frequencies. Microwave tubes-O type and M type classifications. O type tubes: 2 cavity klystrons-structure, Reentrant cavities, velocity modulation process and Applegate diagram, bunching process and small signal theory-Expressions for O/P power and efficiency. Reflex Klystrons-structure, Velocity Modulation, Applegate diagram, mathematical theory of bunching, power output, efficiency, oscillating modes and O/P characteristics, Effect of Repeller Voltage on Power O/P, Illustrative Problems.

**HELIX TWTS:** Significance, types and characteristics of slow wave structures; structure of TWT and amplification process (qualitative treatment), suppression of oscillations, gain considerations.

**UNIT-IV**

**M-TYPE TUBES:** Introduction, cross field effects, Magnetrons-different types, cylindrical travelling wave magnetron-Hull cutoff and Hartree conditions, modes of resonance and PI-mode operation, separation of PI-mode, O/P characteristics, Illustrative Problems.

**MICROWAVE SOLID STATE DEVICES:** Introduction, classification, applications, Transfer Electronic Devices, Gunn diode-principles, RWH theory, characteristics, basic modes of operation - Gunn oscillation modes. LSA Mode, Varactor Diode, Parametric Amplifier, Introduction to Avalanche Transit time devices (brief treatment only).

**UNIT-V****MICROWAVE MEASUREMENTS:**

Scattering Matrix-Significance, Formulation and properties. S Matrix calculations for 2-port junction, E plane and H plane Tees, Magic Tee, Directional coupler, circulator and Isolator, Illustrative Problems

Description of Microwave bench-different blocks and their features, errors and precautions; Microwave power measurement-Bolometers, Measurement of attenuation, frequency standing wave measurements –measurement of low and high VSWR, cavity-Q, impedance measurements.

**TEXT BOOKS:**

1. Microwave devices and circuits-Samuel Y. Liao, Pearson, 3<sup>rd</sup> Edition, 2003.
2. Microwave principles-Herbert J.Reich,J.G.Skalnik, P.F.Ordung and H.L.Krauss, CBS publishers and distributors, New Delhi,2004.

**REFERENCES:**

1. Foundations for microwave engineering-R.E.Collin, IEEE press, John Wiley, 2<sup>nd</sup>edition, 2002.
2. Microwave circuits and passive devices-M.L.Sisodia and G.S.Raghuvanshi,Wiley Eastern Ltd.,New age International publishers Ltd., 1995.
3. Microwave engineering passive circuits-Peter A.Rizzi, PHI, 1999.
4. Electronic and Radio Engineering-F.E.Terman, McGraw-Hill, 4<sup>th</sup> Edition, 1995.
5. Microwave Engineering – A. Das, TMH, 2<sup>nd</sup> ed., 2009.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-ISem. (ECE)**

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**15A04704 DATA COMMUNICATIONS & NETWORKING****UNIT-I****Introduction to Networks & Data Communications**

The Internet, Protocols & Standards, Layered Tasks, OSI Model, TCP / IP, Addressing, Line Coding Review, Transmission Media: Guided and unguided Media Review.

**UNIT-II****Switching**

Datagram Networks, Virtual Circuit Networks, Structure of a switch, Ethernet Physical Layer, Data Link Layer: Error detection and Correction Data Link Control: Framing, Flow and Error Control Protocols, Noiseless Channel and Noisy Channel Protocol, HDLC, Point-to-Point Protocol.

**UNIT-III****Multiple Access**

RANDOH, CDMA, CSMA/CD, CSMA/CA, Controlled Access, Channelization, Wired LANs: IEEE Standards, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, Wireless LAN, IEEE 802.11, Bluetooth IEEE 802.16.

**UNIT-IV****Network Layer**

Design Issues, Routing Algorithms, Congestion control, Algorithms. IPV4 Addresses, Connecting Devices, Virtual LAN IPV6 Addresses, Internet Protocol, Hardware Addressing versus IP Addressing, IP Data Gram.

**UNIT-V****Transport Layer Protocol**

UDP and TCP, ATM, Cryptography, Network Security

**Text Books:**

1. B. A. Forouzan, "Data Communications and Networking", MGH, 4th ed. 2007.

**Reference Books:**

1. A. S. Tanenbaum, "Computer Networks", PHI.
2. W. Stallings, "Data and Computer Communication", PHI.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-ISem. (ECE)**

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**15A04705 RADAR SYSTEMS  
(CBCC-II)**
**Course Objectives:**

The objectives of course are:

- Radar fundamentals and analysis of radar signals.
- To understand various technologies involved in the design of radar transmitters and receivers.
- To learn various like MTI, Doppler and tracking radar and their comparison.

**Course Outcomes:**

After completion of the course, the student will be able to:

- Understand radar fundamentals and analysis of the radar signals.
- Understand various radar transmitters and receivers.
- Understand various radar like MTI, Doppler and tracking radar and their comparison.

**UNIT I**

**BASICS OF RADAR:** Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications, Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.

**RADAR EQUATION:** SNR, Envelope Detector, False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

**UNIT II**

**CW AND FREQUENCY MODULATED RADAR:** Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar, Illustrative Problems.

**FM-CW Radar:** Range and Doppler Measurement, Block Diagram and Characteristics (Approaching/ Receding Targets), FM-CW altimeter, Multiple Frequency CW Radar.

**UNIT III**

**MTI AND PULSE DOPPLER RADAR:** Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range

Gated Doppler Filters, MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler radar.

#### **UNIT IV**

**TRACKING RADAR:** Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two-coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

#### **UNIT V**

**DETECTION OF RADAR SIGNALS IN NOISE:** Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

**RADAR RECEIVERS:** Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Series versus Parallel Feeds, Applications, Advantages and Limitations.

#### **TEXT BOOKS:**

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2<sup>nd</sup> Edition, 2007.

#### **REFERENCES:**

1. Introduction to Radar Systems – Merrill I. Skolnik, 3<sup>rd</sup> Edition, Tata McGraw-Hill, 2001.
2. Radar Principals, Technology, Applications – Byron Edde, Pearson Education, 2004.
3. Radar Principles – Peebles, Jr., P.Z.Wiley, New York, 1998.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-ISem. (ECE)**

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**15A04706 ADAPTIVE SIGNAL PROCESSING  
(CBCC-II)**
**Course Objective:**

- To study in detail about adaptive Systems.
- To study about various Linear optimum filtering techniques.
- To study about various techniques related Linear and Non Linear adaptive filtering.

**Course outcome:**

- After the course students is expected to be able to:
- Get complete knowledge regarding adaptive systems
- Design various linear optimum filters by employing different techniques associated withthem
- Understand various techniques related to with linear and nonlinear adaptive filtering and their design considerations

**UNIT I:**

**Introduction to Adaptive Systems:** Eigen Analysis - Eigen Value problem, Properties of eigen values and eigen vectors, Eigen filters, Eigen value computations, Adaptive Systems - Definitions, Characteristics, Applications and Examples of Adaptive systems, The adaptive linear combiner – Description, weight vectors, Desired response performance function, Gradient and Mean square error(MSE).

**UNIT II:**

**Linear Optimum Filtering:** Wiener Filters – Linear optimum filtering, Principle of Orthogonality, Wiener-Hopf equations, Error performance surface, Channel Equalization, Linearly constrained minimum variance filter, Linear Prediction – Forward and Backward linear prediction, Levinson-Durbin Algorithm, Properties of prediction error filters, AR modeling of stationary stochastic process, Lattice predictors, Joint process estimation, Kalman Filters - Recursive mean square estimation for scalar random variables, Kalman filtering problem, The innovations process, Estimation of the state using innovations process, Filtering, Initial conditions, Variants of the Kalman filter, Extended Kalman filter, Problem Solving.

**UNIT III:**

**Linear Adaptive Filtering-I:** Method of Steepest descent algorithm and its stability, Least Means Square (LMS) algorithm – Structure & operation of LMS algorithm, Examples, Stability & performance analysis of the LMS algorithm, Simulations of Adaptive equalization using LMS algorithm, Convergence aspects, Method of Least Squares (LS) - Statement, Data windowing, Minimum sum of error squares, Normal equations and linear least squares filters, Properties.

**UNIT IV:**

**Linear Adaptive Filtering-II** Recursive Least Squares (RLS) Algorithm – Matrix inversion lemma, The exponentially weighted RLS algorithm, Update recursion for the sum of weighted error squares, Example, Convergence Analysis, Simulation of adaptive equalization using RLS algorithm, Order Recursive Adaptive Filters – Adaptive forward and backward linear prediction, Least squares Lattice predictor, QR-Decomposition based Least squares Lattice filters & their properties, Simulation of Adaptive equalization using Lattice Filter.

**UNIT V:**

**Nonlinear Adaptive Filtering:** Blind deconvolution – Theoretical and practical considerations, Bussgang algorithm for blind equalization for real base band channels, Special cases of Bussgang algorithm, Simulation studies of Bussgang algorithms, SVD, Problem solving.

**Text Books:**

1. Simon Haykin, "Adaptive Filter Theory," Prentice Hall, 4th Edition, 2002.
2. Bernard Widrow, Samuel D. Stearns, "Adaptive Signal Processing," Prentice Hall, 2005.

**References:**

1. Paulo S.R. Diniz, Adaptive Filtering Algorithms and Practical Implementation, Third Edition, Springer, Kluwer Academic Publishers.
2. Alexander D Poularikas, Zayed M Ramadan, Adaptive Filtering Primer with MATLAB, CRC Press Taylor & Francis Group, 2008 Indian Edition.
3. Ali H. Sayed, Adaptive filters, IEEE Press, Wiley-Interscience, A John Wiley & Sons, INC., Publication.
4. S. Thomas Alexander, "Adaptive Signal Processing-Theory & Applications," Springer –Verlag, 1986

B. Tech IV-ISem. (ECE)

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**15A04707    FPGA DESIGN  
(CBCC-II)**

**UNIT-I****Introduction to Field-programmable Gate Arrays**

Programmability and DSP. A Short History of the Microchip, Challenges of FPGAs, DSP System Basics, DSP System Definitions, DSP Transforms, Filter Structures, Adaptive Filtering , Basics of Adaptive Filtering

**UNIT-II****Arithmetic Basics**

Number Systems, Fixed-point and Floating-point, Arithmetic Operations, Fixed-point versus Floating-point, Technology Review: Introduction, Architecture and Programmability, DSP Functionality Characteristics .Processor Classification, Microprocessors, DSP processors.

**UNIT-III****Current FPGA Technologies**

Introduction, Toward FPGA, Altera FPGATEchnologies, Xilinx FPGA Technologies, Detailed FPGA Implementation Issues: Introduction, Various Forms of the LUT, Memory Availability, Fixed Coefficient Design Techniques, Distributed Arithmetic, Reduced Coefficient Multiplier, Rapid DSP System Design Tools and Processes for FPGA: Introduction, Design Methodology Requirements for FPGA DSP, IP Core Generation Tools for FPGA, System level Design Tools for FPGA.

**UNIT-IV****The IRIS Behavioral Synthesis**

Introduction of Behavioral Synthesis Tools, Hierarchical Design Methodology, Hardware Sharing Implementation (Scheduling Algorithm) for IRIS.DECISION ANALYSIS AND SUPPORT: Decision Making., Modeling throughout System Development, Modeling for Decision.

**UNIT-V****Complex DSP Core Design for FPGA**

Motivation for Design for Reuse, Intellectual Property (IP) Cores, Evolution of IP Cores. Model-based Design for Heterogeneous FPGA: Dataflow Modeling and Rapid Implementation for FPGA DSP Systems, Rapid Synthesis and Optimization of Embedded Software from DFGs, System-level Modeling for Heterogeneous Embedded



DSP Systems, System level Design and Exploration of Dedicated Hardware Network, Adaptive Beam former Example, Low Power FPGA Implementation.

**TEXT BOOKS:**

1. Roger Woods, John McAllister, Gaye Light body, Ying Yi, FPGA-based Implementation of Signal Processing Systems, Wiley, 2008.
2. John V. Old Field, Richrad C. Dorf, Field Programmable Gate Arrays, Wiley, 2008.
3. Michel John Sebastian Smith, Application Specific Integrated Circuits, Addison Wesley Professional, 2008.
4. Stephen D. Brown, Robert J. Francis, Jonathan Rose, Zvonko G. Vranesic, Field Programmable Gate Arrays, 2nd Edition, Springer, 1992.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-ISem. (ECE)**

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**15A04708    DIGITAL IMAGE PROCESSING  
(CBCC-III)**
**OBJECTIVES:**

- To know the fundamentals of Image Processing
- To know about various techniques of image enhancement, reconstruction and image compression.

**Course Outcomes:**

- Able to apply the Image processing concept for various fields of engineering and real life process as per needs & specifications.
- Get the skills to Heuristically develop new techniques to process images of any context
- Can experiment, analyze & interpret imagedata /processing data.

**UNIT-I**

Introduction to Digital Image processing – Example fields of its usage- Image sensing and Acquisition – image Modeling - Sampling, Quantization and Digital Image representation - Basic relationships between pixels, - Mathematical tools/ operations applied on images - imaging geometry.

**UNIT-II**

2D Orthogonal and Unitary Transforms and their properties - Fast Algorithms - Discrete Fourier Transform - Discrete Cosine Transforms- Walsh- Hadamard Transforms- Hotelling Transforms , Comparison of properties of the above.

**UNIT-III**

Background enhancement by point processing Histogram processing, Spatial filtering, Enhancement in frequency Domain, Image smoothing, Image sharpening, Colour image Enhancement

**UNIT-IV**

Degradation model, Algebraic approach to restoration – Inverse filtering – Least Mean Square filters, Constrained Least square restoration, Blind Deconvolution.  
Image segmentation: Edge detection -, Edge linking , Threshold based segmentation methods – Region based Approaches - Template matching –use of motion in segmentation

**UNIT-V**

Redundancies in Images - Compression models, Information theoretic perspective- Fundamental coding theorem. Huffman Coding, Arithmetic coding, Bit plane coding, Run length coding, Transform coding, Image Formats and compression standards.

**Text Books:**

1. R.C .Gonzalez & R.E. Woods, "Digital Image Processing", Addison Wesley/Pearson education, 3rd Edition, 2010.
2. A .K. Jain, "Fundamentals of Digital Image processing", PHI.

**References:**

1. Rafael C. Gonzalez, Richard E woods and Steven L.Eddins, "Digital Image processing using MATLAB", Tata McGraw Hill, 2010.
2. S jayaraman, S Esakkirajan, T Veerakumar, "Digital Image processing",Tata McGraw Hill
3. William K. Pratt, "Digital Image Processing", John Wiley, 3rd Edition, 2004.

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**B. Tech IV-ISem. (ECE)**

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**15A04709 CELLULAR & MOBILE COMMUNICATION  
(CBCC-III)**
**OBJECTIVES:**

- To enable the student to synthesis and analyze wireless and mobile cellular communication systems over a stochastic fading channel.
- To provide the student with an understanding of advanced multiple access techniques.
- To provide the student with an understanding of diversity reception techniques.
- To give the student an understanding of digital cellular systems (GSM, CDMA One, GPRS, CDMA 2000, and W-CDMA).

**Course Outcomes:**

By the end of this course, the student will be able to analyze and design wireless and mobile cellular systems.

- The student will be able to understand impairments due to multipath fading channel.
- Understand the fundamental techniques to overcome the different fading effects.
- To understand Co-channel and Non Co-channel interferences.
- Able to familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.
- Understanding of frequency management, channel assignment and types of handoff.

**UNIT I**

**CELLULAR MOBILE RADIO SYSTEMS:** Introduction to Cellular Mobile system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, Hexagonal shaped cells, Analog and Digital Cellular systems.

**ELEMENTS OF CELLULAR RADIO SYSTEM DESIGN:** General description of the problem, concept of frequency channels, Co-channel Interference Reduction Factor, desired C/I from a normal case in a Omni directional Antenna system, Cell splitting, consideration of the components of cellular system.

**UNIT II**

**INTERFERENCE:** Introduction to Co-channel interference, real time co-channel interference, Co-channel measurement, design of Antenna system, Antenna parameters and their effects, diversity receiver, non-co-channel interference-different types.

### **UNIT III**

**CELL COVERAGE FOR SIGNAL AND TRAFFIC:**Signal reflections in flat and hilly terrain, effect of human made structures, phase difference between direct and reflected paths, constant standard deviation, straight line path loss slope, general formula for mobile propagation over water and flat open area, near and long distance propagation antenna height gain, form of a point to point model.

### **UNIT IV**

**CELL SITE AND MOBILE ANTENNAS:**Sum and difference patterns and their synthesis, Omni directional antennas, directional antennas for interference reduction, space diversity antennas, umbrella pattern antennas, minimum separation of cell site antennas, high gain antennas.

**FREQUENCY MANAGEMENT AND CHANNEL ASSIGNMENT:**Numbering and grouping, setup access and paging channels channel assignments to cell sites and mobile units, channel sharing and borrowing, sectorization, overlaid cells, non-fixed channel assignment.

### **UNIT V**

**HANDOFF:**Handoff, dropped calls and cell splitting, types of handoff, handoff invitation, delaying handoff, forced handoff, mobile assigned handoff. Intersystem handoff, cell splitting, micro cells, vehicle locating methods, dropped call rates and their evaluation.

**DIGITAL CELLULAR NETWORKS:** GSM architecture, GSM channels, multiplex access scheme, TDMA, CDMA.

#### **TEXT BOOKS:**

1. Mobile cellular telecommunications-W .C. Y. Lee, Tata Mc-Graw Hill, 2<sup>nd</sup> Edition, 2006.
2. Wireless communications-Theodore. S. Rapport, Pearson Education, 2<sup>nd</sup> Edn., 2002.

#### **REFERENCES:**

1. Principles of Mobile communications-Gordon L. Stuber, Springer International 2<sup>nd</sup> Edition, 2007.
2. Wireless and Mobile Communications-Lee McGraw Hills, 3<sup>rd</sup> Edition, 2006.
3. Wireless communications and Networking-Jon W.Mark and WeihuaZhqung, PHI, 2005.
4. Wireless communication Technology-R.Blake, Thompson Asia Pvt.Ltd., 2004.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-ISem. (ECE)**

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**15A04710 REAL TIME SYSTEMS  
(CBCC-III)**
**Course Outcomes****After completion of the course students able to**

- Know about the basic concepts of embedded systems
- Understand the different architectural features of embedded systems
- Understand the goal embedded systems in real time design applications

**UNIT-I****Introduction to Real Time System**

Introduction to Real time Embedded System, need for a real-time system, different kinds (reactive, time driven, deadline driven, etc..) Embedded system Design cycle, Types of Real Time systems, Real Time Applications and features, Issues in real time computing, aspects of real-time systems (timeliness, responsiveness, concurrency, predictability, correctness, robustness, fault tolerance and safety, resource limitations, RTOS necessity), real-time requirement specifications, modelling/verifying design tools (UML, state charts, etc..).

**UNIT-II****Embedded Hardware for Real Time System**

Selection criteria for Real time system - Hardware and Software perspective, need for partitioning, criteria for partitioning (performance, criticality, development ease, robustness, fault tolerance and safety, resource limitations, etc..), System Considerations, Basic development environment-host vs target concept, CPU features, Architecture, I/O Ports, on-chip peripherals, Memory, Real time implementation considerations, bus architecture, Introduction to Interrupts, Interrupt vector table, interrupt programming, Pipeline and Parallelism concepts.

Case study of C2000 architecture, Real time applications by interfacing C2000 with sensors and actuators (example: Motor Control, Digital Power, and Power Line Communication)

**UNIT III****Embedded Hardware – On chip Peripherals and Communication protocols –**

Role of peripherals for Real time systems, On-Chip peripherals & hardware accelerators, Peripherals [Direct Memory Access, Timers, Analog to Digital Conversion (ADC), DAC, Comparator, Pulse Width Modulation (PWM)], Need of real time

Communication, Communication Requirements, Timeliness, Dependability, Design Issues, Overview of Real time communication, Real time Communication Peripherals – I2C, SPI & UART

Case study - Illustration of configuring and interfacing the peripherals (timers, ADC, DAC, and PWM) and Real time communication protocols (I2C, SPI & UART) using C2000 platforms

## **UNIT IV**

### **Embedded Software and RTOS**

Software Architecture of real time System, Introduction to RTOS, role of RTOS, foreground Back ground system, pros and cons, Real time kernel, qualities of good RTOS, Functionalities of RTOS – Task Management, I/O management, Memory management, Inter Task Communication, Tasks, Task states, Task control block, attributes of TCB, Context switching, Interrupts handling, Multiprocessing and multitasking

Case study examples for demonstrating task management functionalities (ex: Task switching, task deleting, task suspending and resuming, managing priority and etc.,) using TI RTOS on C2000 platforms.

## **UNIT-V**

### **Scheduling, Synchronization and Inter task communication in Real Time Systems**

Basic Concepts for Real-Time Task Scheduling, Scheduling criteria, Overview of Scheduling policies, Task Synchronization – Need of synchronization, shared data problems and its ways of handling, Role of Semaphore, types of semaphores, semaphore functions, Inter task communication – Need of communication, Message Mailbox and Message Queues, RTOS problems - Priority inversion phenomenon, Deadlock phenomenon and steps to handle them.

Case study examples to demonstrate concepts of task synchronization (Semaphore) and Inter task communication (Mailbox and Message queues), using TI RTOS for C2000 platforms

## **TEXT BOOKS**

1. Real-Time Systems by Jane W. S. Liu Prentice Hall; 1 edition ISBN: 978-0130996510
2. Krishna .C.M “Real Time Systems” Mc-Graw Hill Publication.
3. Hamid A. Toliyat and Steven G. Campbell, “DSP based Electromechanical Motion Control” CRC Press, 2003, ISBN 9780849319181.
4. Jean J Labrosse, “Embedded System Design blocks”, CMP books, Second Edition, ISBN 0-87930-604-1

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5. John H Davies, "MSP430 Microcontroller Basics" Newnes, 2<sup>nd</sup> edition, ISBN-13: 978-0750682763

## **REFERENCES**

1. TMS320C28x CPU and Instruction Set Reference Guide, TI Literature Number: SPRU 430E, Revised January 2009
2. TMS320x28xx, 28xxx DSP Peripheral Reference Guide, TI Literature Number: SPRU566J, Revised April 2011
3. C2000 Teaching CD ROM from Texas Instruments
4. Intro to the TI-RTOS Kernel Workshop Lab Manual, by Texas Instruments, Rev 2.3 – December 2014
5. [http://processors.wiki.ti.com/index.php/C2000\\_32-bit\\_Real-Time\\_MCU\\_Training](http://processors.wiki.ti.com/index.php/C2000_32-bit_Real-Time_MCU_Training)



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**B. Tech IV-ISem. (ECE)**

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**15A04711 MICROWAVE & OPTICAL COMMUNICATIONS LABORATORY****Course Outcomes:**

- Capable of Applying microwave Concepts/ Microwave components and test them .
- Able to design and analyse an optical fiber communications link

**Microwave Lab (PART – A) --- Any Seven (7) Experiments**

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Impedance Measurement.
7. Frequency and Wavelength measurements using slotted section.
8. Impedance Matching and Tuning
9. Scattering parameters of Magic Tee.
10. Radiation Pattern Measurement of horn Antennas (at least two antennas).

**Optical Fiber Lab (PART – B) --- Any five (5) Experiments**

1. Characterization of LED.
2. Characterization of Laser Diode.
3. Intensity modulation of Laser output through an optical fiber.
4. Measurement of Data rate for Digital Optical link.
5. Measurement of Numerical Aperture of the given fiber.
6. Measurement of losses for Analog Optical link.

**Equipment required for Laboratories:**

1. Regulated Klystron Power Supply 6 nos.
2. VSWR Meter 6 nos.
3. Milli/Micro Ammeters 10 nos.
4. Multi meters 10 nos.
5. CROs 8 nos.
6. GUNN Power Supply, Pin Moderator 4 nos.
7. Relevant Microwave components --
8. Fiber Optic Analog Trainer based LED 3 nos.
9. Fiber Optic Analog Trainer based laser 2 nos.
10. Fiber Optic Digital Trainer 1 no.
11. Fiber cables - (Plastic, Glass)

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**B. Tech IV-ISem. (ECE)**

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**15A04712 VLSI & EMBEDDED SYSTEMS LABORATORY**

**Note:** The students are required to perform any **Six** Experiments from each Part of the following.

**Part-A: VLSI Lab****Course Objective:**

- To design and draw the internal structure of the various digital integrated circuits
- To develop VHDL/Verilog HDL source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.
- To verify the logical operations of the digital ICs (Hardware) in the laboratory.

**Course Outcome:**

After completion of the course the students will be able to

- Design and draw the internal structure of the various digital integrated circuits
- Develop VHDL/Verilog HDL source code, perform simulation using relevant simulator and analyze the obtained simulation results using necessary synthesizer.
- Verify the logical operations of the digital IC's (Hardware) in the laboratory

**Note:** For the following list of experiments students are required to do the following.

- Target Device Specifications
- Simulation
- Synthesize the design
- Generate RTL Schematic.
- Generate Technology Map.
- Generate Synthesis report.
- Design Summary.

**List of Experiments:****Note: Use VHDL/ Verilog HDL**

1. Realization of Logic Gates.
2. 3- to - 8Decoder- 74138.
3. 8 x 1 Multiplexer-74151 and 2 x 4 De-multiplexer-74155.
4. 4-Bit Comparator-7485.

5. D Flip-Flop-7474.
6. Decade counter-7490.
7. Shift registers-7495.
8. ALU Design.

**Part B : Embedded C Experiments using TM4C processor:**

1. Learn and understand how to configure EK-TM4C123GXL Launchpad digital I/O pins. Write a C program for configuration of GPIO ports for Input and output operation (blinking LEDs, push buttons interface).

**Exercises:**

- a) Modify the code to make the red LED of EK-TM4C123GXL Launchpad blink.
  - b) Modify the code to make the green and red LEDs blink:
    - I. Together
    - II. Alternately
  - c) Alter the code to turn the LED ON when the button is pressed and OFF when it is released.
  - d) Modify the delay with which the LED blinks.
  - e) Alter the code to make the green LED stay ON for around 1 second every time the button is pressed.
  - f) Alter the code to turn the red LED ON when the button is pressed and the green LED ON when the button is released.
2. Learn and understand Timer based interrupt programming. Write a C program for EK-TM4C123GXL Launchpad and associated Timer ISR to toggle onboard LED using interrupt programming technique.

**Exercises:**

- a) Modify the code for a different timer toggling frequency.
  - b) Write the code to turn on interrupt globally.
3. Configure hibernation module of the TM4C123GH6PM microcontroller to place the device in low power state and then to wake up the device on RTC (Real- Time Clock) interrupt.

**Exercises:**

- a) Write a program to configure hibernation mode and wake up the EK-TM4C123GXL Launchpad when onboard switch SW2 is pressed.
4. Configure in-build ADC of TM4C123GH6PM microcontroller and interface potentiometer with EK-TM4C123GXL Launchpad to observe corresponding 12- bit digital value.

**Exercises:**

- a) Tabulate ten different position of the Potentiometer and note down the Digital value and calculate the equivalent analog value.

- b) Use the ADC to obtain the analog value from the internal temperature sensor.
  - c) Configure Dual ADC modules to read from 2 analog input (could be from 2 potentiometers)
  - d) What are the trigger control mechanism for this ADC?
  - e) What does the resolution refer on ADC Specification?
  - f) The current sampling method is single ended sampling. This ADC could also be configured to do differential sampling.  
What is the difference between the two methods of sampling?
5. Learn and understand the generation of Pulse Width Module (PWM) signal by configuring and programming the in-build PWM module of TM4C123GH6PM microcontroller.

**Exercises:**

- a) Change the software to output a set Duty Cycle, which can be user programmed.
  - b) Change the frequency of the PWM Output from 6.25 KHz to 10 KHz and do the tabulation again.
  - c) Generate Complementary signals, route it to two pins, and observe the waveforms.
  - d) What is dead band generation mean and where is it applied?
  - e) Is it possible to construct a DAC from a PWM? Identify the additional components and connection diagram for the same.
  - f) Sketch the gate control sequence of 3 phase Inverter Bridge and how many PWM generator blocks are required? Can we generate this from TIVA Launchpad?
6. Configure the PWM and ADC modules of TM4C123GH6PM microcontroller to control the speed of a DC motor with a PWM signal based on the potentiometer output.

**Exercises:**

- a) With the same ADC input configure 2 PWM generator modules with 2 different frequencies.
  - b) Read the Internal temperature sensor and control a DC Motor that could be deployed in fan Controller by observing the unit or ambient temperature.
  - c) What is the resolution of the PWM in this experiment?
  - d) What would be the maximum frequency that can be generated from the PWM generator?
  - e) Briefly explain an integrated application of ADC and PWM based control.
7. Learn and understand to connect EK-TM4C123GXL Launchpad to PC terminal and send an echo of the data input back to the PC using UART.

**Exercises:**

- a) Change the baud rate to 19200 and repeat the experiment.
  - b) What is the maximum baud rate that can be set in the UART peripheral of TIVA?
  - c) Modify the software to display “Switch pressed” by pressing a user input switch on the Launchpad.
8. Learn and understand interfacing of accelerometer in Sensor Hub Booster pack with EK-TM4C123GXL Launchpad using I2C.

**Exercises:**

- a) Make a LED ON when the acceleration value in the x axis crosses a certain limit, say +5.
  - b) What is the precaution taken in this experiment in order to avoid the overflow of UART buffer?
  - c) Change the value of PRINT\_SKIP\_COUNT to 100 and see the difference in the output.
  - d) Change MPU9150\_ACCEL\_CONFIG\_AFS\_SEL\_2G to MPU9150\_ACCEL\_CONFIG\_AFS\_SEL\_4G on line 461 of the same source file and Observe the difference.
9. USB bulk transfer mode:  
Learn and understand to transfer data using bulk transfer mode with the USB2.0 peripheral of the TM4C123GH6PM device.

**Exercises:**

- a) What are the different modes offered by USB 2.0?
  - b) What are the typical devices that use Bulk transfer mode?
10. Learn and understand to find the angle and hypotenuse of a right angle triangle using IQmath library of TivaWare.

**Exercises:**

- a) Change the base and adjacent values in the program to other values, build the program and observe the values in the watch window.
  - b) Open IQmathLib.h and browse through the available functions. What function is to be used if the IQ number used in the program is to be converted to a string?
11. Learn and understand interfacing of CC3100 WiFi module with EK-TM4C123GXL Launchpad and configuration of static IP address for CC3100 booster pack.

**Exercises:**

- a) Try pinging the same IP address before connecting to the Access Point (AP) and note down the observation.
  - b) What is the difference between static IP address and dynamic IP address?
12. Configure CC3100 Booster Pack connected to EK-TM4C123GXL Launchpad as a Wireless Local Area Network (WLAN) Station to send Email over SMTP.

**Exercises:**

- a) In the terminal output window, we have received a debug message "Pinging...!". Search in the code and change the message to "Pinging the website". Repeat the experiment to observe this change in the Serial Window.
  - b) In line no:62 of main. C replace [www.ti.com](http://www.ti.com) with any non-existing web address and repeat the experiment and observe what happens
  - c) In line no: 62 of main. C replace again with [www.ti.com](http://www.ti.com) and repeat the experiment.
  - d) Identify the code that helps in establishing connection over SMTP. Modify the code to trigger E-mail application based upon external analog input.
  - e) How to configure the AP WLAN parameters and network parameters (IP addresses and DHCP parameters) using CC3100 API.
13. Configure CC3100 Booster Pack connected to EK-TM4C123GXL Launchpad as a HTTP server.

**Exercises:**

- a) Where are the webpages stored in the CC3100?
- b) What happens if we try to access a webpage, which is not there inside the CC3100?
- c) List 3 applications with a 3 to 4-line brief description that you think can be performed with this experimental setup.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech IV-II Sem. (ECE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>15A04801    ADVANCED DIGITAL SIGNAL PROCESSING-MULTIRATE &amp; WAVELET (MOOCS-II)</b>				

**Course Objectives:**

- To study about the digital signal processing algorithms and multi rate signal processing
- To study about the power spectral estimation by using Barlett, Welch & Blackmann & Tukey methods.
- The study about the effects of finite word length in fixed-point dsp systems.

**Course Outcomes:**

After completion of the course students will be able to

- Get complete knowledge regarding various algorithms associated with Digital signal processing and multi rate signal processing.
- Verify the power spectral estimation by using Barlett, Welch & Blackmann & Tukey methods.
- Understand the effects of finite word length in fixed-point DSP systems by using ADC and FFT algorithms

**UNIT – I**

A Beginning with some practical situations, which call for multi-resolution/ multi-scale analysis - and how time-frequency analysis and wavelets arise from them. Examples: Image Compression, Wideband Correlation Processing, Magnetic Resonance Imaging, Digital Communication Piecewise constant approximation - the Haar wavelet, Building up the concept of dyadic Multi-resolution Analysis (MRA), Relating dyadic MRA to filter banks.

**UNIT – II**

A review of discrete signal processing, Elements of multi-rate systems and two-band filter bank design for dyadic wavelets. Families of wavelets: Orthogonal and bi-orthogonal wavelets, Daubechies' family of wavelets in detail, Vanishing moments and

regularity, Conjugate Quadrature Filter Banks (CQF) and their design, Dyadic MRA more formally, Data compression - fingerprint compression standards, JPEG-2000 standards.

### **UNIT – III**

The Uncertainty Principle: and its implications: the fundamental issue in this subject - the problem and the challenge that Nature imposes. The importances of the Gaussian function: the Gabor Transform and its generalization; time, frequency and scale - their interplay, The Continuous Wavelet Transform (CWT), Condition of admissibility and its implications. Application of the CWT in wideband correlation processing.

### **UNIT – IV**

Journey from the CWT to the DWT: Discretization in steps, Discretization of scale - generalized filter bank, Discretization of translation - generalized output sampling, Discretization of time/ space (independent variable) - sampled inputs, Going from piecewise linear to piecewise polynomial, The class of spline wavelets - a case for infinite impulse response (IIR) filter banks, Variants of the wavelet transform and its implementation structures, the wave packet transform, Computational efficiency in realizing filter banks - Polyphase components, The lattice structure, The lifting scheme.

### **UNIT – V**

An exploration of applications (this will be a joint effort between the instructor and the class). Examples: Transient analysis; singularity detection; Biomedical signal processing applications; Geophysical signal analysis applications; Efficient signal design and realization: wavelet based modulation and demodulation; Applications in mathematical approximation; Applications to the solution of some differential equations; Applications in computer graphics and computer vision; Relation to the ideas of fractals and fractal phenomena.

#### **Textbooks:**

1. Howard L. Resnikoff, Raymond O. Wells, "Wavelet Analysis: The scalable Structure Information," Springer, 1998 available in India edition.
2. K. P. Soman, K. I. Ramachandran, "Insight Into Wavelets - From Theory to Practice", Prentice Hall of India, Eastern Economy Edition, Prentice Hall of India Private Limited, M-97, Connaught Circus, New Delhi - 110 001, Copyright 2004, ISBN Number 81-203-2650-4.
3. Michael W. Frazier, "An Introduction to Wavelets through Linear Algebra", Springer, ISBN 3-540-780-75-0, c 1999.



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4. P. P. Vaidyanathan, "Multirate Systems and Filter Banks", Pearson Education, Low Price Edition, ISBN 81 – 7758 – 942 – 3.

B. Tech IV-II Sem. (ECE)

L	T	P	C
3	1	0	3

**15A04802 LOW POWER VLSI CIRCUITS AND SYSTEMS  
(MOOCS-II)**

**Course Outcomes :**

After completion of this subject, students will be able to

- Understand the concepts of velocity saturation, Impact Ionization and Hot Electron Effect
- Implement Low power design approaches for system level and circuit level measures.
- Design low power adders, multipliers and memories for efficient design of systems.

**UNIT I**

Introduction, Historical background, why low power, sources of power dissipations, low-power design methodologies.

**MOS Transistors:** introduction, the structure of MOS Transistor, the Fluid model, Modes of operation of MOS Transistor, Electrical characteristics of MOS Transistors, MOS Transistors as a switch.

**UNIT II**

**MOS Inverters:** introduction, inverter and its characteristics, configurations, inverter ratio in different situations, switching characteristics, delay parameters, driving parameters, driving large capacitive loads.

**MOS Combinational Circuits:** introduction, Pass-Transistor logic, Gate logic, MOS Dynamic Circuits.

**UNIT III**

**Sources of Power Dissipation:** introduction, short-circuit power dissipation, switching power dissipation, glitching power dissipation, leakage power dissipation.

**Supply voltage scaling for low power:** introduction, device features size scaling, architecture-level approaches, voltage scaling, multilevel voltage scaling, challenges, dynamic voltage and frequency scaling, adaptive voltage scaling.

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**UNIT IV**

**Minimizing Switched Capacitance:** introduction, system-level approaches, transmeta's Crusoe processor, bus encoding, clock gating, gated-clock FSMs, FSM state encoding, FSM Partitioning, operand isolation, precomputation, logic styles for low power.

**UNIT V**

**Minimizing Leakage Power:** introduction, fabrication of multiple threshold voltages, approaches for minimizing leakage power, Adiabatic Logic Circuits, Battery-Driven System, CAD Tools for Low Power VLSI Circuits.

**TEXT BOOKS**

1. Ajit. Pal, Low power VLSI Circuits and systems, springer
2. Sung Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits, Tata Mcgrag Hill.
3. Neil H. E. Weste and K. Eshraghian, Principles of CMOS VLSI Design, 2nd Edition, Addison Wesley (Indian reprint).
4. A. Bellamour, and M. I. Elmasri, Low Power VLSI CMOS Circuit Design, Kluwer Academic Press, 1995.
5. Anantha P. Chandrakasan and Robert W. Brodersen, Low Power Digital CMOS Design, Kluwer Academic Publishers, 1995.

**REFERENCES**

1. Kaushik Roy and Sharat C. Prasad, Low-Power CMOS VLSI Design, Wiley-Interscience, 2000.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A04803 PATTERN RECOGNITION & APPLICATIONS  
(MOOCS-III)**
**UNIT – I**

**Introduction:** Feature extraction and Pattern Representation Concept of Supervised and Unsupervised classification Introduction to Application Areas.

**UNIT – II****Statistical Pattern Recognition**

Bayes Decision Theory, Minimum Error and Minimum Risk Classifiers, Discriminant Function and Decision Boundary Normal Density, Discriminant Function for Discrete Features, Parameter estimation

**UNIT – III****Dimensionality Problem**

Dimension and accuracy, Computational Complexity, Dimensionality Reduction, Fisher Linear Discriminant, Multiple Discriminant Analysis

**Nonparametric Pattern Classification**

Density Estimation, Nearest Neighbour Rule, Fuzzy Classification

**UNIT – IV**

**Linear Discriminant Functions** Separability, Two Category and Multi Category Classification, Linear Discriminators, Perceptron Criterion, Relaxation Procedure, Minimum Square Error Criterion, Widrow-Hoff Procedure, Ho-Kashyap Procedure, Kesler's Construction.

**Neural Network Classifier Single** and Multilayer Perceptron, Back Propagation Learning, Hopfield Network, Fuzzy Neural Network

**UNIT – V****Time Varying Pattern Recognition**

First Order Hidden Markov Model, Evaluation, Decoding, Learning

**Unsupervised Classification**

Clustering, Hierarchical Clustering, Graph Based Method, Sum of Squared Error Technique Iterative Optimization

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**Textbooks:**

1. Richard O. Duda, Peter E. Hart and David G. Stork, "Pattern Classification", JohnWiley& Sons, 2001.
2. Earl Gose, Richard Johsonbaugh and Steve Jost, "Pattern Recognition and Image Analysis", Prentice Hall, 1999.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (ECE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A04804 RF INTEGRATED CIRCUITS  
(MOOCS-III)**
**UNIT – I**

**Introduction RF systems** – basic architectures, Transmission media and reflections, Maximum power transfer, Passive RLC Networks, Parallel RLC tank, Q, Series RLC networks, matching, Pi match, T match, Passive IC Components Interconnects and skin effect, Resistors, capacitors Inductors

**UNIT – II**

**Review of MOS Device Physics** - MOS device review, Distributed Systems, Transmission lines, reflection coefficient, the wave equation, examples, Lossy transmission lines, Smith charts – plotting  $\Gamma$ , High Frequency Amplifier Design, Bandwidth estimation using open-circuit time constants, Bandwidth estimation, using short-circuit time constants, Rise time, delay and bandwidth, Zeros to enhance bandwidth, Shunt-series amplifiers, tuned amplifiers, Cascaded amplifiers

**UNIT - III**

**Noise** - Thermal noise, flicker noise review, Noise figure, LNA Design, Intrinsic MOS noise parameters, Power match versus, noise match, large signal performance, design examples & Multiplier based mixers. Mixer Design, Subsampling mixers.

**UNIT – IV**

**RF Power Amplifiers**, Class A, AB, B, C amplifiers, Class D, E, F amplifiers, RF Power amplifier design examples, Voltage controlled oscillators, Resonators, Negative resistance oscillators, Phase locked loops, Linearized PLL models, Phase detectors, charge pumps, Loop filters, and PLL design examples

**UNIT - V**

Frequency synthesis and oscillators, Frequency division, integer-N synthesis, Fractional frequency, synthesis, Phase noise, General considerations, and Circuit examples, Radio architectures, GSM radio architectures, CDMA, UMTS radio architectures

**Textbooks:**

1. The design of CMOS Radio frequency integrated circuits by Thomas H. Lee  
Cambridge university press, 2004.
2. RF Micro Electronics by Behzad Razavi, Prentice Hall, 1997.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
*(Established by Govt. of A.P., Act. No. 30 of 2008)*  
**ANANTHAPURAMU – 515 002 (A.P.) INDIA.**

**Course Structure for B.Tech-R15 Regulations**

**COMPUTER SCIENCE AND ENGINEERING**

**I B.Tech. - I Semester**

S.N o	Course code	Subject	L	T	P	Drg	C
1.	15A52101	Functional English	3	1	-	-	3
2.	15A54101	Mathematics – I	3	1	-	-	3
3.	15A05101	Computer Programming	3	1	-	-	3
4.	15A56101	Engineering Physics	3	1	-	-	3
5.	15A03101	Engineering Drawing	-	-	-	6	3
6.	15A52102	English Language Communication Skills Lab	-	-	4	-	2
7.	15A56102	Engineering Physics Lab	-	-	4	-	2
8.	15A05102	Computer Programming Lab	-	-	4	-	2
Total			12	4	12	6	21

**I-II Semester**

S.N o	Course code	Subject	L	T	P	C
1.	15A52201	English for Professional Communication	3	1	-	3
2.	15A54201	Mathematics – II	3	1	-	3
3.	15A05201	Data Structures	3	1	-	3
4.	15A51101	Engineering Chemistry	3	1	-	3
5.	15A01101	Environmental Studies	3	1	-	3
6.	15A05202	Data Structures Lab	-	-	4	2
7.	15A51102	Engineering Chemistry Lab	-	-	4	2
8.	15A99201	Engineering & IT Workshop	-	-	4	2
Total			15	5	12	21

\* L - Lecture hours

\*T - Tutorial hours

\*P - Practical hours

\*Drg - Drawing

\*C - Credits



**II B. Tech – I Sem**

<b>S. No</b>	<b>Course Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	15A54301	Mathematics III	3	1	-	3
2	15A05301	Database Management Systems	3	1	-	3
3	15A05302	Discrete Mathematics	3	1	-	3
4	15A99301	Basic Electrical and Electronics Engineering	3	1	-	3
5	15A04306	Digital Logic Design	3	1	-	3
6	15A52301	Managerial Economics and Financial Analysis	3	1	-	3
7	15A05303	Database Management Systems Laboratory	-	-	4	2
8	15A99302	Basic Electrical and Electronics Laboratory	-	-	4	2
		<b>Total</b>	<b>18</b>	<b>06</b>	<b>08</b>	<b>22</b>

**II B. Tech – II Sem**

<b>S. No</b>	<b>Course Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	15A54401	Probability and Statistics	3	1	-	3
2	15A05401	Software Engineering	3	1	-	3
3	15A05402	Computer Organization	3	1	-	3
4	15A04407	Microprocessors & Interfacing	3	1	-	3
5	15A05403	Object Oriented Programming using Java	3	1	-	3
6	15A05404	Formal Languages and Automata Theory	3	1	-	3
7	15A04408	Microprocessors & Interfacing Laboratory	-	-	4	2
8	15A05405	Java Programming Laboratory	-	-	4	2
9	15A05406	Comprehensive Online Examination-I	-	-	-	1
		<b>Total</b>	<b>18</b>	<b>06</b>	<b>08</b>	<b>23</b>

**B.Tech III-I Semester (CSE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A05501	Operating Systems	3	1	-	3
2.	15A05502	Computer Networks	3	1	-	3
3.	15A05503	Object Oriented Analysis and Design	3	1	-	3
4.	15A05504	Principles of Programming Languages	3	1	-	3
5.	15A05505	Software Testing	3	1	-	3
6.	15A05506 15A05507 15A05508	<b>MOOCS-I</b> a. Introduction to Big Data b. R Programming c. Introduction to Operations Management	3	1	-	3
7.	15A05509	Object Oriented Analysis and Design & Software Testing Laboratory	-	-	4	2
8.	15A05510	Operating Systems Laboratory	-	-	4	2
9.	15A99501	Social Values & Ethics (Audit Course)	2	-	2	-
<b>Total</b>			<b>20</b>	<b>06</b>	<b>10</b>	<b>22</b>

**B.Tech III-II Semester (CSE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A05601	Compiler Design	3	1	-	3
2.	15A05602	Data Warehousing & Mining	3	1	-	3
3.	15A05603	Design Patterns	3	1	-	3
4.	15A05604	Design and Analysis of Algorithms	3	1	-	3
5.	15A05605	Web and Internet Technologies	3	1	-	3
6.	15A05606 15A05607 15A05608 15A01608	<b>CBCC-I</b> a. Artificial Intelligence b. Linux Environment System c. System Applications & Product (SAP) d. Intellectual Property Rights	3	1	-	3
7.	15A05609	Web and Internet Technologies Laboratory	-	-	4	2
8.	15A05610	Data Warehousing & Mining Laboratory	-	-	4	2
9.	15A52602	Advanced English Language Communication Skills(AELCS) Laboratory (Audit Course)	-	-	2	-
10.	15A05611	Comprehensive Online Examination-II	-	-	-	1
<b>Total</b>			<b>18</b>	<b>06</b>	<b>10</b>	<b>23</b>

**B.Tech IV-I Semester (CSE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A52601	Management Science	3	1	-	3
2.	15A05701	Grid & Cloud Computing	3	1	-	3
3.	15A05702	Information Security	3	1	-	3
4.	15A05703	Mobile Application Development	3	1	-	3
5.	15A05704 15A05705 15A05706	<b>CBCC-II</b> a. Software Architecture b. Computer Graphics c. Machine Learning	3	1	-	3
6.	15A05707 15A05708 15A05709	<b>CBCC-III</b> a. Software Project Management b. Distributed Systems c. Real Time Systems	3	1	-	3
7.	15A05710	Grid & Cloud Computing Laboratory	-	-	4	2
8.	15A05711	Mobile Application Development Laboratory	-	-	4	2
<b>Total</b>			<b>18</b>	<b>06</b>	<b>08</b>	<b>22</b>

**B.Tech IV-II Semester (CSE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A05801 15A05802 15A05803	<b>MOOCS-II</b> a. Data Analytics b. Mobile Computing c. Innovations and IT Management	3	1	-	3
2.	15A05804 15A05805 15A05806	<b>MOOCS-III</b> a. Building Large Scale Software Systems b. Enabling Technologies for Data Science Analytics : IoT c. Cyber Security	3	1	-	3
3.	15A05807	Comprehensive Viva-Voce	-	-	4	2
4.	15A05808	Technical Seminar	-	-	4	2
5.	15A05809	Project Work	-	-	24	12
<b>Total</b>			<b>6</b>	<b>2</b>	<b>32</b>	<b>22</b>

**Minor Discipline in CSE**

<b>S. No.</b>	<b>Course Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	15A05201	Data Structures	3	1	-	3
2	15A05301	Database Management Systems	3	1	-	3
3	15A05401	Software Engineering	3	1	-	3
4	15A05501	Operating Systems	3	1	-	3
5	15M05101	Minor Discipline Project	-	-	-	8
<b>Total</b>			<b>12</b>	<b>4</b>	<b>-</b>	<b>20</b>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (CSE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A52101) FUNCTIONAL ENGLISH****(Common to All Branches)****Preamble:**

English is an international language as well as a living and vibrant one. People have found that knowledge of English is a passport for better career, better pay, and advanced knowledge and for communication with the entire world. As it is a language of opportunities in this global age, English is bound to expand its domain of use everywhere. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**Objectives:**

- To enable the students to communicate in English for academic and social purpose.
- To enable the students to acquire structure and written expressions required for their profession.
- To develop the listening skills of the students.
- To inculcate the habit of reading and critical thinking skills.
- To enhance the study skills of the students with emphasis on LSRW skills.

**UNIT –I**

**Topics:** Paragraph writing, writing letters, role play, reading graphs, prepositions, designing posters, tenses, making recommendations.

**Text:** ENVIRONMENTAL CONSCIOUSNESS' from *MINDSCAPES*  
Climate Change - Green Cover – Pollution

**UNIT –II**

**Topics:** Compound nouns, imperatives, writing instructions, interpreting charts and pictures, note making, role play, prefixes, subject-verb agreement.

**Text:** EMERGING TECHNOLOGIES from *MINDSCAPES*  
Solar Thermal Power - Cloud Computing - Nanotechnology

**UNIT –III**

**Topics:** Making conversations, homonyms and homophones, SMS and use of emotions, past participle for irregular verbs, group discussion, E - mail communication, antonyms, Preparing projects

**Text:** GLOBAL ISSUES from *MINDSCAPES*  
Child Labour - Food Crisis - Genetic Modification - E-Waste - Assistive Technology

**UNIT –IV**

**Topics:** Group discussion, affixes, double consonants, debates, writing a book / film review, predicting and problem-solving-future tense, adverbs

**Text:** SPACE TREK from *MINDSCAPES*  
Hubble Telescope - Chandrayan-2 - Anusat - Living Quarters - Space Tourism

**UNIT –V**

**Topics:** Compare and contrast, effective writing, group discussion, writing reports, writing advertisements, tweeting and blogging, types of interviews, framing questions.

**Text:** MEDIA MATTERS from *MINDSCAPES*

History of Media - Language and Media - Milestone in Media - Manipulation by Media - Entertainment Media - Interviews

**Text Books:**

1. MINDSCAPES: English for Technologists and Engineers, Orient Blackswan, 2014.

**References:**

1. A Practical Course in Effective English Speaking Skills by J.K.Gangal, PHI Publishers, New Delhi.2012
2. Technical Communication, Meenakshi Raman, Oxford University Press,2011.
3. Spoken English, R.K. Bansal & JB Harrison, Orient Longman,2013, 4<sup>th</sup> edition.
4. Murphy's English Grammar with CD, Murphy, Cambridge University Press,3<sup>rd</sup> edition.
5. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO,2008.

**Outcomes:**

- Have improved communication in listening, speaking, reading and writing skills in general.
- Have developed their oral communication and fluency in group discussions and interviews.
- Have improved awareness of English in science and technology context.
- Have achieved familiarity with a variety of technical reports.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (CSE)**

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**(15A54101) MATHEMATICS – I****(Common to All Branches)****Objectives:**

- To train the students thoroughly in Mathematical concepts of ordinary differential equations and their applications.
- To prepare students for lifelong learning and successful careers using mathematical concepts of differential and Integral calculus, ordinary differential equations and vector calculus.
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate and modeling the problems, to think creatively and to synthesize information.

**UNIT – I**

Exact, linear and Bernoulli equations, Applications to first order equations; Orthogonal trajectories, Simple electric circuits.

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$ ,  $xV(x)$ .

**UNIT – II**

Method of variation of parameters, linear equations with variable coefficients: Euler-Cauchy Equations, Legendre's linear equation. Applications of linear differential equations- Mechanical and Electrical oscillatory circuits and Deflection of Beams.

**UNIT – III**

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature.



**UNIT – IV**

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes in Cartesian and polar coordinates using double and triple integral.

**UNIT – V**

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's, Stoke's and Gauss's Theorems.

**Text Books:**

1. Engineering Mathematics-I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher
2. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.

**References:**

1. Engineering Mathematics Volume-I, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

**Outcomes:**

- The students become familiar with the application of differential and integral calculus, ordinary differential equations and vector calculus to engineering problems.
- The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (CSE)**

L	T	P	C
3	1	0	3

**(15A05101) COMPUTER PROGRAMMING****(Common to All Branches)****Objectives:**

- Understand problem solving techniques
- Understand representation of a solution to a problem
- Understand the syntax and semantics of C programming language
- Understand the significance of Control structures
- Learn the features of C language

**UNIT - I**

Overview of Computers and Programming - Electronic Computers Then and Now - Computer Hardware - Computer Software - Algorithm - Flowcharts - Software Development Method - Applying the Software Development Method.

Types, Operators and Expressions: Variable Names - Data Types and Sizes - Constants - Declarations - Arithmetic Operators - Relational and Logical Operators - Type Conversions - Increment and Decrement Operators - Bitwise Operators - Assignment Operators and Expressions - Conditional Expressions - Precedence and Order of Evaluation.

**UNIT - II**

Selections Statements – Iteration Statements – Jump Statements- Expression Statements - Block Statements.

Single Dimensional Arrays – Generating a Pointer to an Array – Passing Single Dimension Arrays to Functions – Strings – Two Dimensional Arrays – Indexing Pointers – Array Initialization – Variable Length Arrays

**UNIT - III**

Pointer Variables – Pointer Operators - Pointer Expressions – Pointers And Arrays – Multiple Indirection – Initializing Pointers – Pointers to Functions – C's Dynamic Allocation Functions – Problems with Pointers.

Understanding the scope of Functions – Scope Rules – Type Qualifiers – Storage Class Specifiers- Functions Arguments –The Return Statement.

**UNIT - IV**

Command line arguments – Recursion – Function Prototypes – Declaring Variable Length Parameter Lists

Structures – Arrays of Structures – Passing Structures to Functions – Structure Pointers – Arrays and Structures within Structures – Unions – Bit Fields – Enumerations – typedef

**UNIT - V**

Reading and Writing Characters – Reading and Writing Strings – Formatted Console I/O – Printf – Scanf – Standard C Vs Unix File I/O – Streams and Files – File System Basics – Fread and Fwrite – Fseek and Random Access I/O – Fprintf ( ) and Fscanf( ) – The Standard Streams – The Preprocessor Directives #define and #include.

**Text Books:**

1. "The Complete Reference C"- Fourth Edition- Herbert Schildt- McGrawHill Education.
2. "The C Programming Language" Second Edition- Brian W. Kernighan- Dennis M. Ritchie- Prentice Hall-India. (UNIT- I)

**References:**

1. Programming in C, Second Edition – Pradip Dey, Manas Ghosh, Oxford University Press.
2. "C From Theory to Practice"- George S. Tselikis- Nikolaos D. Tselikas- CRC Press.
3. "Programming with C"- R S Bichkar- University Press.

4. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education. (UNIT-I)
5. Computer Fundamentals and C Programming- Second Edition- P.Chenna Reddy- Available at Pothi.com (<http://pothi.com/pothi/book/dr-p-chenna-reddy-computer-fundamentals-and-c-programming>).

**Outcomes:**

- Apply problem solving techniques in designing the solutions for a wide-range of problems
- Choose appropriate control structure depending on the problem to be solved
- Modularize the problem and also solution

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (CSE)**

L	T	P	C
3	1	0	3

**(15A56101) ENGINEERING PHYSICS****(Common to CSE/EEE/CIVIL)****Objectives:**

- To evoke interest on applications of superposition effects like interference and diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric waveguides along with engineering applications.
- To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays and non-destructive evaluation using ultrasonic techniques.
- To get an insight into the microscopic meaning of conductivity , classical and quantum free electron model, the effect of periodic potential on electron motion, evolution of band theory to distinguish materials and to understand electron transport mechanism in solids.
- To open new avenues of knowledge and understanding semiconductor based electronic devices , basic concepts and applications of semiconductors and magnetic materials have been introduced which find potential in the emerging micro device applications.
- To give an impetus on the subtle mechanism of superconductors in terms of conduction of electron pairs using BCS theory, different properties exhibited by them and their fascinating applications. Considering the significance of microminiaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties and applications in emerging technologies are elicited.

**UNIT - I****PHYSICAL OPTICS, LASERS AND FIBRE OPTICS**

*Physical Optics:* Interference (Review) – Interference in thin film by reflection –Newton's rings –Diffraction (Review) - Fraunhofer diffraction due to single slit, double slit and diffraction grating.

*Lasers:* Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients — Population inversion – Excitation mechanism and optical resonator – Nd:YAG laser - He-Ne laser – Semiconductor Diode laser - Applications of lasers

*Fiber optics:* Introduction - construction and working principle of optical fiber –Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in Optical fibers –Block diagram of Optical fiber communication system – Applications of optical fibers

## **UNIT – II**

### **CRYSTALLOGRAPHY AND ULTRASONICS**

*Crystallography:* Introduction – Space lattice –Unit cell – Lattice parameters –Bravias lattice – Crystal systems – Packing fractions of SC, BCC and FCC - Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction - Bragg's law – Powder method.

*Ultrasonics:* Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

## **UNIT – III**

### **QUANTUM MECHANICS AND ELECTRON THEORY**

*Quantum Mechanics:* Matter waves – de/Broglie hypothesis and properties - Schrodinger's time dependent and independent wave equations – Physical significance of wave function - Particle in one dimensional infinite potential well.

*Electron theory:* Classical free electron theory – Equation for electrical conductivity - Quantum free electron theory – Fermi-Dirac distribution – Source of electrical resistance – Kronig-Penny model (qualitative treatment) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

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**UNIT – IV****SEMICONDUCTORS AND MAGNETIC MATERIALS**

*Semiconductors:* Intrinsic and extrinsic semiconductors (Qualitative treatment) – Drift & diffusion currents and Einstein's equation – Hall effect - Direct and indirect band gap semiconductors – Formation of p-n junction.

*Magnetic materials:* Introduction and basic definitions – Origin of magnetic moments – Bohr magneton – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials (Qualitative treatment) – Hysteresis - Soft and hard magnetic materials, applications of magnetic materials.

**UNIT – V****SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS**

*Superconductivity:* Introduction - Effect of magnetic field - Meissner effect – Type I and Type II superconductors – Flux quantization – Penetration depth - BCS theory (qualitative treatment) — Josephson effects –Applications of superconductors.

*Physics of Nanomaterials:* Introduction - Significance of nanoscale and types of nanomaterials – Physical properties: optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials by Top down and bottom up approaches: ball mill, chemical vapour deposition, and sol gel –Applications of nanomaterials.

**Text Books:**

1. Engineering Physics – K.Thyagarajan, 5<sup>th</sup> Edition, MacGraw Hill Publishers, NewDelhi, 2014.
2. Physics for Engineers - N.K Verma, 1<sup>st</sup> Edition, PHI Learning Private Limited, New Delhi, 2014.

**References:**

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, 10<sup>th</sup> Edition, S.Chand and Company, New Delhi, 2014.
2. Engineering Physics – D K Pandey, S. Chaturvedi, 2<sup>nd</sup> Edition, Cengage Learning, New Delhi, 2013.
3. Engineering Physics – D.K Bhattacharya, Poonam Tandon, 1<sup>nd</sup> Edition, Oxford University Press, New Delhi, 2015.

**Outcomes:**

- The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics.
- The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques.
- The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.
- The electronic and magnetic properties of materials were successfully explained by free electron theory and the bases for the band theory are focused.
- The properties and device applications of semiconducting and magnetic materials are illustrated.
- The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (CSE)**

<b>L</b>	<b>T</b>	<b>Drg</b>	<b>C</b>
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**(15A03101) ENGINEERING DRAWING****(Common to CSE/EEE/CIVIL)****Objectives:**

- To gain and understanding of the basics of geometrical constructions of various planes and solids, understanding system of graphical representation of various objects and various views to draft and read the products to be designed and eventually for manufacturing applications.
- To learn about various projections, to understand complete dimensions and details of object.
- Ultimately student must get imaginary skill to put an idea of object, circuit, assembly of parts in black & white, to design a product and to understand the composition, which can be understood universally.

**UNIT I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their Significance- Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice. a) Conic Sections including the Rectangular Hyperbola- General method only, b) Cycloid, Epicycloid and Hypocycloid

**UNIT II**

**Scales:** Plain, Diagonal and Vernier;

**Projection of Points:** Principles of orthographic projection – Convention – First angle projections, projections of points.

**UNIT III**

**Projections of Lines:** lines inclined to one or both planes, Problems on projections, Finding True lengths.

**Projections of Planes:** Projections of regular plane surfaces- plane surfaces inclined to both planes.

#### **UNIT IV**

**Projections of Solids:** Projections of Regular Solids with axis inclined to both planes.

**Developments of Solids:** Development of Surfaces of Right Regular Solids-Prism, Cylinder, Pyramid, Cone.

#### **UNIT V**

**Isometric and Orthographic Projections:** Principles of isometric projection- Isometric Scale- Isometric Views- Conventions- Isometric Views of lines, Planes, Simple solids (cube, cylinder and cone). Isometric projections of spherical parts. Conversion of isometric Views to Orthographic Views.

#### **Text Books:**

1. *Engineering Drawing*, N.D. Bhatt, Charotar Publishers
2. *Engineering Drawing*, K.L. Narayana & P. Kannaih, Scitech Publishers, Chennai

#### **References:**

1. *Engineering Drawing*, Johle, Tata McGraw-Hill Publishers
2. *Engineering Drawing*, Shah and Rana, 2/e, Pearson Education
3. *Engineering Drawing and Graphics*, Venugopal/New age Publishers
4. *Engineering Graphics*, K.C. John, PHI, 2013
5. *Engineering Drawing*, B.V.R. Gupta, J.K. Publishers

**Outcomes:**

- Drawing 2D and 3D diagrams of various objects.
- Learning conventions of Drawing, which is an Universal Language of Engineers.
- Drafting projections of points, planes and solids.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (CSE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**(15A52102) ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB****(Common to All Branches)**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

**Objectives:**

- To enable students to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

**UNIT - 1**

1. Phonetics -importance
2. Introduction to Sounds of Speech
3. Vowels and consonants sounds
4. Phonetic Transcription

**UNIT - II**

5. Word Stress
6. Syllabification
7. Rules of word stress
8. Intonation

**UNIT - III**

9. Situational Dialogues
10. Role Plays
11. JAM
12. Describing people/objects/places

**UNIT - IV**

13. Debates
14. Group Discussions
15. Interview skills

**UNIT - V**

16. Video speech writing
17. Book reviews -oral and written

**Minimum Requirements for ELCS Lab:**

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab: The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.  
System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

**Suggested Software:**

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – part II
3. K-Van Advanced Communication Skills
4. Walden InfoTech Software.

**References:**

1. A Textbook of English Phonetics for Indian Students 2<sup>nd</sup> Ed T. Balasubramanian. (Macmillan),2012.
2. A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd
3. Speaking English Effectively, 2<sup>nd</sup> Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. A Hand book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books,2011
5. Spring Board Succes, Sharada Kouhik, Bindu Bajwa, Orient Blackswan, Hyderabad, 2010.

**Outcomes:**

- Become active participants in the learning process and acquire proficiency in spoken English.
- Speak with clarity and confidence thereby enhance employability skills.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (CSE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**(15A56102) ENGINEERING PHYSICS LABORATORY****(Common to CSE/EEE/CIVIL)****Objectives:**

- Will recognize the important of optical phenomenon like Interference and diffraction.
- Will understand the role of optical fiber parameters and signal losses in communication.
- Will recognize the importance of energy gap in the study of conductivity and hall effect  
in a semiconductor
- Will understand the applications of B H curve.
- Will acquire a practical knowledge of studying the crystal structure in terms of lattice constant.
- Will recognize the application of laser in finding the particle size and its role in diffraction studies.
- Will learn to synthesis of the nanomaterials and recognize its importance by knowing its nano particle size and its impact on its properties.

**Any 10 of the following experiments has to be performed during the I year I semester**

1. Determination of radius of curvature of a Plano-convex lens by forming Newton's rings.
2. Determination of wavelength of given source using diffraction grating in normal incidence method.
3. Determination of Numerical aperture, acceptance angle of an optical fiber.
4. Energy gap of a Semiconductor diode.
5. Hall effect – Determination of mobility of charge carriers.
6. B-H curve – Determination of hysteresis loss for a given magnetic material.
7. Determination of Crystallite size using X-ray pattern (powder) using debye-scheerer method.
8. Determination of particle size by using laser source.
9. Determination of dispersive power of a prism.

10. Determination of thickness of the thin wire using wedge Method.
11. Laser : Diffraction due to single slit
12. Laser : Diffraction due to double slit
13. Laser: Determination of wavelength using diffraction grating
14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
15. Synthesis of nanomaterial by any suitable method.

**References:**

1. Engineering Physics Practicals – NU Age Publishing House, Hyderabad.
2. Engineering Practical physics – Cengage Learning, Delhi.

**Outcomes:**

- Would recognize the important of optical phenomenon like Interference and diffraction.
- Would have acquired the practical application knowledge of optical fiber, semiconductor, dielectric and magnetic materials, crystal structure and lasers by the study of their relative parameters.

Would recognize the significant importance of nanomaterials in various engineering fields.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech I-I Sem. (CSE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**(15A05102) COMPUTER PROGRAMMING LAB****(Common to All branches)****Objectives:**

- Learn C Programming language
- To make the student solve problems, implement algorithms using C language.

**List of Experiments/Tasks**

1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. Study of the Editors, Integrated development environments, and Compilers in chosen platform.
3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.
4. Practice programs: Finding the sum of three numbers, exchange of two numbers, maximum of two numbers, To read and print variable values of all data types of C language, to find the size of all data types, to understand the priority and associativity of operators using expressions, to use different library functions of C language.
5. Write a program to find the roots of a Quadratic equation.
6. Write a program to compute the factorial of a given number.
7. Write a program to check whether the number is prime or not.
8. Write a program to find the series of prime numbers in the given range.
9. Write a program to generate Fibonacci numbers in the given range.
10. Write a program to find the maximum of a set of numbers.
11. Write a program to reverse the digits of a number.
12. Write a program to find the sum of the digits of a number.
13. Write a program to find the sum of positive and negative numbers in a given set of numbers.
14. Write a program to check for number palindrome.
15. Write a program to evaluate the sum of the following series up to 'n' terms  
$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$$
16. Write a program to generate Pascal Triangle.

17. Write a program to read two matrices and print their sum and product in the matrix form.
18. Write a program to read matrix and perform the following operations.
  - i. Find the sum of Diagonal Elements of a matrix.
  - ii. Print Transpose of a matrix.
  - iii. Print sum of even and odd numbers in a given matrix.
19. Write a program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters.
20. Write a program to insert a substring in to a given string and delete few characters from the string. Don't use library functions related to strings.
21. Write a program to perform the operations addition, subtraction, multiplication of complex numbers.
22. Write a program to split a 'file' in to two files, say file1 and file2. Read lines into the 'file' from standard input. File1 should consist of odd numbered lines and file2 should consist of even numbered lines.
23. Write a program to merge two files.
24. Write a program to implement numerical methods Lagrange's interpolation, Trapezoidal rule.
25. Write a program to read a set of strings and sort them in alphabetical order.
26. Write a program to read two strings and perform the following operations without using built-in string Library functions and by using your own implementations of functions.
  - i. String length determination
  - ii. Compare Two Strings
  - iii. Concatenate them, if they are not equal
  - iv. String reversing
27. Write programs using recursion for finding Factorial of a number, GCD, LCM, and solving Towers of Hanoi problem.
28. Write a program to exchange two numbers using pointers.
29. Write a program to read student records into a file. Record consists of rollno, name and marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per JNTUA rules. Write the first class, second class, third class and failed students lists separately to another file.
30. A file consists of information about employee salary with fields employeeid, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employeeid, name, and basic have valid values. HRA is taken as 10% of the basic, DA is taken as 80% of basic, IT is 20% of the basic, other deductions is user specified. Compute the Gross and Net salary of the employee and update the file.
31. Write a program to perform Base (decimal, octal, hexadecimal, etc) conversion.

32. Write a program to find the square root of a number without using built-in library function.
33. Write a program to convert from string to number.
34. Write a program to implement pseudo random generator.
35. Write a program to generate multiplication tables from 11 to 20.
36. Write a program to express a four digit number in words. For example 1546 should be written as one thousand five hundred and forty six.
37. Write a program to generate a telephone bill. The contents of it and the rate calculation etc should be as per BSNL rules. Student is expected to gather the required information through the BSNL website.
38. Write a program to find the execution time of a program.
39. Design a file format to store a person's name, address, and other information. Write a program to read this file and produce a set of mailing labels

**Note:**

1. Instructors are advised to conduct the lab in LINUX/UNIX environment also
2. The above list consists of only sample programs. Instructors may choose other programs to illustrate certain concepts, wherever is necessary. Programs should be there on all the concepts studied in Theory. Instructors are advised to change atleast 25% of the programs every year until the next syllabus revision.

**References:**

1. "How to Solve it by Computer", R.G. Dromey, Pearson.
2. "The C Programming Language", Brian W. Kernighan, Dennis M. Ritchie, Pearson.
3. "Let us C", Yeswant Kanetkar, BPB publications
4. "Pointers in C", Yeswant Kanetkar, BPB publications.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education.

**Outcomes:**

- Apply problem solving techniques to find solutions to problems
- Able to use C language features effectively and implement solutions using C language.
- Improve logical skills.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-II Sem. (CSE)**

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**(15A52201) ENGLISH FOR PROFESSIONAL COMMUNICATION****1. INTRODUCTION:**

English is a global language and has international appeal and application. It is widely used in a variety of contexts and for varied purposes. The students would find it useful both for social and professional development. There is every need to help the students acquire skills useful to them in their career as well as workplace. They need to write a variety of documents and letters now extending into professional domain that cuts across business and research also. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**2. OBJECTIVES:**

1. To develop confidence in the students to use English in everyday situations.
2. To enable the students to read different discourses so that they appreciate English for science and technologies.
3. To improve familiarity with a variety of technical writings.
4. To enable the students to acquire structure and written expressions required for their profession.
5. To develop the listening skills of the students.

**3. SYLLABUS:****UNIT –I**

**Topics:** Group discussion, cause and effect, events and perspectives, debate, if conditional, essay writing.

**Text: LESSONS FROM THE PAST** from *MINDSCAPES*

Importance of History - Differing Perspectives - Modern Corporatism - Lessons From The Past

## **UNIT-II**

**Topics:** Idioms, essay writing, power point presentation, modals, listening and rewriting, preparing summary, debate, group discussion, role play, writing a book review, conversation

**Text: 'ENERGY'** from *MINDSCAPES*

Renewable and Non-Renewable Sources - Alternative Sources -Conservation -Nuclear Energy

## **UNIT-III**

**Topics:** Vocabulary, impromptu speech, creative writing, direct and indirect speech, fixed expressions, developing creative writing skills, accents, presentation skills, making posters, report writing

**Text: 'ENGINEERING ETHICS'** from *MINDSCAPES*

Challenger Disaster - Biotechnology - Genetic Engineering - Protection From Natural Calamities

## **UNIT-IV**

**Topics:** Vocabulary, Conversation, Collocation, Group discussion, Note-making, Clauses, Interpreting charts and tables , Report writing.

**Text: 'TRAVEL AND TOURISM' from *MINDSCAPES***

Advantages and Disadvantages of Travel - Tourism - Atithi Devo Bhava - Tourism in India

## **UNIT-V**

**Topics:** Vocabulary, phrasal verbs, writing a profile, connectives, discourse markers, problem-solving, telephone skills, application letters, curriculum vitae, interviews (telephone and personal)

**Text: 'GETTING JOB-READY' from *MINDSCAPES***

SWOT Analysis - Companies And Ways Of Powering Growth - Preparing For Interviews

### **Prescribed Text**

***MINDSCAPES***: English for Technologists and Engineers, Orient Blackswan, 2014.

### **REFERENCES:**

1. **Effective Tech Communication**, [Rizvi](#), Tata McGraw-Hill Education, 2007.
2. **Technical Communication**, Meenakshi Raman, Oxford University Press.
3. **English Conversations Practice**, Grant Taylor, Tata Mc GrawHill publications, 2013.
4. **Practical English Grammar**. Thomson and Martinet, OUP, 2010.

### **Expected Outcomes:**

At the end of the course, students would be expected to:

1. Have acquired ability to participate effectively in group discussions.
2. Have developed ability in writing in various contexts.
3. Have acquired a proper level of competence for employability.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-II Sem. (CSE)**

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**(15A54201) MATHEMATICS – II****(Common to All Branches)**

**Objectives:** Our emphasis will be more on conceptual understanding and application of Fourier series, Fourier, Z and Laplace transforms and solution of partial differential equations.

**UNIT – I**

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

**UNIT – II**

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions- Parseval's formula- Complex form of Fourier series.

**UNIT – III**

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

**UNIT – IV**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional

wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

## **UNIT – V**

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

### **TEXT BOOKS:**

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.

### **REFERENCES:**

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
2. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

**Outcomes:**The student gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and partial differential equations.



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech I-II Sem. (CSE)

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## (15A05201) DATA STRUCTURES

(Common to CSE and IT branches of Engineering)

**Objectives:**

- Understand different Data Structures
- Understand Searching and Sorting techniques

**Unit-1**

**Introduction and overview:** Asymptotic Notations, One Dimensional array- Multi Dimensional array- pointer arrays.

**Linked lists:** Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list- Application of linked lists.

**Unit-2**

**Stacks:** Introduction-Definition-Representation of Stack-Operations on Stacks- Applications of Stacks.

**Queues:** Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues. **Tables:** Hash tables.

**Unit-3**

**Trees:** Basic Terminologies- Definition and Concepts- Representations of Binary Tree- Operation on a Binary Tree- Types of Binary Trees-Binary Search Tree, Heap Trees, Height Balanced Trees, B. Trees, Red Black Trees.

**Graphs:** Introduction- Graph terminologies- Representation of graphs- Operations on Graphs- Application of Graph Structures: Shortest path problem- topological sorting.

## **Unit-4**

**Sorting** : Sorting Techniques- Sorting by Insertion: Straight Insertion sort- List insertion sort- Binary insertion sort- Sorting by selection: Straight selection sort- Heap Sort- Sorting by Exchange- Bubble Sort- Shell Sort-Quick Sort-External Sorts: Merging Order Files-Merging Unorder Files- Sorting Process.

## **Unit-5**

**Searching:** List Searches- Sequential Search- Variations on Sequential Searches- Binary Search- Analyzing Search Algorithm- Hashed List Searches- Basic Concepts- Hashing Methods- Collision Resolutions- Open Addressing- Linked List Collision Resolution- Bucket Hashing.

### **Text Books:**

1. "Classic Data Structures", Second Edition by Debasis Samanta, PHI.
2. "Data Structures A Pseudo code Approach with C", Second Edition by Richard F. Gilberg, Behrouz A. Forouzan, Cengage Learning.

### **Reference Books:**

1. Fundamentals of Data Structures in C – Horowitz, Sahni, Anderson-Freed, Universities Press, Second Edition.
2. Schaum' Outlines – Data Structures – Seymour Lipschutz – McGrawHill-Revised First Edition.
3. Data structures and Algorithms using C++, Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-II Sem. (CSE)**

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**(15A51101) ENGINEERING CHEMISTRY****(Common to All Branches)****Objectives:**

- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.
- After the completion of the course, the student would understand the concepts of chemistry and apply to various materials for engineering applications.

**UNIT – I WATER QUALITY AND TREATMENT**

Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ozonisation)

Industrial Use of water:

For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water:

Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.

External Treatment: Ion-Exchange and Permutit processes.

Demineralisation of brackish water: Reverse Osmosis and Electrodialysis

## **UNIT – II POLYMERS**

i) Introduction: Basic concepts of polymerisation, Types of polymerisation (Chain Growth (Addition), Step growth (Condensation)), Mechanism: cationic, anionic, free radical and coordination covalent.

Plastomers: Thermosetting and Thermoplastics, Preparation, properties and Engineering applications of PVC, Teflon, Bakelite and nylons.

Elastomers

Natural Rubber; Processing of natural rubbers, Compounding of Rubber

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, Buna-N, Polyurethane, Polysulfide (Thiokol) rubbers

ii) Conducting polymers: Mechanism, synthesis and applications of polyacetylene, polyaniline.

iii) Inorganic Polymers: Basic Introduction, Silicones, Polyphosphazenes ( $-(R)_2P=N-$ ) applications

## **UNIT – III ELECTROCHEMISTRY**

i) Galvanic cells, Nernst Equation, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries), Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen, Solid oxide)

ii) Corrosion: Introduction, type of corrosion (Concentration cell corrosion, Galvanic corrosion), Chemical (Dry) and Electrochemical (Wet) Theory of corrosion. Galvanic series, factors affecting the corrosion (Metal and environment). Prevention: Cathodic protection (Sacrificial anode and impressed current), Inhibitors (Anodic and cathodic), electroplating (Copper, nickel and chromium) and electroless plating (Copper and nickel)

## **UNIT – IV FUELS AND COMBUSTION**

Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems.

Solid Fuels: Coal-Classification and Analysis (proximate and ultimate), Coke :Characteristics of metallurgical coke, Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

Liquid Fuels:

Petroleum: Refining of Petroleum, Gasoline- Octane Number, Diesel -Cetane Number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

Gaseous Fuels: Natural gas, Producer gas, Water gas, Coal gas and Biogas. Determination calorific value of Gases fuels by Junker's calorimeter.

Combustion: Basic principles and numerical problems, Flue Gas analysis by Orsat's apparatus.

## **UNIT – V CHEMISTRY OF ENGINEERING MATERIALS**

i) Cement: Composition, Classification, preparation (Dry and Wet processes), Setting and Hardening (Hydration and Hydrolysis)

ii) Refractories: Introduction, Classification , properties and applications

iii) Lubricants: Introduction, classification (Solid, liquid, semi solid, emulsion and synthetic), Theory of lubrication (Thin film, Thick film & Extreme pressure) , properties of lubricants and applications.

iv) Carbon clusters: Fullerenes and Carbon Nano Tubes (CNT)

**Text Books:**

1. Engineering Chemistry, First Edition, Jayaveera KN, Subba Reddy GV and Ramachandraiah C, McGraw Hill Higher Education, New Delhi, 2013.
2. A Text Book of Engineering Chemistry, 15<sup>th</sup> Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013.

**References:**

1. A Text book of Engineering Chemistry, 12<sup>th</sup> Edition, SS Dhara, Uma, S. Chand Publications, New Delhi, 2010.
2. Engineering Chemistry, First edition, K.B. Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited, 2010.
3. Engineering Chemistry, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson Education, 2013.

**Outcomes:** The student is expected to:

- Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.
- Understand the electrochemical sources of energy

Understand industrially based polymers, various engineering materials.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech I-II Sem. (CSE)

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## (15A01101) ENVIRONMENTAL STUDIES

**OBJECTIVE:** To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

**UNIT – I**

**MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:** – Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION** : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### **UNIT – III**

**ENVIRONMENTAL POLLUTION**: Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards



**SOLID WASTE MANAGEMENT :** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

#### **UNIT – IV**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

#### **UNIT – V**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK :** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

**TEXT BOOKS :**

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.

**REFERENCES :**

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

**Outcomes :**

- (1) Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
- (2) Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
- (3) Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
- (4) By studying environmental sciences, students is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.

At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-II Sem. (CSE)**

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**(15A05202) DATA STRUCTURES LAB****(Common to CSE & IT Branches of Engineering)****Course Objectives:**

- To strengthen the ability to identify and apply the suitable data structure for the given real world problem

**Course Outcomes:**

- Apply problem solving techniques to find solutions to problems
- Able to identify the appropriate data structure for a given problem or application.
- Improve logical skills

**List of Experiments/Tasks**

40. Write a program to sort the elements of an array using sorting by exchange.
41. Write a program to sort the elements of an array using Selection Sort.
42. Write a program to implement heap sort.
43. Write a program to perform Linear Search on the elements of a given array.
44. Write a program to perform Binary Search on the elements of a given array.
45. Write a program to convert infix expression to postfix expression and evaluate postfix expression.
46. Write a program to implement stack, queue, circular queue using arrays and linked lists.

47. Write a program to perform the operations creation, insertion, deletion, and traversing a singly linked list.
  48. Write a program to perform the operations creation, insertion, deletion, and traversing a Doubly linked list.
10. Write a program to remove duplicates from ordered and unordered arrays.
11. Write a program to sort numbers using insertion sort.
  12. Write a program to implement quick sort using non-recursive and recursive approaches. Use randomized element as partitioning element.
  13. Write a program to search a word in a given file and display all its positions.
  14. Write a program for tic-tac-toe game.
  15. Write a program to perform operations creation, insertion, deletion and traversing on a binary search tree.
  16. Write a program to implement depth first search and breadth first search on graphs.
  17. Write a program to perform different operations on Red Black trees.
  18. Write a program to implement external sorting.
  19. Write a program to perform different operations of B Tree.

**Note:**

3. Instructors are advised to conduct the lab in LINUX/UNIX environment
4. The above list consists of only sample programs. Instructors may choose other programs to illustrate certain concepts, wherever is necessary. Programs should be there on all the concepts studied in Theory. Instructors are advised to change atleast 25% of the programs every year until the next syllabus revision.

**References:**

6. Fundamentals of Data Structures in C", Horowitz, Sahni, Anderson-freed, Second Edition, Universities Press.
7. Data structures and Algorithms using C++, Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education.

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**(15A51102) ENGINEERING CHEMISTRY LAB  
(Common to All Branches)****Objectives:**

- Will learn practical understanding of the redox reaction
- Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications
- Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology.

**List of Experiments:**

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
5. Determination of Alkalinity of Water
6. Determination of acidity of Water
7. Preparation of Phenol-Formaldehyde (Bakelite)
8. Determination of Viscosity of oils using Redwood Viscometer I
9. Determination of Viscosity of oils using Redwood Viscometer II
10. Determination of calorific value of gaseous fuels by Junker's Calorimeter

11. Conductometric estimation of strong acid using standard sodium hydroxide solution
12. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
13. Potentio metric determination of iron using standard potassium dichromate
14. Colorometric estimation of manganese.
15. pH meter calibration and measurement of pH of water and various other samples.

(Any 10 experiments from the above list)

**References:**

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. Chemistry Practical– Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.

**Outcomes:**

- Would be confident in handling energy storage systems and would be able combat chemical corrosion
- Would have acquired the practical skill to handle the analytical methods with confidence.
- Would feel comfortable to think of design materials with the requisite properties
- Would be in a position to technically address the water related problems.

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**(15A99201) ENGINEERING & I.T. WORKSHOP****ENGINEERING WORKSHOP****Course Objective:**

*The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.*

**1. TRADES FOR EXERCISES:**

- Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
- Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock
- Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 gauge G.I. sheet
- House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
- Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
- Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

## **2. TRADES FOR DEMONSTRATION:**

- a. Plumbing
- b. Machine Shop
- c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

### **References:**

1. *Engineering Work shop practice for JNTU*, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009
2. *Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.*
3. *Engineering Practices Lab Manual*, Jeyapoovan, SaravanaPandian, 4/e Vikas
4. *Dictionary of Mechanical Engineering*, GHF Nayler, Jaico Publishing House.

## **I.T. WORKSHOP**

### **Course Objective:**

- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- To learn about Networking of computers and use Internet facility for Browsing and Searching.

### **Learning Outcome:**

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors
- Prepare Slide presentations using the presentation tool
- Interconnect two or more computers for information sharing



- Access the Internet and Browse it to obtain the required information
- Install single or dual operating systems on computer

### **Preparing your Computer ( 5 weeks)**

**Task 1: Learn about Computer:** Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

**Task 2: Assembling a Computer:** Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

**Task 3: Install Operating system:** Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

**Task 4: Operating system features:** Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

### **Networking and Internet (4 weeks)**

**Task 5: Networking:** Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimping activity, logical configuration etc should be done by the student. The entire process has to be documented.

**Task 6: Browsing Internet:** Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc.

If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

**Task 7: Antivirus:** Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

### **Productivity tools (6 weeks)**

**Task 8: Word Processor:** Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

**Task 9: Spreadsheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

**Task 10: Presentations :** creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

#### **Optional Tasks:**

**Task 11: Laboratory Equipment:** Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material
- Air conditioner
- UPS and Inverter
- RO system

- Electrical Rectifier
- CRO
- Function Generator
- Microwave benches

**Task 12: Software:** Students may submit a report on specifications of various software that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. The software may be proprietary software or Free and Open source software. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop operating system
- Server operating system
- Antivirus software
- MATLAB
- CAD/CAM software
- AUTOCAD

### **References:**

1. Introduction to Computers, Peter Norton, Mc Graw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams", Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs", Bigelows, TMH

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-I Sem. (CSE)**

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**(15A54301) MATHEMATICS-III****(Common to All Branches)****Objectives:**

- This course aims at providing the student with the concepts of Matrices, Numerical Techniques and Curve fitting.

**UNIT – I**

Elementary row transformations-Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations. Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonalization of matrix. Calculation of powers of matrix and inverse of a matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

**UNIT – II**

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout's triangularisation method, Gauss - Seidal iteration method.

**UNIT – III**

**Interpolation:** Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

**UNIT – IV**

Curve fitting: Fitting of a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation for Newton's interpolation formula. Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

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**UNIT – V**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.

**TEXT BOOKS:**

3. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
4. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

**REFERENCES:**

2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
3. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

**Outcomes:** The student will be able to analyze engineering problems using the concepts of Matrices and Numerical methods.

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**(15A05301) DATABASE MANAGEMENT SYSTEMS****Objectives:**

- To understand the basic concepts and the applications of database systems.
- To master the basics of SQL and construct queries using SQL.
- To understand the relational database design principles.
- To become familiar with the basic issues of transaction processing and concurrency control.
- To become familiar with database storage structures and access techniques.

**UNIT-I**

Introduction-Database System Applications, Purpose of Database Systems, View of Data - Data Abstraction, Instances and Schemas, Data Models, Database Languages - DDL, DML, Database Architecture, Database Users and Administrators, History of Database Systems.

Introduction to Database design, ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Conceptual Design for Large enterprises. Relational Model: Introduction to the Relational Model - Integrity Constraints over Relations, Enforcing Integrity constraints, Querying relational data, Logical database Design, Introduction to Views Destroying/ altering Tables and Views.

**UNIT-II**

Relational Algebra and Calculus: Relational Algebra - Selection and Projection, Set operations, Renaming, Joins, Division, Examples of Algebra Queries, Relational calculus - Tuple relational Calculus - Domain relational calculus - Expressive Power of Algebra and calculus.

Form of Basic SQL Query - Examples of Basic SQL Queries, Introduction to Nested Queries, Correlated Nested Queries, Set - Comparison Operators, Aggregate Operators, NULL values - Comparison using Null values - Logical connectives - AND, OR and NOT - Impact on SQL Constructs, Outer Joins, Disallowing NULL values, Complex Integrity Constraints in SQL Triggers and Active Data bases.

**UNIT-III**

Introduction to Schema Refinement - Problems Caused by redundancy, Decompositions - Problem related to decomposition, Functional Dependencies - Reasoning about FDS, Normal Forms - FIRST, SECOND, THIRD Normal forms - BCNF - Properties of Decompositions - Loss less join Decomposition, Dependency preserving Decomposition, Schema Refinement in Data base Design - Multi valued Dependencies - FOURTH Normal Form, Join Dependencies, FIFTH Normal form, Inclusion Dependencies.

#### **UNIT-IV**

Transaction Management - Transaction Concept - Transaction State - Implementation of Atomicity and Durability - Concurrent - Executions - Serializability - Recoverability - Implementation of Isolation - Testing for serializability.

Concurrency Control - Lock - Based Protocols - Timestamp Based Protocols - Validation - Based Protocols - Multiple Granularity.

Recovery System-Failure Classification-Storage Structure-Recovery and Atomicity - Log - Based Recovery - Recovery with Concurrent Transactions - Buffer Management - Failure with loss of nonvolatile storage - Advance Recovery systems - Remote Backup systems.

#### **UNIT-V**

Overview of Storage and Indexing: Data on External Storage, File Organization and Indexing - Clustered Indexes, Primary and Secondary Indexes, Index data Structures - Hash Based Indexing, Tree based Indexing, Comparison of File Organizations.

Tree Structured Indexing: Intuitions for tree indexes, Indexed Sequential Access Methods(ISAM) B+ Trees: A Dynamic Index Structure, Search, Insert, Delete.

Hash Based Indexing: Static Hashing, Extendable hashing, Linear Hashing, Extendible vs. Linear Hashing.

#### **TEXT BOOKS:**

1. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, McGrawHill Education, 3rd Edition, 2003.
2. Data base System Concepts, A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw Hill, VI edition, 2006.



**REFERENCES:**

1. Database Systems, 6th edition, Ramez Elmasri, Shamkat B. Navathe, Pearson Education, 2013.
2. Database Systems Concepts, Peter Rob & Carlos Coronel, Cengage Learning, 2008.
3. Introduction to Database Systems, C.J. Date, Pearson Education.
4. Database Management Systems, G.K. Gupta, McGrawHill Education.

**Outcomes:**

- Demonstrate the basic elements of a relational database management system,
- Ability to identify the data models for relevant problems.
- Ability to design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.
- Apply normalization for the development of application software.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-I Sem. (CSE)**

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**(15A05302) DISCRETE MATHEMATICS****Course Objectives**

- Understand the methods of discrete mathematics such as proofs, counting principles, number theory, logic and set theory.
- Understand the concepts of graph theory, binomial theorem, and generating function in analysis of various computer science applications.

**Course Outcomes**

- Able to apply mathematical concepts and logical reasoning to solve problems in different fields of Computer science and information technology.
- Able to apply the concepts in courses like Computer Organization, DBMS, Analysis of Algorithms, Theoretical Computer Science, Cryptography, Artificial Intelligence

**UNIT I:****Mathematical Logic:**

Introduction, Connectives, Normal Forms, The theory of Inference for the Statement Calculus,  
The Predicate Calculus, Inference Theory of Predicate Calculus.

**UNIT II:****SET Theory:**

Basic concepts of Set Theory, Representation of Discrete structures, Relations and Ordering, Functions, Recursion.

**UNIT III:****Algebraic Structures:**

Algebraic Systems: Examples and General Properties, Semi groups and Monoids, Polish expressions and their compilation, Groups: Definitions and Examples, Subgroups and Homomorphism's, Group Codes.

### **Lattices and Boolean algebra:**

Lattices and Partially Ordered sets, Boolean algebra.

### **UNIT IV:**

#### **An Introduction to Graph Theory:**

Definitions and Examples, Sub graphs, complements, Graph Isomorphism, Vertex Degree: Euler Trails and Circuits, Planar Graphs, Hamilton Paths and Cycles, Graph Coloring and Chromatic Polynomials

#### **Trees:**

Definitions, Properties, Examples, Rooted Trees, Trees and Sorting, Weighted trees and Prefix Codes, Biconnected Components and Articulation Points

### **UNIT V:**

#### **Fundamental Principles of Counting:**

The rules of Sum and Product, Permutations, Combinations: The Binomial Theorem, Combinations with Repetition

#### **The Principle of Inclusion and Exclusion:**

The Principle of Inclusion and Exclusion, Generalizations of Principle, Derangements: Nothing is in Its Right Place, Rook Polynomials, Arrangements with Forbidden Positions

#### **Generating Functions:**

Introductory Examples, Definitions and Examples: Calculation Techniques, Partitions of Integers, The Exponential Generating Functions, The Summation Operator.

### **TEXT BOOKS:**

1. "Discrete Mathematical Structures with Applications to Computer Science", J.P. Tremblay and R. Manohar, Mc Graw Hill Education, 2015.
2. "Discrete and Combinatorial Mathematics, an Applied Introduction", Ralph P. Grimaldi and B.V.Ramana, Pearson, 5<sup>th</sup> Edition, 2016.

### **REFERENCE BOOKS:**

1. Graph Theory with Applications to Engineering by NARSINGH DEO, PHI.

2. Discrete Mathematics by R.K.Bisht and H.S. Dhali, Oxford Higher Education.
3. Discrete Mathematics theory and Applications by D.S.Malik and M.K.Sen, Cenegage Learning.
4. Elements of Discrete Mathematics, A computer Oriented approach by C L Liu and D P Mohapatra, MC GRAW HILL Education.
5. Discrete Mathematics for Computer scientists and Mathematicians by JOE L.Mott, Abraham Kandel and Theodore P.Baker, Pearson ,2<sup>nd</sup> Edition

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-I Sem. (CSE)**

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**(15A99301) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING****PART – A****BASIC ELECTRICAL ENGINEERING****Objective:**

Basic Electrical Engineering contains basic Circuits, Network theorems, two port networks, DC generators & motors, Transformers, Induction motors. The objective is to study their performance aspects.

**UNIT – I Introduction to DC & AC Circuits**

Ohm's Law, R, L, C Components, Kirchhoff's Laws, Types of Sources, Simple problems on Resistive Networks, Series Parallel Circuits, Star Delta and Delta Star Transformation. Sinusoidal waveforms and Basic Definitions, Root Mean Square and average values of sinusoidal Currents and Voltages. Form Factor and Peak Factor.

**Network Theorems:** Thevenin's, Norton's, Maximum Power Transfer and Superposition Theorems for DC Excitations.

**Two Port Networks:** Two Port Network Parameters – Impedance, Admittance, Transmission and Hybrid Parameters and Their Relations.

**UNIT-II DC Machines**

**D.C Generators:** Constructional details of D.C. machines, Principle of Operation of D.C. generators, Types of D.C Generators, E.M.F Equation, O.C.C. of a D.C. Shunt Generator

**D.C Motors:** Principle of Operation of DC Motors, Torque Equation, Losses and Efficiency Calculation, Speed Control of D.C. shunt motor (Armature voltage control and Field flux control), Swinburne's Test and Applications.

**UNIT-III AC Machines**

**1-phase Transformers:** Principle of Operation, Constructional Details, E.M.F. equation, Losses and Efficiency, OC & SC Tests, Regulation of Transformers.

**3-Phase Induction Motors:** Principle of Operation, Slip, Torque (Simple Problems), Slip-Torque characteristics.

**3-phase Alternators:** Principle of Operation-Constructional Details-EMF Equation.

Outcome:

After going through this course the student acquires knowledge on basics of Electrical Circuits, Network theorems, two port networks, DC generators & motors, Transformers, Induction motors and Alternators.

**TEXT BOOKS:**

1. Basic Electrical Engineering, V. N. Mittle and Arvind Mittle, Mc Graw Hill (India) Pvt. Ltd., 2<sup>nd</sup> Edition, 2005.
2. Basic Electrical Engineering, T.K.Nagsarkar and M.S. Sukhija, Oxford University Press, 2<sup>nd</sup> Edition, 2011.

**REFERENCES:**

1. Basic Electrical Engineering, M.S.Naidu and S. Kamakshiah, Tata Mc Graw Hill, 3<sup>rd</sup> Edition, 2009.
2. Electrical and Electronic Technology, Hughes, Pearson Education.

**PART-B****UNIT I**

**Semiconductor Devices:** Intrinsic semiconductors-Electron-Hole Pair Generation, Conduction in Intrinsic Semiconductors, Extrinsic Semiconductors-N-Type and P-Type Semiconductors, Comparison of N-Type and P-Type Semiconductors. The p-n Junction – Drift and Diffusion Currents, The p-n Junction Diode-Forward Bias, Reverse Bias, Volt-Ampere Characteristics- Diode Specifications, Applications of Diode, Diode as a Switch. Diode as a Rectifier-Half-wave Rectifier, Full-Wave Rectifier, Full-Wave Bridge Rectifier, Rectifiers with Filters, Zener Diode- Volt-Ampere Characteristics, Zener Diode as Voltage Regulator.

**UNIT II**

**BJT and FETs:** Bipolar Junction Transistor (BJT) – Types of Transistors, Operation of NPN and PNP Transistors, Input-Output Characteristics of BJT-CB, CE and CC Configurations, Relation between  $I_c$ ,  $I_B$  and  $I_E$ . Transistor Biasing- Fixed Bias, Voltage Divider Bias, Transistor Applications- Transistor as an Amplifier, Transistor as a Switch., Junction Field Effect Transistor (JFET)- Theory and Operation of JFET, Output Characteristics, Transfer Characteristics, Configurations of JFET-CD, CS and CG Configurations, JFET Applications- JFET as an Amplifier, JFET as a Switch, Comparison of BJT and JFET, MOSFET-The Enhancement and Depletion MOSFET, Static Characteristics of MOSFET, Applications of MOSFET.

**UNIT III**

**Oscillators and Op-Amps:** Sinusoidal Oscillators, Barkhausen Criteria for Oscillator Operation, Components of an Oscillator-Transistor Amplifier Circuits, Feedback Circuits and Oscillator Circuits, Classification of Oscillators, LC Tuned, RC Phase Shift Oscillator circuits.

**Operational Amplifiers(Op-Amps)**-Symbol of an Op-Amp, single Input and Dual Input Op-Amps(Differential Amplifier), Characteristics of an Ideal Op-Amp, Basic Forms of Op-Amps-Inverting & Non-Inverting Amplifiers, Applications of Op-Amps, summing, Differential, Integrator, differentiator Amplifier.

TEXT BOOKS:

1. Basic Electrical and Electronics Engineering, M.S.Sukhija, T.K.Nagsarkar, Oxford University Press, 1<sup>st</sup> Edition, 2012.
2. Basic Electrical and Electronics Engineering, S.K Bhattacharya, Pearson Education, 2012.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (CSE)

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## (15A04306) DIGITAL LOGIC DESIGN

## UNIT I

**BINARY SYSTEMS:** Digital Systems, Binary Numbers, Number Base Conversions, Octal and Hexadecimal Numbers, Compliments, Signed Binary Numbers, Binary Codes, Binary Storage and Registers, Binary Logic.

**BOOLEAN ALGEBRA AND LOGIC GATES:** Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

## UNIT II

**GATE – LEVEL MINIMIZATION:** The Map Method, Four Variable Map, Five-Variable Map, Product of Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Other Two Level Implementations, EX-OR Function, Other Minimization Methods

## UNIT III

**COMBINATIONAL LOGIC:** Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers.

## UNIT IV

**SYNCHRONOUS SEQUENTIAL LOGIC:** Sequential Circuits, Latches, Flip-Flops, Analysis of Clocked Sequential Circuits, State Reduction and Assignment, Design Procedure, Registers, Shift Registers, Ripple Counters, Synchronous Counters, Other counters.

## UNIT V

**MEMORY AND PROGRAMMABLE LOGIC:** Random access memory, memory decoding, Error Detection and Correction, Read-only Memory, Programmable Logic Array, Programmable Array Logic.

**DIGITAL LOGIC CIRCUITS:** RTL and DTL Circuits, Transistor-Transistor Logic (TTL), Emitter-Coupled Logic (ECL), MOS, CMOS Logic, Comparisons of Logic Families.

## TEXT BOOKS:

1. Digital Design, M.Morris Mano & Micheal D. Ciletti, Pearson, 5<sup>th</sup> Edition, 2013.
2. Digital Logic & State Machine Design, David J. Comer, Oxford University Press, 3<sup>rd</sup>



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Reprinted Indian Edition, 2012.

**REFERENCES:**

1. Digital Logic Design, R.D. Sudhakar Samuel, Elsevier
2. Fundamentals of Logic Design, 5/e, Roth, Cengage
3. Switching and Finite Automata Theory, 3/e, Kohavi, Jha, Cambridge.
4. Digital Logic Design, Leach, Malvino, Saha, TMH
5. Modern Digital Electronics, R.P. Jain, TMH

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (CSE)

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## (15A52301) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

**Course Objectives:** The objective of this course is to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to impart analytical skills in helping them take sound financial decisions for achieving higher organizational productivity.

**Unit I: INTRODUCTION TO MANAGERIAL ECONOMICS**

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Relationship of Managerial Economics with Financial Accounting and Management. **Demand Analysis:** Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of elasticity of demand - Demand Forecasting- factors governing demand forecasting- methods of demand forecasting.

**UNIT II: THEORY OF PRODUCTION AND COST ANALYSIS**

**Production Function-** Least cost combination- Short-run and Long- run production function- Isoquants and Isocosts, MRTS - Cobb-Douglas production function - Laws of returns - Internal and External economies of scale - **Cost Analysis:** Cost concepts and cost behavior- Break-Even Analysis (BEA) -Determination of Break Even Point (Simple Problems)-Managerial significance and limitations of Break- Even Point.

**UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT**

**Market structures:** Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition- Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization.

#### **UNIT IV: INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS**

Financial Accounting – Concept - Emerging need and Importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

#### **UNIT V: CAPITAL AND CAPITAL BUDGETING**

Concept of Capital - Over and Undercapitalization – Remedial Measures - Sources of Short term and Long term Capital - Estimating Working Capital Requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

**Learning Outcome:** After completion of this course, the student will be able to understand various aspects of Managerial Economics and analysis of financial statements and inputs therein will help them to make sound and effective decisions under different economic environment and market situations.

#### **TEXT BOOKS:**

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1. Managerial Economics 3/e, Ahuja H.L, S.Chand, 2013.
  2. Financial Management, I.M.Pandey, Vikas Publications, 2013.

## **REFERENCES**

1. Managerial Economics and Financial Analysis, 1/e, Aryasri, TMH, 2013.
2. Managerial Economics and Financial Analysis, S.A. Siddiqui and A.S. Siddiqui, New Age International, 2013.

Accounting and Financial Mangement, T.S.Reddy & Y. Hariprasad Reddy, Margham Publishers.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-I Sem. (CSE)	L	T	P	C
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## (15A05303) DATABASE MANAGEMENT SYSTEMS LABORATORY

**Course Objectives:**

- To create a database and query it using SQL, design forms and generate reports.
- Understand the significance of integrity constraints, referential integrity constraints, triggers, assertions.

**Course Outcomes:**

- Design databases
- Retrieve information from data bases
- Use procedures to program the data access and manipulation
- Create user interfaces and generate reports

**List of Experiments:**

1. Practice session: Students should be allowed to choose appropriate DBMS software, install it, configure it and start working on it. Create sample tables, execute some queries, use SQLPLUS features, use PL/SQL features like cursors on sample database. Students should be permitted to practice appropriate User interface creation tool and Report generation tool.
2. A college consists of number of employees working in different departments. In this context, create two tables **employee** and **department**. Employee consists of columns empno, empname, basic, hra, da, deductions, gross, net, date-of-birth. The calculation of hra,da are as per the rules of the college. Initially only empno, empname, basic have valid values. Other values are to be computed and updated later. Department contains deptno, deptname, and

description columns. Deptno is the primary key in department table and referential integrity constraint exists between employee and department tables. Perform the following operations on the the database:

- Create tables department and employee with required constraints.
- Initially only the few columns (essential) are to be added. Add the remaining columns separately by using appropriate SQL command
- Basic column should not be null
- Add constraint that basic should not be less than 5000.
- Calculate hra,da,gross and net by using PL/SQL program.
- Whenever salary is updated and its value becomes less than 5000 a trigger has to be raised preventing the operation.
- The assertions are: hra should not be less than 10% of basic and da should not be less than 50% of basic.
- The percentage of hra and da are to be stored separately.
- When the da becomes more than 100%, a message has to be generated and with user permission da has to be merged with basic.
- Empno should be unique and has to be generated automatically.
- If the employee is going to retire in a particular month, automatically a message has to be generated.
- The default value for date-of-birth is 1 jan, 1970.
- When the employees called daily-wagers are to be added the constraint that salary should be greater than or equal to 5000 should be dropped.
- Display the information of the employees and departments with description of the fields.
- Display the average salary of all the departments.
- Display the average salary department wise.
- Display the maximum salary of each department and also all departments put together.
- Commit the changes whenever required and rollback if necessary.
- Use substitution variables to insert values repeatedly.
- Assume some of the employees have given wrong information about date-of-birth. Update the corresponding tables to change the value.

- Find the employees whose salary is between 5000 and 10000 but not exactly 7500.
- Find the employees whose name contains 'en'.
- Try to delete a particular deptno. What happens if there are employees in it and if there are no employees.
- Create alias for columns and use them in queries.
- List the employees according to ascending order of salary.
- List the employees according to ascending order of salary in each department.
- Use '&&' wherever necessary
- Amount 6000 has to be deducted as CM relief fund in a particular month which has to be accepted as input from the user. Whenever the salary becomes negative it has to be maintained as 1000 and the deduction amount for those employees is reduced appropriately.
- The retirement age is 60 years. Display the retirement day of all the employees.
- If salary of all the employees is increased by 10% every year, what is the salary of all the employees at retirement time.
- Find the employees who are born in leap year.
- Find the employees who are born on feb 29.
- Find the departments where the salary of atleast one employee is more than 20000.
- Find the departments where the salary of all the employees is less than 20000.
- On first January of every year a bonus of 10% has to be given to all the employees. The amount has to be deducted equally in the next 5 months. Write procedures for it.
- As a designer identify the views that may have to be supported and create views.
- As a designer identify the PL/SQL procedures necessary and create them using cursors.

Use appropriate Visual programming tools like oracle forms and reports, visual basic etc to create user interface screens and generate reports.

**Note:** As a designer identify other operations that may be required and add to the above list. The above operations are not in order. Order them appropriately. Use SQL or PL/SQL depending on the requirement.

3. Students may be divided into batches and the following experiments may be given to them to better understand the DBMS concepts. Students should gather the required information, draw ER diagrams, map them to tables, normalize, create tables, triggers, procedures, execute queries, create user interfaces, and generate reports.
  - Student information system
  - APSRTC reservation system
  - Hostel management
  - Library management
  - Indian Railways reservation
  - Super market management
  - Postal system
  - Banking system
  - Courier system
  - Publishing house system

### **References:**

1. "Oracle Database 11g PL/SQL Programming", M.Mc Laughlin,TMH.
2. "Learning Oracle SQL and PL/SQL", Rajeeb C. Chatterjee, PHI.
3. "Introduction to SQL", Rick F.Vander Lans, Pearson education.
4. "Oracle PL/SQL", B.Rosenzweig and E.Silvestrova, Pearson education.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-I Sem. (CSE)**

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**(15A99302) BASIC ELECTRICAL AND ELECTRONICS LABORATORY****PART – A****BASIC ELECTRICAL ENGINEERING LAB****OBJECTIVES:** The student has to learn about:

- Practical verification of Superposition and Thevenin's theorem
- Experimental determination of O.C. and S.C. parameters of two – port network
- Swinburne's Test on DC Shunt Machine and Predetermination of Efficiency of a Given DC Shunt Machine (i) while working as a Motor and (ii) while working as a Generator
- Brake Test on DC Shunt Motor and determination of Performance Characteristics
- OC & SC Tests on Single-Phase Transformer and Predetermination of Efficiency and Regulation at any given load and Power Factor.

**PART- A : ELECTRICAL LAB**

1. Verification of Superposition Theorem.
2. Verification of Thevenin's Theorem.
3. Determination of Open circuit and Short circuit parameters of two – port network.
4. Swinburne's Test on DC Shunt Machine (Predetermination of Efficiency of a Given DC Shunt Machine Working as Motor and Generator).
5. Brake Test on DC Shunt Motor. Determination of Performance Characteristics.
6. OC & SC Tests on Single-Phase Transformer (Predetermination of Efficiency and Regulation at any given load and Power Factor).

**OUTCOMES:** At the end of the course the student should be able to

- Practically verify Superposition and Thevenin's theorem.
- Experimentally determine the O.C. and S.C. parameters of two-port network.
- Conduct Swinburne's Test on DC Shunt Machine and Predetermine the Efficiency of a given DC Shunt Machine (i) while working as a Motor and (ii) while working as a Generator
- Conduct Brake Test on DC Shunt Motor and determine the Performance Characteristics
- Conduct OC & SC Tests on Single-Phase Transformer and Predetermine the Efficiency and Regulation at any given load and Power Factor.

**PART – B****ELECTRONICS LABORATORY  
(Any Six Experiments)**

1. P-N Junction Diode and Zener Diode Volt-Ampere Characteristics.
2. Bipolar Junction Transistor in CB Configuration-Input and Output Characteristics, Computation of  $\alpha$ .
3. Half-Wave Rectifier- a) Without Filter b) With Capacitor Filter.
4. Full-Wave Rectifier- a) Without Filter b) With Capacitor Filter.
5. Bipolar Junction Transistor in CE Configuration-Input and Output Characteristics, Computation of  $\beta$ .
6. Junction field effect Transistor in Common Source Configuration Output and Transfer Characteristics.
7. Verification of Logic Gates- AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-II Sem. (CSE)**

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**(15A54401) PROBABILITY AND STATISTICS****(Common to CSE, IT, Civil, Mech.)**

**Objectives:** To help the students in getting a thorough understanding of the fundamentals of probability and usage of statistical techniques like testing of hypothesis, Statistical Quality Control and Queuing theory

**UNIT – I**

Basic concepts of Probability – Random variables – Expectation – Discrete and continuous Distributions – Distribution functions. Binomial and poisson distributions Normal distribution – Related properties.

**UNIT – II**

Test of Hypothesis: Population and Sample - Confidence interval of mean from Normal distribution - Statistical hypothesis - Null and Alternative hypothesis - Level of significance. Test of significance - Test based on normal distribution - Z test for means and proportions.

**UNIT – III**

Small samples - t- test for one sample and two sample problem and paired t-test, F-test and Chi-square test (testing of goodness of fit and independence).

**UNIT – IV**

Statistical Quality Control: Concept of quality of a manufactured product -Defects and Defectives - Causes of variations - Random and assignable - The principle of Shewhart Control Chart-Charts for attribute and variable quality characteristics- Constructions and operation of  $\bar{X}$  - Chart, R-Chart, p - Chart and C-Chart.

**UNIT – V**

Queuing Theory: Pure Birth and Death process, M/M/1 & M/M/S & their related simple problems.

**TEXT BOOKS:**

1. Probability & Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
2. Probability & Statistics for engineers by Dr. J. Ravichandran WILEY-INDIA publishers.

**REFERENCES:**

1. Probability & Statistics by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.
2. Statistical methods by S.P. Gupta, S.Chand publications.
3. Probability & Statistics for Science and Engineering by G.Shanker Rao, Universities Press.
4. Probability and Statistics for Engineering and Sciences by Jay L.Devore, CENGAGE.
5. Probability and Statistics by R.A. Jhonson and Gupta C.B.

**Outcomes:** The student will be able to analyze the problems of engineering & industry using the techniques of testing of hypothesis, Statistical Quality Control and Queuing theory and draw appropriate inferences.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-II Sem. (CSE)

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## (15A05401) SOFTWARE ENGINEERING

**Course Objectives**

- To understand the software life cycle models.
- To understand the software requirements and SRS document.
- To understand the importance of modeling and modeling languages.
- To design and develop correct and robust software products.
- To understand the quality control and how to ensure good quality software.
- To understand the planning and estimation of software projects.
- To understand the implementation issues, validation and verification procedures.
- To understand the maintenance of software

**Course Outcomes**

- Define and develop a software project from requirement gathering to implementation.
- Ability to code and test the software
- Ability to plan, Estimate and Maintain software systems

**Unit I:**

**Software and Software Engineering:** The Nature of Software, The Unique Nature of WebApps, Software Engineering, The Software Process, Software Engineering Practice, Software Myths

**Process Models:** A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, The Unified Process, Personal and Team Process Models, Process Technology, Product and Process.

**Agile Development:** Agility, Agility and the Cost of Change, Agile Process, Extreme Programming, Other Agile Process Models

**Unit II:**

**Understanding Requirements:** Requirements Engineering, Establishing the groundwork, Eliciting Requirements, Developing Use Cases, Building the requirements model, Negotiating Requirements, Validating Requirements.

**Requirements Modeling (Scenarios, Information and Analysis Classes):** Requirements Analysis, Scenario-Based Modeling, UML Models that Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling.

**Requirements Modeling (Flow, Behavior, Patterns and WEBAPPS):** Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Patterns for Requirements Modeling, Requirements Modeling for WebApps.

**Unit III:**

**Design Concepts:** Design with Context of Software Engineering, The Design Process, Design Concepts, The Design Model.

**Architectural Design:** Software Architecture, Architecture Genres, Architecture Styles, Architectural Design, Assessing Alternative Architectural Designs, Architectural Mapping Using Data Flow.

**Component-Level Design:** Component, Designing Class-Based Components, Conducting Component-level Design, Component Level Design for WebApps, Designing Traditional Components, Component-Based Development.

#### **Unit IV:**

**User Interface Design:** The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, WebApp Interface Design, Design Evaluation.

**WebApp Design:** WebApp Design Quality, Design Goal, A Design Pyramid for WebApps, WebApp Interface Design, Aesthetic Design, Content Design, Architecture Design, Navigation Design, Component-Level Design, Object-Oriented Hypermedia Design Method(OOHMD).

#### **Unit V:**

**Software Testing Strategies:** A strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object-Oriented Software, Test Strategies for WebApps, Validation Testing, System Testing, The Art of Debugging.

**Testing Conventional Applications:** Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, basic Path testing, Control Structure Testing, Black-Box Testing, Model-based Testing, Testing for Specialized Environments, Architectures and Applications, Patterns for Software Testing. Testing Object-Oriented Applications: Broadening the View of Testing, Testing with OOA and OOD Models, Object-Oriented Testing Strategies, Object-Oriented Testing Methods, Testing Methods Applicable at the Class level, Interclass Test-Case Design.

#### **Textbook:**

1. “Software engineering A practitioner's Approach”, Roger S. Pressman, McGraw Hill International Education, Seventh Edition, 2016.

#### **Reference Textbooks:**

1. Fundamentals of Software Engineering, Fourth Edition, Rajib Mall, PHI,
2. Software Engineering, Ninth Edition, IAN Sommerville, Pearson, Ninth edition.
3. Software Engineering, A Precise Approach, Pankaj Jalote, Wiley India, 2010.
4. Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.
5. Software Engineering1: Abstraction and modeling, Diner Bjorner, Springer International edition, 2006.
6. Software Engineering2: Specification of systems and languages, Diner Bjorner, Springer International edition, 2006.
7. Software Engineering Foundations, Yingxu Wang, Auerbach Publications, 2008.



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8. Software Engineering Principles and Practice, Hans Van Vliet, 3<sup>rd</sup> edition, John Wiley & Sons Ltd.
  9. Software Engineering 3: Domains, Requirements, and Software Design, D.Bjorner, Springer International Edition.
  10. Introduction to Software Engineering R.J.Leach, CRC Press

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-II Sem. (CSE)

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## (15A05402) COMPUTER ORGANIZATION

**Course Objectives:**

- To learn the fundamentals of computer organization and its relevance to classical and modern problems of computer design
- To make the students understand the structure and behavior of various functional modules of a computer.
- To understand the techniques that computers use to communicate with I/O devices
- To study the concepts of pipelining and the way it can speed up processing.
- To understand the basic characteristics of multiprocessors

**Course Outcomes:**

- Ability to use memory and I/O devices effectively
- Able to explore the hardware requirements for cache memory and virtual memory
- Ability to design algorithms to exploit pipelining and multiprocessors

**Unit I:**

**Basic Structure of Computer:** Computer Types, Functional Units, Basic operational Concepts, Bus Structure, Software, Performance, Multiprocessors and Multicomputer.

**Machine Instructions and Programs:** Numbers, Arithmetic Operations and Programs, Instructions and Instruction Sequencing, Addressing Modes, Basic Input/output Operations, Stacks and Queues, Subroutines, Additional Instructions.

**Unit II:**

**Arithmetic:** Addition and Subtraction of Signed Numbers, Design and Fast Adders, Multiplication of Positive Numbers, Signed-operand Multiplication, Fast Multiplication, Integer Division, Floating-Point Numbers and Operations.

**Basic Processing Unit:** Fundamental Concepts, Execution of a Complete Instruction, Multiple-Bus Organization, Hardwired Control, Multiprogrammed Control.

**Unit III:**

**The Memory System:** Basic Concepts, Semiconductor RAM Memories, Read-Only Memories, Speed, Size and Cost, Cache Memories, Performance Considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

**Unit IV:**

**Input/output Organization:** Accessing I/O Devices, Interrupts, Processor Examples, Direct Memory Access, Buses, Interface Circuits, Standard I/O Interfaces.

**Unit V:**

**Pipelining:** Basic Concepts, Data Hazards, Instruction Hazards, Influence on Instruction Sets.

**Large Computer Systems:** Forms of Parallel Processing, Array Processors, The Structure of General-Purpose, Interconnection Networks.

**Textbook:**

1) "Computer Organization", Carl Hamacher, Zvonko Vranesic, Safwat Zaky, McGraw Hill Education, 5<sup>th</sup> Edition, 2013.

**Reference Textbooks:**

1. Computer System Architecture, M.Morris Mano, Pearson Education, 3<sup>rd</sup> Edition.
2. Computer Organization and Architecture, Themes and Variations, Alan Clements, CENGAGE Learning.
3. Computer Organization and Architecture, Smruti Ranjan Sarangi, McGraw Hill Education.
4. Computer Architecture and Organization, John P.Hayes, McGraw Hill Education.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-II Sem. (CSE)**

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**(15A04407) MICROPROCESSORS & INTERFACING****Course Objective:**

- *Study the instruction set of 8086 microprocessor and its architecture*
- *Learn assembly language programming using 8086 microprocessor*
- *Interfacing 8051, 8255, 8237, and 8259*

**Learning Outcome:**

- *Program the 8086 microprocessor*
- *Interface the 8086 microprocessor with various devices and program them*

**UNIT I**

Microprocessors-Evolution and Introduction: Microprocessors and Micro Controllers, Microprocessor based system, Origin of Microprocessor, Classification of Microprocessors, Types of Memory, I/O Devices, Technology Improvements Adapted to Microprocessors and Computers, Introduction to 8085 processor, Architecture of 8085, Microprocessor instructions, classification of instructions, Instruction set of 8085.

Intel 8086 Microprocessor architecture, Features, and Signals: Architecture of 8086, Accessing memory locations, PIN details of 8086.

**UNIT II**

Addressing Modes, Instruction Set and Programming of 8086: Addressing modes in 8086, Instruction set of 8086, 8086 Assembly Language Programming, Modular Programming.

**UNIT III**

8086 Interrupts: Interrupt types in 8086, Processing of Interrupts by 8086, Dedicated interrupt types in 8086, Software interrupts-types 00H-FFH, Priority among 8086 interrupts, Interrupt service routines, BIOS interrupts or functional calls, Interrupt handlers, DOS services-INT 21H, System calls-BIOS services.

Memory and I/O Interfacing: Physical memory organization in 8086, Formation of system bus, Interfacing RAM and EPROM chips using only logic gates, Interfacing RAM/ EPROM chips using decoder IC and logic gates, I/O interfacing, Interfacing 8-bit input device with 8086, Interfacing output device using 8086, Interfacing printer with 8086, Interfacing 8-bit and 16-bit I/O devices or ports with 8086, Interfacing CRT terminal with 8086.

**UNIT IV**

Features and Interfacing of programmable devices for 8086 systems: Intel 8255 programmable peripheral interface, Interfacing switches and LEDS, Interfacing seven segment displays, Traffic light control, Interfacing analog to digital converters, Intel Timer IC 8253, Introduction to serial communication, 8259 programmable controller, 8237 DMA controller.

**UNIT V**

Introduction to 8051 Micro controllers: Intel's MCS-51 series micro controllers, Intel 8051 architecture, Memory organization, Internal RAM structure, Power control in 8051, Stack operation.

8051, Hardware features of 8051: Introduction, Parallel ports in 8051, External memory interfacing in 8051, Timers, Interrupts, Serial ports.

Interfacing Examples: Interfacing 8255 with 8051, Interfacing of push button switches and LEDS, Interfacing of seven segment displays.

**Text Books:**

- *“Microprocessor and Interfacing 8086,8051, 8096 and advanced processors”, Senthil Kumar, Saravanan, Jeevanathan, Shah, 1<sup>st</sup> edition, 2<sup>nd</sup> impression, 2012, Oxford University Press.*
- *“The X86 Microprocessors”, Lyla B. Das. , 2010, Pearson.*

**Reference Books:**

1. *“Microprocessor and Interfacing: Programming and Hardware”, Douglas V.Hall, McGrawHill*
2. *“8086 microprocessor: Programming and Interfacing the PC”, Kenneth Ayala, Cengage Learning*
3. *“ARM system-on-chip architecture”, Steve Furber, Addison-Wesley Professional*
4. *“The Intel Microprocessors”, Barry B. Brey, Prentice Hall*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-II Sem. (CSE)**

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**(15A05403) OBJECT ORIENTED PROGRAMMING USING JAVA****Course Objectives:**

- Study the syntax, semantics and features of Java Programming Language
- Learn the method of creating Multi-threaded programs and handle exceptions
- Learn Java features to create GUI applications & perform event handling

**Course Outcomes:**

- Ability to solve problems using object oriented approach and implement them using Java
- Ability to write Efficient programs with multitasking ability and handle exceptions
- Create user friendly interface

**UNIT I:****The History and Evolution of Java:**

Java's Lineage, The Creation of java, how java changed the internet, Java's magic: The byte code, Servlets: java on the server side, java Buzzwords, Evolution of java.

**An Overview of Java:**

Object Oriented Programming, Two control statements, Using blocks of codes, Lexical issues,

The java class Libraries.

**Data Types, Arrays and Variables:**

Primitive Types, Integers, Floating-point Types, Characters, Booleans, literals, variables, Type conversion and casting, Automatic Type Promotion in Expressions, Arrays, strings, Pointers.

**UNIT II:****Operators:**

Arithmetic Operators, The Bitwise Operators, Relational Operators, Boolean Logic operators, The assignment operator, The ? Operator, Operator Precedence, Using Parentheses.

**Control Statements:**

Java's selection Statements, Iteration statements, Jump Statements.

**Introducing Classes:**

Class Fundamentals, Declaring Objects, Assuming Object reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage Collection, The Finalize() method, A

Stack class. Overloading Methods, Using Object as Parameter, Argument Passing, Returning Objects, Recursion, Introducing Access control, Understanding static, Introducing Nested and Inner classes, Exploring the String class, Using Command line Arguments, Varargs: variable-Length Arguments.

**UNIT III:**

**Inheritance:** Basics, Using super, creating a multi level hierarchy, when constructors are executed, method overriding, dynamic method dispatch, using abstract class, using final with inheritance, the object class.

**Packages and Interfaces:**

Packages, Access protection, Importing Packages, Interfaces, Default Interfaces, Default interface methods, Use static methods in an Interface, Final thoughts on Packages and interfaces.

**Exception Handling:**

Exception handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try statements, throw, throws, finally, Java Built-in Exceptions, Creating your own exception subclasses, Chained Exceptions, Three Recently added Exceptions features, Using Exceptions.

**UNIT IV:****Multithreaded Programming:**

The java Thread Model, The main thread , Creating Thread, Creating Multiple Threads, Using `isAlive()` and `join()`, Thread Priorities, Synchronization, Interthread Communication, Suspending, resuming and stopping threads, Obtaining a thread state, Using Multithreading.

**I/O, Applets, and Other Topics:**

I/O basics, Reading Console input, Writing console Output, The `PrintWriter` class, Reading and writing files, Automatically closing a file, Applet fundamentals, enumerations type wrappers auto boxing annotations, Generics: The general form of a generics class, creating a generic method, generics interfaces.

**UNIT V:****Introduction the AWT: Working with windows, graphics and Text:**

AWT classes, window fundamentals, working with frame windows, creating a frame window in a an AWT Based applet, creating a window program, displaying information within a window, Graphics, working with color, setting the paint mode, working with fonts, managing text output using font metrics,.

**Using AWT controls, Layout Mangers, and Menus:**

AWT control fundamentals, Labels, using buttons, applying check boxes, check box group, choice controls, using lists, Managing scroll bars, using a Text field, Using a Text area, understanding layout managers, Menu bars and Menus, dialog boxes, file dialog, Overriding `paint()`.

**TEXT BOOKS:**

1."Java The Complete Reference", Herbert Schildt, MC GRAW HILL Education, 9<sup>th</sup> Edition,2016.



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**REFENCE BOOKS:**

1. "Programming with Java" T.V.Suresh Kumar, B.Eswara Reddy, P.Raghavan Pearson Edition.
  2. "Java Fundamentals - A Comprehensive Introduction", Herbert Schildt and Dale Skrien, Special Indian Edition, McGrawHill, 2013.
  3. "Java – How to Program", Paul Deitel, Harvey Deitel, PHI.
  4. "Core Java", NageswarRao, Wiley Publishers.
  5. "Thinking in Java", Bruce Eckel, Pearson Education.
  6. "A Programmers Guide to Java SCJP", Third Edition, Mughal, Rasmussen, Pearson.
- "Head First Java", Kathy Sierra, Bert Bates, O'Reilly "SCJP – Sun Certified Programmer for Java Study guide" – Kathy Sierra, Bert Bates, McGrawHill

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-II Sem. (CSE)

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## (15A05404) FORMAL LANGUAGES AND AUTOMATA THEORY

**Course Objective:**

- Understand formal definitions of machine models.
- Classify machines by their power to recognize languages.
- Understanding of formal grammars, analysis
- Understanding of hierarchical organization of problems depending on their complexity
- Understanding of the logical limits to computational capacity
- Understanding of undecidable problems

**Learning Outcome:**

At the end of the course, students will be able to

- Construct finite state diagrams while solving problems of computer science
- Find solutions to the problems using Turing machines
- Design of new grammar and language

**UNIT I**

**Introduction:** Basics of set theory, Relations on sets, Deductive proofs, Reduction to definitions, Other theorem forms, Proving equivalences about sets, The Contrapositive, Proof by contradiction, Counter examples, Inductive proofs, Alphabets, Strings, Languages, Problems, Grammar formalism, Chomsky Hierarchy

**Finite Automata:** An Informal picture of Finite Automata, Deterministic Finite Automata (DFA), Non Deterministic Finite Automata (NFA), Applying FA for Text search, Finite Automata with

Epsilon transitions ( $\epsilon$ -NFA or NFA- $\epsilon$ ), Finite Automata with output, Conversion of one machine to another, Minimization of Finite Automata, Myhill-Nerode Theorem.

**UNIT II**

**Regular Languages:** Regular Expressions (RE), Finite Automata and Regular Expressions,

Applications of Regular Expressions, Algebraic laws for Regular Expressions, The Arden's Theorem, Using Arden's theorem to construct RE from FA, Pumping Lemma for RLs, Applications of Pumping Lemma, Equivalence of Two FAs, Equivalence of Two REs, Construction of Regular Grammar from RE, Constructing FA from Regular Grammar, Closure properties of RLs, Decision problem's of RLS, Applications of REs and FAs

### UNIT III

**Context Free Grammars and Languages:** Definition of Context Free Grammars (CFG), Derivations and Parse trees, Ambiguity in CFGs, Removing ambiguity, Left recursion and Left factoring, Simplification of CFGs, Normal Forms, Linear grammars, Closure properties for CFLs, Pumping Lemma for CFLs, Decision problems for CFLs, CFG and Regular Language..

### UNIT IV

**Push Down Automata (PDA):** Informal introduction, The Formal Definition, Graphical notation, Instantaneous description, The Languages of a PDA, Equivalence of PDAs and CFGs, Deterministic Push Down Automata, Two Stack PDA.

### UNIT V

**Turing Machines and Undecidability:** Basics of Turing Machine (TM), Transitional Representation of TMs, Instantaneous description, Non Deterministic TM, Conversion of Regular Expression to TM, Two stack PDA and TM, Variations of the TM, TM as an integer function, Universal TM, Linear Bounded Automata, TM Languages, Unrestricted grammar , Properties of Recursive and Recursively enumerable languages, Undecidability, Reducibility, Undecidable problems about TMs, Post's Correspondence Problem(PCP), Modified PCP.

**Text Books:**

1. *Introduction to Automata Theory, Formal Languages and Computation*, Shyamalendu kandar, Pearson.
2. *Introduction to Automata Theory, Languages, and Computation*, Third Edition, John E.Hopcroft, Rajeev Motwani, Jeffery D. Ullman, Pearson.

**Reference Books:**

1. *Introduction to Languages and the Theory of Computation*, John C Martin, TMH, Third Edition.
2. *Theory of Computation*, Vivek Kulkarni, OXFORD.
3. *Introduction to the Theory of Computation.*, Michel Sipser, 2<sup>nd</sup> Edition, Cengage Learning
4. *Theory of computer Science Automata, Languages and Computation*, K.L.P. Mishra, Chandrasekaran, PHI, Third Edition.
5. *Fundamentals of the Theory of Computation, Principles and Practice*, Raymond Greenlaw, H. James Hoover, Elsevier, Morgan Kaufmann.
6. *Finite Automata and Formal Language A Simple Approach*, A.M. Padma Reddy, Pearson

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-II Sem. (CSE)**

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**(15A04408) MICRO PROCESSORS & INTERFACING LAB****Course Objective:**

- *To become skilled in 8086 Assembly Language programming.*
- *To understand programmable peripheral devices and their Interfacing.*
- *To understand and learn 8051 microcontroller.*
- *To learn 8051 assembly Language programming*

**Learning Outcome:**

- *Able to write 8086 Assembly Language programs.*
- *Able to understand programmable peripheral devices and their Interfacing.*
- *Able to write 8051 assembly Language programs.*

Minimum **Ten** Experiments to be conducted (**Five** from each section)

**I) 8086 Microprocessor Programs using MASM/8086 kit.**

1. Introduction to MASM Programming.
2. Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Length of the string, String comparison.

**Interfacing:**

1. 8259 – Interrupt Controller and its interfacing programs
2. 8255 – PPI and its interfacing programs (A/D, D/A, stepper motor,)
3. 7-Segment Display.

**II) Microcontroller 8051 Trainer kit**

1. Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation.
2. Logic operations – Shift and rotate.
3. Sorting- Ascending and descending order.

**Interfacing using 8051 Trainer kit:**

1. Key board Interfacing
2. Seven Segment display
3. Switch Interfacing
4. Relay Interfacing
5. UART

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-II Sem. (CSE)**

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**(15A05405) JAVA PROGRAMMING LABORATORY****Course Objectives:**

- Learn to use object orientation to solve problems and use java language to implement them.
- To experiment with the syntax and semantics of java language and gain experience with java programming

**Course Outcomes:**

- Ability to write portable programs which work in all environments
- Ability to create user friendly interfaces
- Ability to solve the problem using object oriented approach and design solutions which are robust

**List of Experiments**

- 1) Preparing and practice – Installation of Java software, study of any Integrated development environment, sample programs on operator precedence and associativity, class and package concept, scope concept, control structures, constructors and destructors. Learn to compile, debug and execute java programs.
- 2) Write Java program(s) on use of inheritance, preventing inheritance using final, abstract classes.
- 3) Write Java program(s) on dynamic binding, differentiating method overloading and overriding.
- 4) Write Java program(s) on ways of implementing interface.
- 5) Write a program for the following
  - Develop an applet that displays a simple message.
  - Develop an applet for waving a Flag using Applets and Threads.
- 6) Write Java program(s) which uses the exception handling features of the

- language, creates exceptions and handles them properly, uses the predefined exceptions, and create own exceptions
- 7) Write java program that inputs 5 numbers, each between 10 and 100 inclusive. As each number is read display it only if it's not a duplicate of any number already read. Display the complete set of unique values input after the user enters each new value.

Write Java program(s) on creating multiple threads, assigning priority to threads, synchronizing threads, suspend and resume threads

- 10) Write a java program to split a given text file into n parts. Name each part as the name of the original file followed by .part<n> where n is the sequence number of the part file.
- 11) Write a java program to create a super class called Figure that receives the dimensions of two dimensional objects. It also defines a method called area that computes the area of an object. The program derives two subclasses from Figure. The first is Rectangle and second is Triangle. Each of the sub classes override area() so that it returns the area of a rectangle and triangle respectively.
- 12) Write a Java program that creates three threads. First thread displays "Good Morning" every one second, the second thread displays "Hello" every two seconds and the third thread displays "Welcome" every three seconds
- 13) Design a simple calculator which performs all arithmetic operations. The interface should look like the calculator application of the operating system. Handle the exceptions if any.
- 14) Write a java program to handle mouse events
- 15) Write a java program to handle keyboard events
- 16) Write a java program that allows conduction of object type examination containing multiple choice questions, and true/false questions. At the end of the examination when the user clicks a button the total marks have to be displayed in the form of the message.
- 17) Write a java program that creates menu which appears similar to the menu of notepad application of the Microsoft windows or any editor of your choice.
- 18) Write a java program that creates dialog box which is similar to the save dialog box of the Microsoft windows or any word processor of your choice.
- 19) Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication
- 20) Write a java program to find and replace pattern in a given file.
- 21) Use inheritance to create an exception super class called ExceptionA and exception sub classes ExceptionB and ExceptionC, where ExceptionB inherits from ExceptionA and ExceptionC inherits from ExceptionB. Write a java program



to demonstrate that the catch block for type ExceptionA catches exception of type ExceptionB and ExceptionC.

22) Write a Java program which opens a connection to standard port on well known server, sends the data using socket and prints the returned data.

23) Write a Java program to create a URLConnection and use it to examine the documents properties and content.

24) Write a Java program which uses TCP/IP and Datagrams to communicate client and server.

25) Create an interface for stack with push and pop operations. Implement the stack in two ways: fixed size stack and Dynamic stack (stack size is increased when stack is full).

26) Create multiple threads to access the contents of a stack. Synchronize thread to prevent simultaneous access to push and pop operations.

**References:**

1. "Java: How to Program", P.J.Deitel and H.M.Deitel, PHI.
2. "Object Oriented Programming through Java", P.Radha Krishna, Universities Press.
3. "Thinking in Java", Bruce Eckel, Pearson Education
4. "Programming in Java", S.Malhotra and S.Choudhary, Oxford Univ. Press.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech III-I Sem. (CSE)

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15A05501

## OPERATING SYSTEMS

**Course Objectives:**

- To make the students understand the basic operating system concepts such as processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection.
- To get acquaintance with the class of abstractions afford by general purpose operating systems that aid the development of user applications.

**Course Outcomes:**

- Able to use operating systems effectively.
- Write System and application programs to exploit operating system functionality.
- Add functionality to the exiting operating systems
- Design new operating systems

**UNIT I**

**Operating Systems Overview:** Operating system functions, Operating system structure, operating systems Operations, protection and security, Computing Environments, Open- Source Operating Systems

**System Structures:** Operating System Services, User and Operating-System Interface, systems calls, Types of System Calls, system programs, operating system structure, operating system debugging, System Boot.

**Processes:** Process concept, process Scheduling, Operations on processes, Inter process Communication, Examples of IPC systems.

**UNIT II**

**Threads:** overview, Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.

**Process Synchronization:** The critical-section problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic problems of synchronization, Monitors, Synchronization examples, Alternative approaches.

**CPU Scheduling:** Scheduling-Criteria, Scheduling Algorithms, Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation.

### UNIT III

**Memory Management:** Swapping, contiguous memory allocation, segmentation, paging, structure of the page table.

**Virtual memory:** demand paging, page-replacement, Allocation of frames, Thrashing, Memory-Mapped Files, Allocating Kernel Memory

**Deadlocks:** System Model, deadlock characterization, Methods of handling Deadlocks, Deadlock prevention, Detection and Avoidance, Recovery from deadlock.

### UNIT IV

**Mass-storage structure:** Overview of Mass-storage structure, Disk structure, Disk attachment, Disk scheduling, Swap-space management, RAID structure, Stable-storage implementation.

**File system Interface:** The concept of a file, Access Methods, Directory and Disk structure, File system mounting, File sharing, Protection.

**File system Implementation:** File-system structure, File-system Implementation, Directory Implementation, Allocation Methods, Free-Space management.

### UNIT V

**I/O systems:** I/O Hardware, Application I/O interface, Kernel I/O subsystem, Transforming I/O requests to Hardware operations.

**Protection:** Goals of Protection, Principles of Protection, Domain of protection, Access Matrix, Implementation of Access Matrix, Access control, Revocation of Access Rights, Capability- Based systems, Language – Based Protection

**Security:** The Security problem, Program threats, System and Network threats, Cryptography as a security tool, User authentication, Implementing security defenses, Firewalling to protect systems and networks, Computer–security classifications.

#### Text Books:

1. Operating System Concepts, Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Wiley , Eight Edition, 2014.

#### Reference Books:

1. Operating systems by A K Sharma, Universities Press,
2. Operating Systems, S.Haldar, A.A.Aravind, Pearson Education.
3. Modern Operating Systems, Andrew S Tanenbaum, Second Edition, PHI.
4. Operating Systems, A.S.Godbole, Second Edition, TMH.
5. An Introduction to Operating Systems, P.C.P. Bhatt, PHI.

6. Operating Systems, G.Nutt, N.Chaki and S.Neogy, Third Edition, Pearson Education.
7. Operating Systems, R.Elmasri, A.G.Carrick and D.Levine, Mc Graw Hill.
8. Principles of Operating Systems, B.L.Stuart, Cengage learning, India Edition.
9. Operating System Desgin, Douglas Comer, CRC Press, 2<sup>nd</sup> Edition.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech III-I Sem. (CSE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>COMPUTER NETWORKS</b>				

**Course Objectives:**

- Study the evolution of computer networks and future directions.
- Study the concepts of computer networks from layered perspective.
- Study the issues open for research in computer networks.

**Course Outcomes:**

- Ability to choose the transmission media depending on the requirements.
- Ability to design new protocols for computer network.
- Ability to configure a computer network logically.

**Unit I**

**Introduction:** Networks, Network Types, Internet History, Standards and Administration, Network Models: Protocol Layering, TCP/IP Protocol Suite, The ISO Model.

**The Physical layer:** Data and Signals, Transmission impairment, Data rate limits, Performance, Transmission media: Introduction, Guided Media, Unguided Media, Switching: Introduction, Circuit Switched Networks, Packet switching.

**Unit II**

**The Data Link Layer:** Introduction, Link layer addressing, Error detection and Correction: Cyclic codes, Checksum, Forward error correction, Data link control: DLC Services, Data link layer protocols, HDLC, Point to Point Protocol, Media Access control: Random Access, Controlled Access, Channelization, Connecting devices and virtual LANs: Connecting Devices.

**Unit III**

**The Network Layer:** Network layer design issues, Routing algorithms, Congestion control algorithms, Quality of service, Internetworking, The network layer in the Internet: IPV4 Addresses, IPV6, Internet Control protocol, OSPF, BGP, IP, ICMPv4, IGMP.

**Unit IV**

**The Transport Layer:** The Transport Service, Elements of Transport Protocols, Congestion Control, The internet transport protocols: UDP, TCP, Performance problems in computer networks, Network performance measurement.

### **Unit V**

**The Application Layer:** Introduction, Client Server Programming, WWW and HTTP, FTP, e-mail, TELNET, Secure Shell, Domain Name System, SNMP.

### **Text Books:**

1. "Data communications and networking", Behrouz A. Forouzan, Mc Graw Hill Education, 5<sup>th</sup> edition, 2012.
2. "Computer Networks", Andrew S. Tanenbaum, Wetherall, Pearson, 5<sup>th</sup> edition, 2010.

### **References:**

1. Data Communication and Networks, Bhushan Trivedi, Oxford
2. "Internetworking with TCP/IP – Principles, protocols, and architecture- Volume 1, Douglas E. Comer, 5<sup>th</sup> edition, PHI
3. "Computer Networks", 5E, Peterson, Davie, Elsevier.
4. "Introduction to Computer Networks and Cyber Security", Chawan- Hwa Wu, Irwin, CRC Publications.
5. "Computer Networks and Internets with Internet Applications", Comer.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-I Sem. (CSE)**

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**15A05503 OBJECT ORIENTED ANALYSIS & DESIGN****Course Objectives**

- To understand how to solve complex problems
- Analyze and design solutions to problems using object oriented approach
- Study the notations of Unified Modeling Language

**Course Outcomes:**

- Ability to find solutions to the complex problems using object oriented approach
- Represent classes, responsibilities and states using UML notation
- Identify classes and responsibilities of the problem domain

**Unit-I**

**Introduction:** The Structure of Complex systems, The Inherent Complexity of Software, Attributes of Complex System, Organized and Disorganized Complexity, Bringing Order to Chaos, Designing Complex Systems, Evolution of Object Model, Foundation of Object Model, Elements of Object Model, Applying the Object Model.

**Unit-II**

**Classes and Objects:** Nature of object, Relationships among objects, Nature of a Class, Relationship among Classes, Interplay of Classes and Objects, Identifying Classes and Objects, Importance of Proper Classification, Identifying Classes and Objects, Key abstractions and Mechanisms.

**Unit-III**

**Introduction to UML:** Why model, Conceptual model of UML, Architecture, Classes, Relationships, Common Mechanisms, Class diagrams, Object diagrams.

**Unit-IV**

**Structural Modeling:** Package Diagram, Composite Structure Diagram, Component Diagram, Deployment Diagram, Profile Diagram.

**Unit-V**

**Behavioral Modeling:** Use Case Diagram, Activity Diagrams, State Machine Diagrams, Sequence Diagram, Communication Diagram, Timing Diagram, Interaction Overview Diagram.

**Text Books:**

1. "Object- Oriented Analysis And Design with Applications", Grady BOOCH, Robert A. Maksimchuk, Michael W. ENGLE, Bobbi J. Young, Jim Conallen, Kellia Houston, PEARSON, 3<sup>rd</sup> edition, 2013.
2. "The Unified Modeling Language User Guide", Grady Booch, James Rumbaugh, Ivar Jacobson, PEARSON 12<sup>th</sup> Impression, 2012.
3. <http://www.omg.org/>

**References:**

1. "Object-oriented analysis and design using UML", Mahesh P. Matha, PHI
2. "Head first object-oriented analysis and design", Brett D. McLaughlin, Gary Pollice, Dave West, O'Reilly
3. "Object-oriented analysis and design with the Unified process", John W. Satzinger, Robert B. Jackson, Stephen D. Burd, Cengage Learning
4. "The Unified modeling language Reference manual", James Rumbaugh, Ivar Jacobson, Grady Booch, Addison-Wesley

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech III-I Sem. (CSE)

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## 15A05504 PRINCIPLES OF PROGRAMMING LANGUAGES

**Course Objectives:**

- To study various programming paradigms.
- To provide conceptual understanding of High level language design and implementation.
- To introduce the power of scripting languages

**Course Outcomes:**

- Ability to select appropriate programming language for problem solving
- Ability to design new programming language.

**Unit I:**

**Introduction:** Software Development Process, Language and Software Development Environments, Language and Software Design Models, Language and Computer Architecture, Programming Language Qualities, A brief Historical Perspective.

**Syntax and Semantics:** Language Definition, Language Processing, Variables, Routines, Aliasing and Overloading, Run-time Structure.

**Unit II:**

**Structuring the data:** Built-in types and primitive types, Data aggregates and type constructors, User-defined types and abstract data types, Type Systems, The type Structure of representative languages, Implementation Models

**Unit III:**

**Structuring the Computation:** Expressions and Statements, Conditional Execution and Iteration, Routines, Exceptions, Pattern Matching, Nondeterminism and Backtracking, Event-driven computations, Concurrent Computations

**Structuring the Program:** Software Design Methods, Concepts in Support of Modularity, Language Features for Programming in the Large, Generic Units

**Unit IV:**

**Object-Oriented Languages:** Concepts of Object-oriented Programming, Inheritances and the type system, Object-oriented features in programming languages

**Unit V:**



**Functional Programming Languages:** Characteristics of imperative languages, Mathematical and programming functions, Principles of Functional Programming, Representative Functional Languages, Functional Programming in C++

**Logic and Rule-based Languages:** “What” versus “how”: Specification versus implementation, Principles of Logic Programming, PROLOG, Functional Programming versus Logic Programming, Rule-based Languages

**Textbook:**

- 1) “Programming Language Concepts”, Carlo Ghezzi, Mehdi Jazayeri, WILEY Publications. Third Edition, 2014

**Reference Textbooks:**

1. Concepts of Programming Languages, Tenth Edition, Robert W. Sebesta, Pearson Education.
2. Programming Languages Principles and Paradigms, Second Edition, Allen B. Tucker, Robert E. Noonan, McGraw Hill Education.
3. Introduction to Programming Languages, Aravind Kumar Bansal, CRC Press.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-I Sem. (CSE)**

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**15A05505****SOFTWARE TESTING****Course Objectives:**

- Fundamentals for various testing methodologies.
- Describe the principles and procedures for designing test cases.
- Provide supports to debugging methods.
- Acts as the reference for software testing techniques and strategies.

**Course Outcomes:**

- Understand the basic testing procedures.
- Able to support in generating test cases and test suites.
- Able to test the applications manually by applying different testing methods and automation tools.
- Apply tools to resolve the problems in Real time environment.

**UNIT I**

**Introduction:** Purpose of Testing, Dichotomies, Model for Testing, Consequences of Bugs, Taxonomy of Bugs.

**Flow graphs and Path testing:** Basics Concepts of Path Testing, Predicates, Path Predicates and Achievable Paths, Path Sensitizing, Path Instrumentation, Application of Path Testing.

**UNIT II**

**Transaction Flow Testing:** Transaction Flows, Transaction Flow Testing Techniques.

**Dataflow testing:** Basics of Dataflow Testing, Strategies in Dataflow Testing, Application of Dataflow Testing.

**UNIT III**

**Domain Testing:** Domains and Paths, Nice & Ugly Domains, Domain testing, Domains and Interfaces Testing, Domain and Interface Testing, Domains and Testability.

**UNIT IV**

**Paths, Path products and Regular expressions:** Path Products & Path Expression, Reduction Procedure, Applications, Regular Expressions & Flow Anomaly Detection.

**Logic Based Testing:** Overview, Decision Tables, Path Expressions, KV Charts, Specifications.

**UNIT V:**

**State, State Graphs and Transition Testing:** State Graphs, Good & Bad State Graphs, State Testing, Testability Tips.

**Graph Matrices and Application:** Motivational Overview, Matrix of Graph, Relations, Power of a Matrix, Node Reduction Algorithm, Building Tools.

**Text Books:**

1. Software testing techniques – Boris Beizer, Dreamtech, second edition.

**Reference Books :**

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing- Yogesh Singh, Camebridge
3. Software Testing, 3<sup>rd</sup> edition, P.C. Jorgensen, Aurbach Publications (Dist.by SPD).
4. Software Testing, N.Chauhan, Oxford University Press.
5. Introduction to Software Testing, P.Ammann & J.Offutt, Cambridge Univ. Press.
6. Effective methods of Software Testing, Perry, John Wiley, 2<sup>nd</sup> Edition, 1999.
7. Software Testing Concepts and Tools, P.Nageswara Rao, dreamtech Press
8. Win Runner in simple steps by Hakeem Shittu, 2007 Genixpress.
9. Foundations of Software Testing, D.Graham & Others, Cengage Learning.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-I Sem. (CSE)**

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**15A05506****INTRODUCTION TO BIG DATA  
(MOOCS-I)****Course Objectives:**

- To understand Big Data Analytics for different systems like Hadoop.
- To learn the design of Hadoop File System.
- To learn how to analyze Big Data using different tools.
- To understand the importance of Big Data in comparison with traditional databases.

**Course Outcomes:**

- To gain knowledge about working of Hadoop File System.
- Ability to analyze Big Data using different tools.

**Unit-1:** Distributed programming using JAVA: Quick Recap and advanced Java Programming: Generics, Threads, Sockets, Simple client server Programming using JAVA, Difficulties in developing distributed programs for large scale clusters and introduction to cloud computing.

**Unit-2:** Distributed File systems leading to Hadoop file system, introduction, Using HDFS, Hadoop Architecture, Internals of Hadoop File Systems.

**Unit-3:** Map-Reduce Programming: Developing Distributed Programs and issues, why map- reduce and conceptual understanding of Map-Reduce programming, Developing Map-Reduce programs in Java, setting up the cluster with HDFS and understanding how Map- Reduce works on HDFS, Running simple word count Map-Reduce program on the cluster, Additional examples of M-R Programming.

**Unit-4:** Anatomy of Map-Reduce Jobs: Understanding how Map- Reduce program works, tuning Map-Reduce jobs, Understanding different logs produced by Map-Reduce jobs and debugging the Map- Reduce jobs.

**Unit-5:** Case studies of Big Data analytics using Map-Reduce programming: K-Means clustering, using Big Data analytics libraries using Mahout.

**Text Books:**

1. JAVA in a Nutshell 4th Edition.
2. Hadoop: The definitive Guide by Tom White, 3rd Edition, O'reily.

**References:**

1. Hadoop in Action by Chuck Lam, Manning Publications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-I Sem. (CSE)**

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**15A05507****R-PROGRAMMING  
(MOOCS-I)****Course Objectives:**

- Understand the fundamentals of 'R' programming
- Learn how to carry out a range of commonly used statistical methods including analysis of variance and linear regression.
- Explore data-sets to create testable hypotheses and identify appropriate statistical tests.

**Course Outcomes:**

- Ability to Work on a real life Project, implementing R Analytics to create Business Insights.
- Ability to analyze the data and results using R, a flexible and completely cross-platform.
- Ability to use a wide range of analytical methods and produce presentation quality graphics.

**UNIT-I**

**INTRODUCING R:** Getting the Hand of R, Running the R Program, Finding Your Way with R, Command Packages.

**BECOMING FAMILIAR WITH R:** Reading and Getting Data into R, Viewing Named Objects, Types of Data Items, The Structure of Data Items, Examining Data Structure Working with History Commands, Saving your Work in R.

**WORKING WITH OBJECTS:** Manipulating Objects, Viewing Objects within Objects, Constructing Data Objects, Forms of Data Objects: Testing and Converting,

**UNIT II**

**Data:** Descriptive statistics and tabulation.

**DISTRIBUTION:** Looking at the Distribution of Data

**SIMPLE HYPOTHESIS TESTING:** Using the Student's t-test, The Wilcoxon U-Test (Mann-Whitney), Paired t- and U-Tests, Correlation and Covariance, Tests for Association.

**UNIT-III**

**INTRODUCTION TO GRAPHICAL ANALYSIS:** Box-whisker Plots, Scatter Plots, Pairs Plots(Multiple Correlation Plots) Line Charts, Pie Charts, Cleveland Dot Charts, Bar Charts, Copy Graphics to Other Applications.

**FORMULA NOTATION AND COMPLEX STATISTICS:** Examples of Using Formula Syntax for Basic tests, Formula Notation in Graphics, Analysis of Variance (ANOVA).

**UNIT-IV**

**MANIPULATING DATA AND EXTRACTING COMPONENTS:** Creating Data for Complex Analysis, Summarizing Data.

**REGRESSION (LINEAR MODELING):** Simple Linear Regression, Multiple Regression, Curvilinear Regression, Plotting Linear Models and Curve Fitting, Summarizing Regression Models.

**UNIT-V**

Adding elements to existing plots, Matrix plots, multiple plots in one window, exporting graphs

**WRITING YOUR OWN SCRIPTS:**

**BEGINNING TO PROGRAM:** Copy and Paste Scripts, Creating Simple Functions, Making Source Code.

**Text Books:**

- 1) "Beginning R the statistical programming language" Dr. Mark Gardener, Wiley Publications, 2015.

**References Books:**

- 1) Hands-On Programming with R Paperback by Grolemund (Author), Garrett (Author), SPD,2014.
- 2) The R Book, Michael J. Crawley, WILEY, 2012.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-I Sem. (CSE)**

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**15A05508 INTRODUCTION TO OPERATIONS MANAGEMENT  
(MOOCS-I)****Course Objectives:**

Study key aspects of business operations and lean management including capacity, productivity, quality, and supply chain.

**Course Outcomes:**

- Identify an operations system with some known standard configurations
- Make an assessment of the complexity of an operations system
- Understand the various components of a supply chain and the need to configure them appropriately
- Identify methods for reducing bullwhip effect in supply chains
- Understand and relate the concept of Lean Management to one's own business situation
- Understand & use specific tools and techniques to analyze quality problems

**UNIT I****Understanding Operations**

Introduction, Operations in an Organization, Alternative Configurations in Operations, Performance Measures in Operations.

**UNIT II****Analyzing Capacity in Operations**

Introduction, The Notion of Capacity in Organizations, Process Design and Capacity Analysis, Capacity Estimation and De-bottlenecking, Other Issues in Capacity Planning.

**UNIT III****Supply Chain in Operations**

Introduction, Supply Chain Management: Components, Design of an Appropriate Supply Chain, Issues in Inventory Planning, Reverse Supply Chain.

**UNIT IV****Productivity Improvement in Operations**



Introduction, Productivity Paradox in Organizations, Productivity Management: Philosophy, Tools & Techniques, Tools for Sustaining Productivity Improvements, Challenges in Lean Management.

## **UNIT V**

### **Assuring Quality in Operations**

Introduction, Six Sigma Quality in Organizations, Total Quality Management: Philosophy, Tools & Techniques, Statistical Process Control, Establishing Quality in Service Organizations.

#### **Text Book:**

1. B. Mahadevan, "Operations Management: Theory & Practice", third edition, Pearson education-2015.

#### **Reference Books:**

1. Nigel Slack, Stuart Chambers and Robert Johnston, "Operations Management", Sixth Edition, Pearson-2010.
2. [Robert Johnston](#), [Graham Clark](#) and [Michael Shulver](#), "Service Operations Management", 4th Edition, Pearson.
3. S. N. Chary, "Production And Operations Management", Third edition, [Tata McGraw-Hill Education](#)-2004

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

B. Tech III-I Sem. (CSE)	L	T	P	C
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**15A05509 OBJECT ORIENTED ANALYSIS AND DESIGN & SOFTWARE TESTING LABORATORY****Course Objectives:**

- Practice the notation for representing various UML diagrams
- Analyze and design the problem by representing using UML diagrams
- Become familiar with all phases of OOAD

**Course Outcomes:**

- Find solutions to the problems using object oriented approach
- Represent using UML notation and interact with the customer to refine the UML diagrams

**Part A: OOAD Lab**

UML diagrams to be developed are:

1. Use Case Diagram.
2. Class Diagram.
3. Sequence Diagram.
4. Collaboration Diagram.
5. State Diagram
6. Activity Diagram.
7. Component Diagram
8. Deployment Diagram.
9. Test Design.

Problems that may be considered are

1. College information system
2. Hostel management
3. ATM system

**Part B : Software Testing Lab**

- 1 Write programs in 'C' Language to demonstrate the working of the following constructs:
  - i) do...while
  - ii) while....do
  - iii) if...else
  - iv) switch
  - v) for

- 2 "A program written in 'C' language for Matrix Multiplication fails" Introspect the causes for its failure and write down the possible reasons for its failure.
- 3 Take any system (e.g. ATM system) and study its system specifications and report the various bugs.
- 4 Write the test cases for any known application (e.g. Banking application)
- 5 Create a test plan document for any application (e.g. Library Management System)
- 6 Study of Win Runner Testing Tool and its implementation
  - a) Win runner Testing Process and Win runner User Interface.
  - b) How Win Runner identifies GUI (Graphical User Interface) objects in an application and describes the two modes for organizing GUI map files.
  - c) How to record a test script and explains the basics of Test Script Language (TSL).
  - d) How to synchronize a test when the application responds slowly.
  - e) How to create a test that checks GUI objects and compare the behaviour of GUI objects in different versions of the sample application.
  - f) How to create and run a test that checks bitmaps in your application and run the test on different versions of the sample application and examine any differences, pixel by pixel.
  - g) How to Create Data-Driven Tests which supports to run a single test on several sets of data from a data table.
  - h) How to read and check text found in GUI objects and bitmaps.
  - i) How to create a batch test that automatically runs the tests.
  - j) How to update the GUI object descriptions which in turn supports test scripts as the application changes.

Apply Win Runner testing tool implementation in any real time applications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-I Sem. (CSE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A05510 OPERATING SYSTEMS LABORATORY****Course Objectives:**

- To understand the design aspects of operating system
- To solve various synchronization problems

**Course out comes:**

- Ensure the development of applied skills in operating systems related areas.
  - Able to write software routines modules or implementing various concepts of operating system.
1. Simulate the following CPU scheduling algorithms
    - a) Round Robin b) SJF c) FCFS d) Priority
  2. Simulate all file allocation strategies
    - a) Sequential b) Indexed c) Linked
  3. Simulate MVT and MFT
  4. Simulate all File Organization Techniques
    - a) Single level directory b) Two level c) Hierarchical d) DAG
  5. Simulate Bankers Algorithm for Dead Lock Avoidance
  6. Simulate Bankers Algorithm for Dead Lock Prevention
  7. Simulate all page replacement algorithms
    - a) FIFO b) LRU c) LFU Etc. ...
  8. Simulate Paging Technique of memory management
  9. Control the number of ports opened by the operating system with
    - a) Semaphore b) monitors
  10. Simulate how parent and child processes use shared memory and address space
  11. Simulate sleeping barber problem
  12. Simulate dining philosopher's problem
  13. Simulate producer and consumer problem using threads (use java)
  14. Simulate little's formula to predict next burst time of a process for SJF scheduling algorithm.
  15. Develop a code to detect a cycle in wait-for graph
  16. Develop a code to convert virtual address to physical address
  17. Simulate how operating system allocates frame to process
  18. Simulate the prediction of deadlock in operating system when all the processes announce their resource requirement in advance.

**Reference Books :**

1. "Operating System Concepts", Abraham Silberchatz, Peter B. Galvin, Greg Gagne, Eighth edition, John Wiley.
2. "Operating Systems: Internals and Design Principles", Stallings, Sixth Edition– 2009, Pearson Education
3. "Modern Operating Systems", Andrew S Tanenbaum, Second Edition, PHI.
4. "Operating Systems", S.Haldar, A.A.Aravind, Pearson Education.
5. "Principles of Operating Systems", B.L.Stuart, Cengage learning, India Edition.2013-2014
6. "Operating Systems", A.S.Godbole, Second Edition, TMH.
7. "An Introduction to Operating Systems", P.C.P. Bhatt, PHI.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech III-I Sem. (CSE)	L	T	P	C
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## 15A99501 SOCIAL VALUES &amp; ETHICS (AUDIT COURSE)

*(Common to all Branches)***UNIT - I**

**Introduction and Basic Concepts of Society: Family and Society:** Concept of family, community, PRIs and other community based organizations and society, growing up in the family – dynamics and impact, Human values, Gender Justice.

**Channels of Youth Moments for National Building: NSS & NCC:** History, philosophy, aims & objectives; Emblems, flags, mottos, songs, badge etc.; Organizational structure, roles and responsibilities of various NSS functionaries. **Nehru Yuva Kendra (NYK):** Activities – Socio Cultural and Sports.

**UNIT – II**

Activities of NSS, NCC, NYK:

**Citizenship:** Basic Features Constitution of India, Fundamental Rights and Fundamental Duties, Human Rights, Consumer awareness and the legal rights of the consumer, RTI.

**Youth and Crime:** Sociological and psychological Factors influencing youth crime, Peer Mentoring in preventing crimes, Awareness about Anti-Ragging, Cyber Crime and its prevention, Juvenile Justice

**Social Harmony and National Integration:** Indian history and culture, Role of youth in peace-building and conflict resolution, Role of youth in Nation building.

**UNIT – III**

**Environment Issues:** Environment conservation, enrichment and Sustainability, Climate change, Waste management, Natural resource management (Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation).

**Health, Hygiene & Sanitation:** Definition, needs and scope of health education, Food and Nutrition, Safe drinking water, Sanitation, Swachh Bharat Abhiyan.

**Disaster Management:** Introduction to Disaster Management, classification of disasters, Role of youth in Disaster Management. Home Nursing, First Aid.

**Civil/ Self Defense:** Civil defense services, aims and objectives of civil defense, Need for self defense training – Teakwondo, Judo, karate etc.,

**UNIT – IV**

**Gender Sensitization:** Understanding Gender – Gender inequality – Role of Family, Society and State; Challenges – Declining Sex Ratio – Sexual Harassment – Domestic Violence; Gender Equality – Initiatives of Government – Schemes, Law; Initiates of NGOs – Awareness, Movements;

**UNIT - V**

**Physical Education :** Games & Sports: Health and Recreation – Biological basis of Physical activity – benefits of exercise – Physical, Psychological, Social; Physiology of Muscular Activity, Respiration, Blood Circulation.

**Yoga:** Basics of Yoga – Yoga Protocol, Postures, Asanas, Pranayama: Introduction of Kriyas, Bandhas and Mudras.

**TEXT BOOKS:**

1. NSS MANUAL
2. SOCIETY AND ENVIRONMENT: A.S.Chauha, Jain Brothers Publications, 6<sup>th</sup> Edition, 2006
3. INDIAN SOCIAL PROBLEM: G.R.Madan, Asian Publisher House
4. INDIAN SOCIAL PROBLEM: Ram Ahuja, Rawat Publications
5. HUMAN SOCIETY: Kingsley Davis, Macmillan
6. SOCIETY: Mac Iver D Page, Macmillan
7. SOCIOLOGY – THEMES AND PERSPECTIVES: Michael Honalambos, Oxford University Press
8. CONSTITUTION OF INDIA: D.D.Basu, Lexis Nexis Butterworth Publishers
9. National Youth Policy 2014 (available on [www.yas.nic.in](http://www.yas.nic.in))
10. TOWARDS A WORLD OF EQUALS: A.Suneetha, Uma Bhargudanda, Duggirala Vasantha, Rama Melkote, Vasudha Nagraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu
11. LIGHT ON YOGA : B.K.S.Iyengar, Penguin Random House Publishers

[www.un.org](http://www.un.org)

[www.india.gov.in](http://www.india.gov.in)

[www.yas.nic.in](http://www.yas.nic.in)

<http://www.who.int/countries/ind/en/>

<http://www.ndma.gov.in>

<http://ayush.gov.in/event/common-yoga-protocol-2016-0>

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

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**15A05601 COMPILER DESIGN****Course Objectives:**

This course is a *de facto* capstone course in Computer Science, as it combines skills in software design, programming, data structures and algorithms, theory of computing, documentation, and machine architecture to produce a functional compiler.

- Realize that computing science theory can be used as the basis for real applications
- Introduce the major concept areas of language translation and compiler design.
- Learn how a compiler works
- Know about the powerful compiler generation tools and techniques, which are useful to the other non-compiler applications
- Know the importance of optimization and learn how to write programs that execute faster

**Course Outcomes**

- Able to design a compiler for a simple programming language
- Able to use the tools related to compiler design effectively and efficiently
- Ability to write optimized code

**Unit - I**

**Introduction:** Language processors, The Structure of a Compiler, the science of building a compiler

**Lexical Analysis:** The Role of the lexical analyzer, Input buffering, Specification of tokens, Recognition of tokens, The lexical analyzer generator Lex, Design of a Lexical Analyzer generator

**Unit II**

**Syntax Analysis:** Introduction, Context Free Grammars, Writing a grammar, TOP Down Parsing, Bottom Up Parsing, Introduction to LR Parsing: Simple LR, More Powerful LR Parsers, Using ambiguous grammars, Parser Generators

**UNIT III**



**Syntax Directed Translation:** Syntax Directed Definitions, Evaluation orders for SDD's, Application of SDT, SDT schemes, Implementing L-attribute SDD's.

**Intermediate Code Generation:** Variants of syntax trees, three address code, Types and declarations, Translations of expressions, Type checking, control flow statements, backpatching, switch statements, intermediate code for procedure.

#### **UNIT IV**

**Run Time Environment :** storage organization, , Stack allocation of space, Access to non-local data on stack , Heap management

**Symbol Table:** Introduction, symbol table entries, operations on the symbol table, symbol table organizations, non block structured language, block structured language.

#### **UNIT V**

**Code Generation:** Issues in the design of a code generator, The Target language, Basic blocks and flow graphs, optimization of basic blocks, a simple code generator, register allocation and assignment, optimal code generation for expressions, dynamic programming code generation.

**Code Optimization:** Introduction, where and how to optimize, principle source of optimization, function preserving transformations, loop optimizations, global flow analysis, machine dependent optimization

#### **Text Books :**

1. "Compilers Principles, Techniques and Tools", Second Edition, Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman., Pearson, 2014.
2. "Compiler Construction", K.V.N Sunitha, Pearson, 2013

#### **Reference Books :**

1. "Compiler Design", K. Muneeswaran., Oxford University Press, 2012
2. "Engineering A Compiler", Second Edition, Keith D. Cooper & Linda Torczon., MK(Morgan Kaufmann) (ELSEVIER)
3. "Compilers Principles and Practice", Parag H. Dave, Himanshu B. Dave., PEARSON
4. "Compiler Design", Sandeep Saxena, Rajkumar Singh Rathore., S.Chand publications
5. "Compiler Design", Santanu Chattopadhyay., PHI
6. "Principals of Compiler Design", Nadhni Prasad, Elsevier

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

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**15A05602 DATA WAREHOUSING & MINING****Course Objectives:**

- To know the basic concepts and principles of data warehousing and data mining
- Learn pre-processing techniques and data mining functionalities
- Learn and create multidimensional models for data warehousing
- Study and evaluate performance of Frequent Item sets and Association Rules
- Understand and Compare different types of classification and clustering algorithms

**Course Outcomes:**

- Understand the basic concepts of data warehouse and data Mining
- Apply pre-processing techniques for data cleansing
- Analyze and evaluate performance of algorithms for Association Rules
- Analyze Classification and Clustering algorithms

**UNIT I**

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.

**UNIT II**

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.

**UNIT III**

Mining Frequent Patterns, Associations and Correlations: Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules,

From Association Mining to Correlation Analysis, Constraint-Based Association Mining, Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Back propagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods

#### **UNIT IV**

Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.

#### **UNIT V**

Mining Streams, Time Series and Sequence Data: Mining Data Streams, Mining Time-Series Data, Mining Sequence Patterns in Transactional Databases, Mining Sequence Patterns in Biological Data, Graph Mining, Social Network Analysis and Multi relational Data Mining, Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Data Mining, Multimedia Data Mining, Text Mining, Mining the World Wide Web.

#### **TEXT BOOKS:**

1. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education.

#### **REFERENCES:**

1. Data Mining Techniques, Arun K Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory & Dennis Murray Pearson EdnAsia.
3. Insight into Data Mining, K.P.Soman, S.Diwakar, V.Ajay, PHI, 2008.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

L	T	P	C
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**15A05603 DESIGN PATTERNS****Course Objectives:**

- To understand design patterns and their underlying object oriented concepts.
- To understand implementation of design patterns and providing solutions to real world software design problems.
- To understand patterns with each other and understanding the consequences of combining patterns on the overall quality of a system.

**Course Outcomes:**

- Know the underlying object oriented principles of design patterns.
- Understand the context in which the pattern can be applied.
- Understand how the application of a pattern affects the system quality and its tradeoffs.

**UNIT-I****Introduction to Design Patterns**

Design Pattern Definition, Design Patterns in Small Talk MVC, Describing Design Patterns, Catalog of Design Patterns, Organizing the Catalog, Solving of Design Problems using Design Patterns, Selection of a Design Pattern, Use of Design Patterns.

**UNIT-II****Designing A Document Editor: A Case Study**

Design problems, Document structure, Formatting, Embellishing the User Interface, Supporting Multiple Look and Feel standards, Supporting Multiple Window Systems, User Operations, Spelling Checking and Hyphenation.

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

**UNIT-III**

**Structural Patterns-1:** Adapter, Bridge, Composite.

**Structural Patterns-2:** Decorator, Façade, Flyweight, Proxy, Discuss of Structural Patterns.

**UNIT-IV**

Behavioral Patterns-1: Chain of Responsibility, Command, Interpreter, Iterator.

Behavioral Patterns-2: Mediator, Memento, Observer.

**UNIT-V**

Behavioral Patterns-2(cont'd): State, Strategy, Template Method, Visitor, Discussion of Behavioral Patterns.

What to Expect from Design Patterns, A Brief History, The Pattern Community An Invitation, A Parting Thought.

**TEXT BOOK :**

1. Design Patterns By Erich Gamma, Pearson Education

**REFERENCE BOOKS:**

1. Pattern's in JAVA Vol-I By Mark Grand, Wiley DreamTech.
2. Pattern's in JAVA Vol-II By Mark Grand, Wiley DreamTech.
3. JAVA Enterprise Design Patterns Vol-III By Mark Grand, Wiley DreamTech.
4. Head First Design Patterns By Eric Freeman-Oreilly-spd
5. Design Patterns Explained By Alan Shalloway, Pearson Education.
6. Pattern Oriented Software Architecture, F.Buschmann & others, John Wiley & Sons.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech III-II Sem. (CSE)

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## 15A05604 DESIGN AND ANALYSIS OF ALGORITHMS

**Course Objectives:**

- To know the importance of the complexity of a given algorithm.
- To study various algorithm design techniques.
- To utilize data structures and/or algorithmic design techniques in solving new problems.
- To know and understand basic computability concepts and the complexity classes P, NP, and NP-Complete.
- To study some techniques for solving hard problems.

**Course Outcomes:**

- Analyze the complexity of the algorithms
- Use techniques divide and conquer, greedy, dynamic programming, backtracking, branch and bound to solve the problems.
- Identify and analyze criteria and specifications appropriate to new problems, and choose the appropriate algorithmic design technique for their solution.
- Able to prove that a certain problem is NP-Complete.

**UNIT I****Introduction:** What is an Algorithm, Algorithm specification, Performance analysis.**Divide and Conquer:** General method, Binary Search, Finding the maximum and minimum, Merge sort, Quick Sort, Selection sort, Strassen's matrix multiplication.**UNIT II****Greedy Method:** General method, Knapsack problem, Job Scheduling with Deadlines, Minimum cost Spanning Trees, Optimal storage on tapes, Single-source shortest paths.**Dynamic programming:** General Method, Multistage graphs, All-pairs shortest paths, Optimal binary search trees, 0/1 knapsack, The traveling sales person problem.**UNIT III****Basic Traversal and Search Techniques:** Techniques for binary trees, Techniques for Graphs,

Connected components and Spanning trees, Bi-connected components and DFS

**Back tracking:** General Method, 8 – queens problem, Sum of subsets problem, Graph coloring and Hamiltonian cycles, Knapsack Problem.

**UNIT IV**

**Branch and Bound:** The method, Travelling salesperson, 0/1 Knapsack problem, Efficiency

Considerations.

**Lower Bound Theory:** Comparison trees, Lower bounds through reductions – Multiplying triangular matrices, inverting a lower triangular matrix, computing the transitive closure.

**UNIT V**

**NP – Hard and NP – Complete Problems:** NP Hardness, NP Completeness, Consequences of being in P, Cook's Theorem, Reduction Source Problems, Reductions: Reductions for some known problems

**Text Books:**

1. "Fundamentals of Computer Algorithms", Ellis Horowitz, S. Satraj Sahani and Rajasekhran, 2nd edition, University Press.2014,
2. "Design and Analysis of Algorithms", Parag Himanshu Dave, Himanshu Bhalchandra Dave, Pearson Education, Second Edition, 2009.

**Reference Books:**

1. "Introduction to Algorithms", second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd./ Pearson Education.
2. "Introduction to Design and Analysis of Algorithms A strategic approach", R.C.T.Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc Graw Hill.
3. "Data structures and Algorithm Analysis in C++", Allen Weiss, Second edition, Pearson education.
4. "Design and Analysis of algorithms", Aho, Ullman and Hopcroft, Pearson education.
5. "Algorithms" – Richard Johnson baugh and Marcus Schaefer, Pearson Education

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

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**15A05605 WEB AND INTERNET TECHNOLOGIES****Course Objectives:**

- To introduce client side scripting with Javascript and DHTML
- To introduce server side programming with Java servlets, JSP and PHP.
- To learn the basic web concepts and Internet protocols

**Course Outcomes:**

- Ability to create dynamic and interactive web sites
- Gain knowledge of client side scripting using java script and DHTML.
- Demonstrate understanding of what is XML and how to parse and use XML data
- Able to do server side programming with Java Servlets, JSP and PHP.
- Able to design rich client presentation using AJAX.

**UNIT I**

Introduction to Web Technologies: Introduction to Web servers like Apache 1.1, IIS XAMPP(Bundle Server), WAMP(Bundle Server), Handling HTTP Request and Response, installations of above servers, HTML and CSS: HTML 5.0 , XHTML, CSS 3.

**UNIT II**

**Java Script:** An introduction to JavaScript–JavaScript DOM Model–Date and Objects,–Regular Expressions– Exception Handling–Validation–Built-in objects–Event Handling–DHTML with JavaScript. **Servlets:** Java Servlet Architecture– Servlet Life Cycle– Form GET and POST actions– Session Handling– Understanding Cookies.

**Installing and Configuring Apache Tomcat Web Server:-** DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example - **JSP:** Understanding Java Server Pages–JSP Standard Tag Library(JSTL)–Creating HTML forms by embedding JSP code.

**UNIT III**

Introduction to PHP: The problem with other Technologies (Servlets and JSP), Downloading, installing, configuring PHP, Programming in a Web environment and The anatomy of a PHP Page.

Overview of PHP Data types and Concepts: Variables and data types, Operators, Expressions and Statements, Strings, Arrays and Functions.



PHP Advanced Concepts: Using Cookies, Using HTTP Headers, Using Sessions, Authenticating users, Using Environment and Configuration variables, Working with Date and Time.

#### **UNIT IV**

Creating and Using Forms: Understanding Common Form Issues, GET vs. POST, Validating form input, Working with multiple forms, and Preventing Multiple Submissions of a form.

XML: Basic XML- Document Type Definition XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

#### **UNIT V**

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing, Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application – SOAP.

#### **TEXT BOOKS:**

1. Beginning PHP and MySQL, 3<sup>rd</sup> Edition , Jason Gilmore, Apress Publications (Dream tech.).
2. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.
3. Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Prentice Hall, 5<sup>th</sup> Edition, 2011.
4. Herbert Schildt, "Java-The Complete Reference", Eighth Edition, Mc Graw Hill Professional, 2011.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

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**15A05606      ARTIFICIAL INTELLIGENCE  
(CBCC-I)****Course Objectives:**

To learn the basics of designing intelligent agents that can solve general purpose problems, represent and process knowledge, plan and act, reason under uncertainty and can learn from experiences.

**Course Outcomes:**

- Select a search algorithm for a problem and estimate its time and space complexities.
- Possess the skill for representing knowledge using the appropriate technique for a given problem
- Possess the ability to apply AI techniques to solve problems of game playing, expert systems, machine learning and natural language processing.

**UNIT I****PROBLEM SOLVING**

Introduction – Agents – Problem formulation – uninformed search strategies – heuristics – informed search strategies – constraint satisfaction

**UNIT II****LOGICAL REASONING**

Logical agents – propositional logic – inferences – first-order logic – inferences in firstorder logic – forward chaining – backward chaining – unification – resolution

**UNIT III****PLANNING**

Planning with state-space search – partial-order planning – planning graphs – planning and acting in the real world

**UNIT IV****UNCERTAIN KNOWLEDGE AND REASONING**

Uncertainty – review of probability - probabilistic Reasoning – Bayesian networks – inferences in Bayesian networks – Temporal models – Hidden Markov models.

**UNIT V**  
**LEARNING**

Learning from observation - Inductive learning – Decision trees – Explanation based learning –Statistical Learning methods - Reinforcement Learning

**TEXT BOOK:**

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education, 2003.

**REFERENCES:**

1. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press, 2004.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

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**15A05607 LINUX ENVIRONMENT SYSTEM  
(CBCC-I)**

**Course Objectives:****The student should be made to:**

- Understand the Multiuser, Multiprocessing, Multitasking, and multiprogramming environment.
- Learn the various flavors and installation types of Linux operating system.
- Experiences the installation and configuration status of Linux system.
- Learn the file system and various commands of Linux environment system.

**Course Outcomes:**

- Able to describe and use the LINUX operating system.
- Able to describe and use the fundamental LINUX system tools and utilities.
- Able to describe and write shell scripts in order to perform basic shell programming.
- Able to describe and understand the LINUX file system.

**UNIT- I**

**INTRODUCTION TO LINUX OPERATING SYSTEM:** Introduction and Types of Operating Systems, Linux Operating System, Features, Architecture Of Linux OS and Shell Interface, Linux System Calls, Linux Shared Memory Management, Device and Disk Management in Linux, Swap space and its management. File System and Directory Structure in Linux. Multi-Processing, load sharing and Multi-Threading in Linux, Types of Users in Linux, Capabilities of Super Users and equivalents.

**UNIT -II**

**INSTALLING LINUX AS A SERVER :** Linux and Linux Distributions ; Major differences between various Operating Systems (on the basis of: Single Users vs Multiusers vs Network Users; Separation of the GUI and the Kernel; Domains; Active Directory;).

**INSTALLING LINUX IN A SERVER CONFIGUARTION :** Before Installation; Hardware; Server Design ;Dual-Booting Issues; Modes of Installation; Installing Fedora Linux; Creating a Boot Disk; Starting the Installation; GNOME AND KDE

: The History of X Windows; The Downside; Enter GNOME; About GNOME ; Starting X Windows and GNOME; GNOME Basics; The GNOME Configuration Tool.

### **UNIT-III**

**INSTALLING SOFTWARE** : The Fedora Package Manager; Installing a New Package using dpkg and RPM; Querying a Package; Uninstalling a Package using dpkg and RPM; Compiling Software; Getting and Unpacking the Package; Looking for Documentation; Configuring the Package; Compiling Your Package; Installing the Package, Driver Support for various devices in linux.

**MANAGING USERS:** Home Directories ;Passwords; Shells; Startup Scripts; Mail; User Databases; The / etc /passwd File; The / etc / shadow File; The / etc /group File; User Management Tools; Command-Line User Management; User LinuxConf to Manipulate Users and Groups; SetUID and SetGID Programs.

### **UNIT IV**

**THE COMMAND LINE** : An Introduction to BASH, KORN, C, A Shell etc. ; BASH commands: Job Control; Environment Variables; Pipes; Redirection; Command-Line Shortcuts; Documentation Tools; The man Command; the text info System; File Listings; Owner ships and permissions; Listing Files; File and Directory Types; Change Ownership; Change Group; Change Mode ; File Management and Manipulation; Process Manipulation; Miscellaneous Tools; Various Editors Available like: Vi and its modes, Pico, Joe and emacs, , Su Command.

**BOOTING AND SHUTTING DOWN:** LILO and GRUB; Configuring LILO; Additional LILO options; Adding a New Kernel to Boot ; Running LILO; The Steps of Booting; Enabling and disabling Services.

### **UNIT-V**

**FILE SYSTEMS:** The Makeup File Systems; Managing File Systems; Adding and Partitioning a Disk; Network File Systems; Quota Management;

**CORE SYSTEM SERVICES:** The init Service; The inetd and xinetd Processes; The syslogd Daemon; The cron Program.

**PRINTING** : The Basic of lpd; Installing LPRng; Configuring /etc/printcap; The /ETC/lpd.perms File; Clients of lpd, Interfacing Printer through Operating System.

### **Text Books:**

1. [Linux Administration : A Beginner's Guide](#) by **Steve Shah** , Wale Soyinka, ISBN 0072262591 (0-07-226259-1), McGraw-Hill Education.
2. [Unix Shell Programming](#), Yashavant P. Kanetkar, BPB Publications, 2003.
3. UNIX Concepts and Applications by Sumitabha Das Tata McGraw-Hill, 2006.

4. Operating System Concepts 8<sup>th</sup> edition, by Galvin Wiley Global Education, 2012.

**References:**

1. Unix operating system, by [Grace Todino](#), [John Strang](#), [Jerry D. Peek](#) Oreily publications 1993.
2. Operating System Concepts 8<sup>th</sup> edition, by Galvin Wiley Global Education, 2012.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech III-II Sem. (CSE)

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**15A05608    SYSTEM APPLICATIONS & PRODUCT (SAP)**  
**(CBCC-I)**

**Course Objectives:**

1. Understand the role of enterprise systems in supporting business processes.
2. Identify key integration points between financial accounting and other processes.
3. Understand the role of the credit management process in fulfillment.
4. Analyze the key concepts associated with material planning.

**Course Outcomes:**

1. Adopt and apply an integrated perspective to business processes
2. Effectively use SAP® ERP to execute the key steps in the procurement process.
3. Ability to use SAP ERP to extract meaningful information about the production process.
4. Extract and evaluate meaningful information about the material planning process using the SAP ERP system.

**Unit 1:**

**Introduction to Business Processes:** The Functional Organizational Structure, Business Processes, Global Bike Incorporated (GBI). **Introduction to Enterprise Systems:** Enterprise Systems, Data in an Enterprise System, Reporting. **Introduction to Accounting:** Organizational Data, Master Data, Key Concepts, Processes, Reporting.

**Unit 2:**

**The Procurement Process:** Organizational Data, Master Data, Key Concepts, Process, Reporting.

**Unit 3:**

**The Fulfillment Process:** Organizational Data, Master Data, Process, Credit Management Process, Reporting.

**Unit 4:**

**The Production Process:** Master Data, Process, Reporting. **Inventory and Warehouse Management Processes:** Inventory Management, Organizational Data in warehouse Management, Master Data in Warehouse Management, Processes in Warehouse Management, Reporting.

**Unit 5:**

**The Material Planning Process:** Master Data, Process, Reporting, **Process Integration:** Procurement, Fulfillment, and IWM Processes, Procurement, Fulfillment, Production, and IWM Processes.

**Text Book:**

1. "Integrated Business Processes with ERP systems" Simha R.Magal, Jeffery word, JOHN WILEY & SON S, INC.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

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**15A01608 INTELLECTUAL PROPERTY RIGHTS  
(CBCC-I)****Course Objectives:**

*This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.*

**Course Outcomes:**

*On completion of this course, the student will have an understanding of the following:*

- Intellectual Property Rights and what they mean*
- Trade Marks and Patents and how to register them*
- Laws Protecting the Trade Marks and Patents*
- Copy Right and laws related to it.*

**UNIT – I**

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

**UNIT – II**

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

**UNIT – III**

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.

Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

**UNIT – IV**

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.

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Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

#### UNIT – V

New Developments Of Intellectual Property: New Developments In Trade Mark Law ;  
Copy Right Law, Patent Law, Intellectual Property Audits.

International Overview On Intellectual Property, International – Trade Mark Law, Copy  
Right Law, International Patent Law, International Development In Trade Secrets Law.

#### TEXT BOOKS & REFERENCES:

1. Intellectual Property Rights, Deborah. E. Bouchoux, Cengage Learning.
2. Intellectual Property Rights– Unleashmy The Knowledge Economy, Prabuddha  
Ganguli, Tate Mc Graw Hill Publishing Company Ltd.,

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

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**15A05609 WEB AND INTERNET TECHNOLOGIES LABORATORY****Course Objectives:**

- To introduce client side scripting with Javascript and DHTML
- To introduce server side programming with Java servlets, JSP and PHP.
- To learn the basic web concepts and Internet protocols

**Course Outcomes:**

- Ability to create dynamic and interactive web sites.
  - Gain knowledge of client side scripting using java scrip and DHTML.
  - Demonstrate understanding of what is XML and how to parse and use XML data
  - Able to do server side programming with Java Servelets, JSP and PHP.
1. To create a simple student bio-data form using html5 . it should contain the following name (text box), address (multiline text box),gender (radio button male,female),skill sets known (check boxes – c,c++,java,C#etc), extra curricular activities (text box), nationality (combobox) ,submit and reset button.
  2. To create an html page with different types of frames such as floating frame, navigation frame & mixed frame.
  3. Design the webpage by applying the different styles using inline, external & internal style sheets.
  4. Write a java script program to read .XML file and display data in a neat format.
  5. To write a Javascript program to define a user defined function for sorting the values in an array. Use HTML5 for user interface.
  6. To create an html page to demonstrate exception handling in javascript  
Create an html page named as “exception.html” and do the following.
    - i. within the script tag write code to handle exception
      - a) define a method RunTest() to get any string values(str) from the user and call the method Areletters(str).
      - b) In Areletters(str) method check whether str contain only alphabets (a-z, A-Z), if not throw exception.
      - c) Define a exception method Input Exception(str) to handle the exception thrown by the above method.
    - ii. Within the body tag define a script tag to call Runtest() method define.

7. Write a jsp servlet program to implement the single text field calculator.
8. Write a jsp servlet program to demonstrate session handling using
  - url rewriting
  - hidden formfield
  - cookies
  - sessions
9. To create a php program to demonstrate the different predefined function in array, Math, Data & Regular Expression.

Procedure:

- Create php file named as Regularexpression.php
  - for demonstrating the method for handling various strings with regular expression Array.php
  - for demonstrating the methods for handling the array values Math\_function.php
  - to demonstrate the predefined in math objects. Date\_time.php to demonstrate the predefined function in date subject
10. Write a program in PHP for a simple email processing with attachment using forms
  11. Write a program for PHP for a login script ; create a login database and store username and password
  12. Write a program in PHP to add, update and delete using student database
  13. Create a DTD to describe a library. Library has one or more books, members and staffs.
    - Each book has BookID(Attribute), Title, one or more Authors, Publisher Year of Publication, ISBN and Price.
    - Each Member has MemberID(Attribute), Name, Address, Phone number.
    - Each Staff has StaffID(Attribute), Name, Address, Phone number.
    - Each Author has AuthorID(Attribute), Name, Address, Phone number.
    - Each Publisher has PublisherID(Attribute), Name, Address, Phone number.
    - Use it in a XML document.
  14. Create a DTD to describe a Computer. A computer has following details,
    - Type of computer (this is an attribute), Which can be Desktop PC, Laptop, Palm Top, Server, Minicomputer or mainframe)
    - A Monitor with Serial Number (Attribute), Make, Model, Year of manufacture, Size, Type (which is either colour or monochrome)
    - A keyboard with Serial Number (Attribute), Make, Model, Year of manufacture, No of keys, Type( which is either Standard or Enhanced or Multimedia)
    - A mouse with Serial Number (Attribute), Make, Model, Year of manufacture, No of buttons, Scroll wheel (which is yes or no), Type (Which is Ball or Optical)

- A Mother board with Serial Number (Attribute), Make, Model, Year of manufacture, No of USB ports, No of IDE slots, No of SATA hubs, No of PCI slots, Display Type(Which is VGA or HDMI), Number of Processor slots, Type of Processors supported (must be a list), Type of RAM supported (Which is either SD or DDR1 or DDR2 or RD), Maximum Capacity of RAM, Form Factor (which is either AT or Baby AT), On Board sound card (Which is yes or no)
  - A Microprocessor with Serial Number (Attribute), Make, Model, Year of manufacture, speed (in GHz), No of Cores (Single, Dual, Quad)
  - A power supply with Serial Number (Attribute), Make, Model, Year of manufacture, Type (AT, ATX), Wattage
  - One or more hard disks, each Hard disk must have Serial Number (Attribute), Make, Model, Year of manufacture, capacity and type (Which is IDE or SATAI or SATAII, SCSI)
  - One or more RAM SIMM, with Serial Number (Attribute), Make, Model, Year of manufacture, Type (which must be SD, DDRI, DDRII, RD), capacity, operating frequency.
- Use it in a XML document.

15. Create a Schema to describe a Computer. Use the previous question's details and show an instance XML document.

16. Create a Schema to describe a library. Library has one or more - books, members and staffs.

- Each book has BookID(Attribute), Title, one or more Authors, Publisher Year of Publication, ISBN and Price.
- Each Member has MemeberID(Attribute), Name, Address, Phone number.
- Each Staff has StaffID(Attribute), Name, Address, Phone number.
- Each Author has AuthorID(Attribute), Name, Address, Phone number.
- Each Publisher has PublisherID(Attribute), Name, Address, Phone number.

Use the above DTD in a sample XML document.

17. Create a DTD to describe a bank that has one or more customers, accounts or Employee.

- Each Customer has a Customer ID, Name and address.
- Each account has an account ID, BranchID, CustomerID, AccountType and Balance.
- Each Employee has aEmpID, Name, Designation, DOJ, Salary and Address.

Use this DTD in a XML file.

18. Create Schema describe a bank that has one or more customers, accounts or depositors. Use the previous questions details. Also show a sample instance XML document.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

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**15A05610 DATA WAREHOUSING & MINING LABORATORY****Course Objectives:**

Learn how to build a data warehouse and query it (using open source tools like Pentaho Data Integration and Pentaho Business Analytics), Learn to perform data mining tasks using a data mining toolkit (such as open source WEKA), Understand the data sets and data preprocessing, Demonstrate the working of algorithms for data mining tasks such as association rule mining, classification, clustering and regression, Exercise the data mining techniques with varied input values for different parameters.

**Course Outcomes:**

- Ability to build Data Warehouse and Explore WEKA
- Ability to perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
- Ability to perform classification, clustering and regression on data sets
- Ability to design data mining algorithms

**Data Warehousing****Experiments:****Build Data Warehouse and Explore WEKA**

- A. Build a Data Warehouse/Data Mart (using open source tools like Pentaho Data Integration tool, Pentaho Business Analytics; or other data warehouse tools like Microsoft-SSIS, Informatica, Business Objects, etc.).
  - (i). Identify source tables and populate sample data
  - (ii). Design multi-dimensional data models namely Star, snowflake and Fact constellation schemas for any one enterprise (ex. Banking, Insurance, Finance, Healthcare, Manufacturing, Automobile, etc.).
  - (iii). Write ETL scripts and implement using data warehouse tools
  - (iv). Perform various OLAP operations such as slice, dice, roll up, drill up and pivot
  - (v). Explore visualization features of the tool for analysis like identifying trends etc.

- B. Explore WEKA Data Mining/Machine Learning Toolkit
- (i). Downloading and/or installation of WEKA data mining toolkit,
  - (ii). Understand the features of WEKA toolkit such as Explorer, Knowledge Flow interface, Experimenter, command-line interface.
  - (iii). Navigate the options available in the WEKA (ex. Select attributes panel, Preprocess panel, Classify panel, Cluster panel, Associate panel and Visualize panel)
  - (iv). Study the arff file format
  - (v). Explore the available data sets in WEKA.
  - (vi). Load a data set (ex. Weather dataset, Iris dataset, etc.)
  - (vii). Load each dataset and observe the following:
    - i. List the attribute names and they types
    - ii. Number of records in each dataset
    - iii. Identify the class attribute (if any)
    - iv. Plot Histogram
    - v. Determine the number of records for each class.
    - vi. Visualize the data in various dimensions

### **Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets**

- A. Explore various options available in Weka for preprocessing data and apply (like Discretization Filters, Resample filter, etc.) on each dataset
- B. Load each dataset into Weka and run Apriori algorithm with different support and confidence values. Study the rules generated.
- C. Apply different discretization filters on numerical attributes and run the Apriori association rule algorithm. Study the rules generated. Derive interesting insights and observe the effect of discretization in the rule generation process.

### **Demonstrate performing classification on data sets**

- A. Load each dataset into Weka and run Id3, J48 classification algorithm. Study the classifier output. Compute entropy values, Kappa statistic.
- B. Extract if-then rules from the decision tree generated by the classifier, Observe the confusion matrix and derive Accuracy, F-measure, TPrate, FPrate, Precision and Recall values. Apply cross-validation strategy with various fold levels and compare the accuracy results.
- C. Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbour classification. Interpret the results obtained.
- D. Plot RoC Curves

- E. Compare classification results of ID3, J48, Naïve-Bayes and k-NN classifiers for each dataset, and deduce which classifier is performing best and poor for each dataset and justify.

### **Demonstrate performing clustering on data sets**

- A. Load each dataset into Weka and run simple k-means clustering algorithm with different values of k (number of desired clusters). Study the clusters formed. Observe the sum of squared errors and centroids, and derive insights.
- B. Explore other clustering techniques available in Weka.
- C. Explore visualization features of Weka to visualize the clusters. Derive interesting insights and explain.

### **Demonstrate performing Regression on data sets**

- A. Load each dataset into Weka and build Linear Regression model. Study the clusters formed. Use Training set option. Interpret the regression model and derive patterns and conclusions from the regression results.
- B. Use options cross-validation and percentage split and repeat running the Linear Regression Model. Observe the results and derive meaningful results.
- C. Explore Simple linear regression technique that only looks at one variable

### **Resource Sites:**

- 1. <http://www.pentaho.com/>
- 2. <http://www.cs.waikato.ac.nz/ml/weka/>

### **Data Mining**

#### **Task 1: Credit Risk Assessment**

#### **Description:**

The business of banks is making loans. Assessing the credit worthiness of an applicant is of crucial importance. You have to develop a system to help a loan officer decide whether the credit of a customer is good, or bad. A bank's business rules regarding loans must consider two opposing factors. On the one hand, a bank wants to make as many loans as possible. Interest on these loans is the bank's profit source. On the other hand, a bank cannot afford to make too many bad loans. Too many bad loans could lead to the collapse of the bank. The bank's loan policy must involve a compromise: not too strict, and not too lenient.



To do the assignment, you first and foremost need is some knowledge about the world of credit. You can acquire such knowledge in a number of ways.

1. Knowledge Engineering. Find a loan officer who is willing to talk. Interview her and try to represent her knowledge in the form of production rules.
2. Books. Find some training manuals for loan officers or perhaps a suitable textbook on finance. Translate this knowledge from text form to production rule form.
3. Common sense. Imagine yourself as a loan officer and make up reasonable rules which can be used to judge the credit worthiness of a loan applicant.
4. Case histories. Find records of actual cases where competent loan officers correctly judged when, and when not to, approve a loan application.

### **The German Credit Data:**

Actual historical credit data is not always easy to come by because of confidentiality rules. Here is one such dataset, consisting of 1000 actual cases collected in Germany. [credit dataset \(original\)](#) Excel [spreadsheet](#) version of the German credit data.

In spite of the fact that the data is German, you should probably make use of it for this assignment. (Unless you really can consult a real loan officer !)

A few notes on the German dataset

- DM stands for Deutsche Mark, the unit of currency, worth about 90 cents Canadian (but looks and acts like a quarter).
- Owns\_telephone. German phone rates are much higher. So fewer people own telephones.
- Foreign\_worker. There are millions of these in Germany (many from Turkey). It is very hard to get German citizenship if you were not born of German parents.
- There are 20 attributes used in judging a loan applicant. The goal is to classify the applicant into one of two categories, good or bad.

### **Subtasks: (Turn in your answers to the following tasks)**

1. List all the categorical (or nominal) attributes and the real-valued attributes separately.
2. What attributes do you think might be crucial in making the credit assessment ? Come up with some simple rules in plain English using your selected attributes.
3. One type of model that you can create is a Decision Tree - train a Decision Tree using the complete dataset as the training data. Report the model obtained after training.

4. Suppose you use your above model trained on the complete dataset, and classify credit good/bad for each of the examples in the dataset. What % of examples can you classify correctly? (This is also called testing on the training set) Why do you think you cannot get 100 % training accuracy?
5. Is testing on the training set as you did above a good idea? Why or Why not ?
6. One approach for solving the problem encountered in the previous question is using cross-validation? Describe what is cross-validation briefly. Train a Decision Tree again using cross-validation and report your results. Does your accuracy increase/decrease? Why?
7. Check to see if the data shows a bias against "foreign workers" (attribute 20), or "personal-status" (attribute 9). One way to do this (perhaps rather simple minded) is to remove these attributes from the dataset and see if the decision tree created in those cases is significantly different from the full dataset case which you have already done. To remove an attribute you can use the preprocess tab in Weka's GUI Explorer. Did removing these attributes have any significant effect?
8. Another question might be, do you really need to input so many attributes to get good results? Maybe only a few would do. For example, you could try just having attributes 2, 3, 5, 7, 10, 17 (and 21, the class attribute (naturally)). Try out some combinations. (You had removed two attributes in problem 7. Remember to reload the arff data file to get all the attributes initially before you start selecting the ones you want.)
9. Sometimes, the cost of rejecting an applicant who actually has a good credit (case 1) might be higher than accepting an applicant who has bad credit (case 2). Instead of counting the misclassifications equally in both cases, give a higher cost to the first case (say cost 5) and lower cost to the second case. You can do this by using a cost matrix in Weka. Train your Decision Tree again and report the Decision Tree and cross-validation results. Are they significantly different from results obtained in problem 6 (using equal cost)?
10. Do you think it is a good idea to prefer simple decision trees instead of having long complex decision trees? How does the complexity of a Decision Tree relate to the bias of the model?
11. You can make your Decision Trees simpler by pruning the nodes. One approach is to use Reduced Error Pruning. Try reduced error pruning for training your Decision Trees using cross-validation (you can do this in Weka) and report the Decision Tree you

obtain? Also, report your accuracy using the pruned model. Does your accuracy increase?

12.(Extra Credit): How can you convert a Decision Trees into "if-then-else rules". Make up your own small Decision Tree consisting of 2-3 levels and convert it into a set of rules. There also exist different classifiers that output the model in the form of rules - one such classifier in Weka is rules. PART, train this model and report the set of rules obtained. Sometimes just one attribute can be good enough in making the decision, yes, just one ! Can you predict what attribute that might be in this dataset ? OneR classifier uses a single attribute to make decisions (it chooses the attribute based on minimum error). Report the rule obtained by training a one R classifier. Rank the performance of j48, PART and oneR.

### Task Resources:

- [Andrew Moore's Data Mining Tutorials](#) (See tutorials on Decision Trees and Cross Validation)
- [Decision Trees](#) (Source: Tan, MSU)
- [Tom Mitchell's book slides](#) (See slides on Concept Learning and Decision Trees)
- Weka resources:
  - o [Introduction to Weka](#) (html version) (download [ppt](#) version)
  - o [Download Weka](#)
  - o [Weka Tutorial](#)
  - o [ARFF format](#)
  - o [Using Weka from command line](#)

### Task 2: Hospital Management System

Data Warehouse consists Dimension Table and Fact Table.

REMEMBER The following

Dimension

The dimension object (Dimension):

\_ Name

\_ Attributes (Levels) , with one primary key

\_ Hierarchies

One time dimension is must.

About Levels and Hierarchies

Dimension objects (dimension) consist of a set of levels and a set of hierarchies defined over those levels. The levels represent levels of aggregation. Hierarchies describe parent-child relationships among a set of levels.

For example, a typical calendar dimension could contain five levels. Two hierarchies can be defined on these levels:

H1: YearL > QuarterL > MonthL > WeekL > DayL

H2: YearL > WeekL > DayL

The hierarchies are described from parent to child, so that Year is the parent of Quarter, Quarter the parent of Month, and so forth.

About Unique Key Constraints

When you create a definition for a hierarchy, Warehouse Builder creates an identifier key for each level of the hierarchy and a unique key constraint on the lowest level (Base Level)

Design a Hospital Management system data warehouse (TARGET) consistig of Dimensions Patient, Medicine, Supplier, Time. Where measures are ' NO UNITS', UNIT PRICE.

Assume the Relational database (SOURCE) table schemas as follows

TIME (day, month, year),

PATIENT (patient\_name, Age, Address, etc..)

MEDICINE ( Medicine\_Brand\_name, Drug\_name, Supplier, no\_units, Uinit\_Price, etc..)

SUPPLIER :( Supplier\_name, Medicine\_Brand\_name, Address, etc., )

If each Dimension has 6 levels, decide the levels and hierarchies, Assume the level names suitably.

Design the Hospital Management system data warehouse using all schemas. Give the example 4-D cube with assumption names.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-II Sem. (CSE)**

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**15A52602      ADVANCED ENGLISH LANGUAGE COMMUNICATION  
SKILLS (AELCS) LAB (Audit Course)****1. Introduction**

With increased globalization and rapidly changing industry expectations, employers are looking for the wide cluster of skills to cater to the changing demand. The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information and to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Taking part in social and professional communication.

**2 OBJECTIVES:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

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### **3. SYLLABUS:**

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

#### **UNIT-I: COMMUNICATION SKILLS**

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary Development
4. Common Errors

#### **UNIT-II: WRITING SKILLS**

1. Report writing
2. Resume Preparation
3. E-mail Writing

#### **UNIT-III: PRESENTATION SKILLS**

1. Oral presentation
2. Power point presentation
3. Poster presentation

#### **UNIT-IV: GETTING READY FOR JOB**

1. Debates
2. Group discussions
3. Job Interviews

#### **UNIT-V: INTERPERSONAL SKILLS**

1. Time Management
2. Problem Solving & Decision Making
3. Etiquettes

### **4. LEARNING OUTCOMES:**

- Accomplishment of sound vocabulary and its proper use contextually
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

## **5. MINIMUM REQUIREMENT:**

The Advanced English Communication Skills (AECS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

## **6. SUGGESTED SOFTWARE:**

The software consisting of the prescribed topics elaborated above should be procured and G

1. **Walden Infotech: Advanced English Communication Skills Lab**
2. **K-VAN SOLUTIONS-Advanced English Language Communication Skills lab**
3. **DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.**
4. **TOEFL & GRE( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)**
5. **Train2success.com**

## **7. BOOKS RECOMMENDED:**

1. **Objective English for Competitive Exams**, Hari Mohana Prasad, 4<sup>th</sup> edition, Tata Mc Graw Hill.
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, O U Press 3<sup>rd</sup> Edn. 2015.
3. **Essay Writing for Exams, Audrone Raskauskiene, Irena Ragaisience & Ramute Zemaitience,OUP, 2016**
4. **Soft Skills for Everyone**, Butterfield Jeff, Cengage Publications, 2011.
5. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. **Campus to Corporate**, Gangadhar Joshi, Sage Publications, 2015

7. **Communicative English**, E Suresh Kumar & P.Sreehari, Orient Blackswan, 2009.
8. **English for Success in Competitive Exams**, Philip Sunil Solomon OUP, 2015



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B. Tech IV-I Sem. (CSE)

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## 15A52601 MANAGEMENT SCIENCE

**Course Objectives:** The objective of the course is to equip the student the fundamental knowledge of management science and its application for effective management of human resource, materials and operation of an organization. It also aims to expose the students about the latest and contemporary developments in the field of management.

**UNIT –I: Introduction to Management:** Concept-Nature and Importance of Management, Functions-Evaluation of Scientific Management, Modern management-Motivation Theories-Leadership Styles-Decision Making Process-Designing Organization Structure-Principles and Types of Organization.

**UNIT- II: Operations Management:** Plant location and Layout, Methods of production, Work-Study-Statistical Quality Control through Control Charts, Objectives of Inventory Management, Need for Inventory Control-EOQ&ABC Analysis(Simple Problems)**Marketing Management:** Meaning, Nature, Functions of Marketing, Marketing Mix, Channels of distribution- Advertisement and sales promotion-Marketing strategies-Product Life Cycle.

**UNIT -III: Human Resource Management (HRM):** Significant and Basic functions of HRM-Human Resource Planning(HRP), Job evaluation, Recruitment and Selection, Placement and Induction-Wage and Salary administration. Employee Training and development-Methods-Performance Appraisal-Employee Grievances-techniques of handling Grievances.

**UNIT –IV: Strategic Management:** Vision, Mission, Goals and Strategy- Corporate Planning Process-Environmental Scanning-SWOT analysis-Different Steps in Strateg Formulation, Implementation and Evaluation. **Project Management:** Network Analysis- PERT, CPM, Identifying Critical Path-Probability-Project Cost Analysis, Project Crashing (Simple Problems).

**UNIT-V: Contemporary Management Practices:** Basic concepts of MIS-Materials Requirement Planning(MRP),Just-In-Time(JIT)System, Total Quality Management(TQM)-Six Sigma and Capability Maturity Models(CMM) evies, Supply Chain Management, Enterprise Resource Planning(ERP),Performance Management,

Business Process Outsourcing(BPO), Business Process Re-Engineering and Bench Marking, Balance Score Card.

**Course Outcomes:** This course enables the student to know the principles and applications of management knowledge and exposure to the latest developments in the field. This helps to take effective and efficient management decisions on physical and human resources of an organization. Beside the knowledge of Management Science facilitates for his/her personal and professional development.

**TEXT BOOKS:**

1. A.R Aryasri: Management Science, TMH, 2013
2. Kumar /Rao/Chalill 'Introduction to Management Science' Cengage, Delhi, 2012.

**REFERENCE BOOKS:**

1. A.K.Gupta "Engineering Management",S.CHAND, New Delhi, 2016.
2. Stoner, Freeman, Gilbert, Management, Pearson Education,New Delhi, 2012.
3. Kotler Philip & Keller Kevin Lane: Marketing Mangement , PHI,2013.
5. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005.
6. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
7. Memoria & S.V.Gauker, Personnel Management, Himalaya, 25/e, 2005
8. Parnell: Strategic Management, Biztantra, 2003.
9. L.S.Srinath: PERT/CPM,Affiliated East-West Press, 2005.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech IV-I Sem. (CSE)**

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**15A05701 GRID AND CLOUD COMPUTING****Course Objectives:**

The student should be made to:

- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing. Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

**Course Outcomes:**

The student should be able to

- Apply the security models in the grid and the cloud environment.
- Use the grid and cloud tool kits.
- Apply the concept of virtualization.
- Apply grid computing techniques to solve large scale scientific problems

**UNIT I INTRODUCTION**

Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – clusters of cooperative computers - Grid computing Infrastructures – cloud computing - service oriented architecture – Introduction to Grid Architecture and standards – Elements of Grid – Overview of Grid Architecture.

**UNIT II GRID SERVICES**

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

**UNIT III VIRTUALIZATION**

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource

Management – Virtualization for data center automation.

#### **UNIT IV PROGRAMMING MODEL**

Open source grid middleware packages – Globus Toolkit (GT4) Architecture , Configuration – Usage of Globus – Main components and Programming model - Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, command line and java interface, dataflow of File read & File write.

#### **UNIT V SECURITY**

Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

#### **TEXT BOOK:**

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, “Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet”, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

#### **REFERENCES:**

1. Jason Venner, “Pro Hadoop- Build Scalable, Distributed Applications in the Cloud”, A Press, 2009
2. Tom White, “Hadoop The Definitive Guide”, First Edition. O'Reilly, 2009.
3. Bart Jacob (Editor), “Introduction to Grid Computing”, IBM Red Books, Vervante, 2005
4. Ian Foster, Carl Kesselman, “The Grid: Blueprint for a New Computing Infrastructure”, 2<sup>nd</sup> Edition, Morgan Kaufmann.
5. Frederic Magoules and Jie Pan, “Introduction to Grid Computing” CRC Press, 2009.
6. Daniel Minoli, “A Networking Approach to Grid Computing”, John Wiley Publication, 2005.
7. Barry Wilkinson, “Grid Computing: Techniques and Applications”, Chapman and Hall, CRC, Taylor and Francis Group, 2010.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech IV-I Sem. (CSE)**

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**15A05702 INFORMATION SECURITY****Course Objectives:**

- Extensive, thorough and significant understanding of the concepts, issues, principles and theories of computer network security
- Identifying the suitable points for applying security features for network traffic
- Understanding the various cryptographic algorithms and implementation of the same at software level
- Understanding the various attacks, security mechanisms and services

**Course Outcomes:**

- Protect the network from both internal and external attacks
- Design of new security approaches
- Ability to choose the appropriate security algorithm based on the requirements.

**Unit-I**

Computer Security concepts, The OSI Security Architecture, Security attacks, Security services and Security mechanisms, A model for Network Security

Classical encryption techniques- symmetric cipher model, substitution ciphers, transposition ciphers, Steganography.

Modern Block Ciphers: Block ciphers principles, Data encryption standard (DES), Strength of DES, linear and differential cryptanalysis, block cipher modes of operations, AES, RC4.

**Unit-II**

Introduction to Number theory – Integer Arithmetic, Modular Arithmetic, Matrices, Linear Congruence, Algebraic Structures,  $GF(2^n)$  Fields, Primes, Primality Testing, Factorization, Chinese remainder Theorem, Quadratic Congruence, Exponentiation and Logarithm.

Public-key cryptography - Principles of public-key cryptography, RSA Algorithm, Diffie-Hellman Key Exchange, ElGamal cryptographic system, Elliptic Curve Arithmetic, Elliptic curve cryptography

**Unit-III**

Cryptographic Hash functions: Applications of Cryptographic Hash functions, Requirements and security, Hash functions based on Cipher Block Chaining, Secure Hash Algorithm (SHA)

Message Authentication Codes: Message authentication Requirements, Message authentication functions, Requirements for Message authentication codes, security of MACs, HMAC, MACs based on Block Ciphers, Authenticated Encryption  
 Digital Signatures-RSA with SHA & DSS

#### **Unit-IV**

Key Management and distribution: Symmetric key distribution using Symmetric Encryption, Symmetric key distribution using Asymmetric, Distribution of Public keys, X.509 Certificates, Public key Infrastructure.

User Authentication: Remote user Authentication Principles, Remote user Authentication using Symmetric Encryption, Kerberos, Remote user Authentication using Asymmetric Encryption, Federated Identity Management, Electronic mail security: Pretty Good Privacy (PGP), S/MIME.

#### **Unit-V**

Security at the Transport Layer(SSL and TLS) : SSL Architecture, Four Protocols, SSL Message Formats, Transport Layer Security, HTTPS, SSH

Security at the Network layer (IPSec): Two modes, Two Security Protocols, Security Association, Security Policy, Internet Key Exchange.

System Security: Description of the system, users, Trust and Trusted Systems, Buffer Overflow and Malicious Software, Malicious Programs, worms, viruses, Intrusion Detection System(IDS), Firewalls

#### **Text books:**

1. "Cryptography and Network Security", Behrouz A. Frouzan and Debdeep Mukhopadhyay, Mc Graw Hill Education, 2<sup>nd</sup> edition, 2013.
2. "Cryptography and Network Security: Principals and Practice", William Stallings, Pearson Education , Fifth Edition, 2013.

#### **References:**

1. "Network Security and Cryptography", Bernard Menezes , Cengage Learning.
2. "Cryptography and Security", C.K. Shymala, N. Harini and Dr. T.R. Padmanabhan, Wiley-India.
3. "Applied Cryptography, Bruce Schiener, 2<sup>nd</sup> edition, John Wiley & Sons.
4. "Cryptography and Network Security", Atul Kahate, TMH.
5. "Introduction to Cryptography", Buchmann, Springer.
6. "Number Theory in the Spirit of Ramanujan", Bruce C.Berndt, University Press
7. "Introduction to Analytic Number Theory", Tom M.Apostol, University Press

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech IV-I Sem. (CSE)**

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**15A05703 MOBILE APPLICATION DEVELOPMENT****Course Objectives:**

- To understand fundamentals of android operating systems.
- Illustrate the various components, layouts and views in creating android applications
- To understand fundamentals of android programming.

**Course Outcomes:**

- Create data sharing with different applications and sending and intercepting SMS.
- Develop applications using services and publishing android applications.
- To demonstrate their skills of using Android software development tools

**Unit 1: Introduction to Android:**

The Android 4.1 jelly Bean SDK, Understanding the Android Software Stack, installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text view Control, Using the Android Emulator, The Android Debug Bridge(ADB), Launching Android Applications on a Handset.

**Unit 2: Basic Widgets:**

Understanding the Role of Android Application Components, Understanding the Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons

**Unit 3: Building Blocks for Android Application Design:**

Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout, Adapting to Screen orientation.

**Utilizing Resources and Media** Resources, Creating Values Resources, Using Drawable Resources, Switching States with Toggle Buttons, Creating an Images Switcher Application, Scrolling Through Scroll View, playing Audio, Playing Video, Displaying Progress with Progress Bar, Using Assets.

**Unit 4: Using Selection widgets and Debugging:**

Using List View, Using the Spinner control, Using the GridView Control, Creating an Image Gallery Using the ViewPager Control, Using the Debugging Tool: Dalvik Debug Monitor Service(DDMS), Debugging Application, Using the Debug Perspective.

**Displaying And Fetching Information Using Dialogs and Fragments:** What Are Dialogs?, Selecting the Date and Time in One Application, Fragments, Creating Fragments with java Code, Creating Special Fragments

**Unit 5: Building Menus and Storing Data:**

Creating Interface Menus and Action Bars, Menus and Their Types, Creating Menus Through XML, Creating Menus Through Coding, Applying a Context Menu to a List View, Using the Action Bar, Replacing a Menu with the Action Bar, Creating a Tabbed Action Bar, Creating a Drop-Down List Action Bar

**Using Databases:**

Using the SQLiteOpenHelperclasss, Accessing Databases with the ADB, Creating a Data Entry Form,

**Communicating with SMS and Emails:**

Understanding Broadcast Receivers, Using the Notification System, Sending SMS Messages with Java Code, Receiving SMS Messages, Sending Email, Working With Telephony Manager.

**Text Books**

1. Android Programming by B.M Harwani, Pearson Education, 2013.

**References Text Books:**

1. Android application Development for Java Programmers, James C Sheusi, Cengage Learning
2. Android In Action by w.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz., Dreamtech.
3. Professional Android 4 applications development, Reto Meier, Wiley India, 2012.
4. Beginning Android 4 applications development, Wei- Meng Lee, Wiley India,2013



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech IV-I Sem. (CSE)**

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**15A05704 SOFTWARE ARCHITECTURE  
(CBCC-II)****Course Objectives:**

- Introduction to the fundamentals of software architecture.
- Software architecture and quality requirements of a software system
- Fundamental principles and guidelines for software architecture design, architectural styles, patterns, and frameworks.
- Methods, techniques, and tools for describing software architecture and documenting design rationale.
- Software architecture design and evaluation processes.

**Course Outcomes:**

- The student will be able to:
- Design and motivate software architecture for large scale software systems
- Recognize major software architectural styles, design patterns, and frameworks
- Describe a software architecture using various documentation approaches and architectural
- description languages
- Generate architectural alternatives for a problem and select among them
- Use well-understood paradigms for designing new systems

**UNIT I: ENVISIONING ARCHITECTURE**

What is software Architecture-What is Software Architecture, Other Points of View, Architectural Patterns, Reference Models, and Reference Architectures, Importance of Software Architecture, Architectural Structures and views.

**ENVISIONING ARCHITECTURE:**

Architecture Business Cycle- Architectures influences, Software Processes and the Architecture Business Cycle, Making of “Good” Architecture.

**UNIT II: DESIGNING THE ARCHITECTURE WITH STYLES**

Designing the Architecture: Architecture in the Life Cycle, Designing the Architecture, Formatting the Team Structure, Creating a Skeletal System.

Architecture Styles: Architectural Styles, Pipes and Filters, Data Abstraction and Object-Oriented Organization, Event-Based, Implicit Invocation, Layered Systems, Repositories, Interpreters. 2013-2014

### **UNIT III: CREATING AN ARCHITECTURE-I**

Creating an Architecture: Understanding Quality Attributes – Functionality and Architecture, Architecture and Quality Attributes, System Quality Attributes, Quality Attribute. Scenarios in Practice, Other System Quality Attributes, Business Qualities, Architecture Qualities.

Achieving Qualities: Introducing Tactics, Availability Tactics, Modifiability Tactics, Performance Tactics, Security Tactics, Testability Tactics, Usability Tactics.

### **UNIT IV: CREATING AN ARCHITECTURE-II**

Documenting Software Architectures: Use of Architectural Documentation, Views, Choosing the Relevant Views, Documenting a view, Documentation across Views. Reconstructing Software Architecture: Introduction, Information Extraction, Database Construction, View Fusion, and Reconstruction.

### **UNIT V: ANALYZING ARCHITECTURES**

The ATAM: Participants in the ATAM, Outputs of The ATAM, Phases Of the ATAM. The CBAM: Decision-Making Context, The Basis for the CBAM, Implementing the CBAM. The World Wide Web: A Case study in Interoperability- Relationship to the Architecture Business Cycle, Requirements and Qualities, Architecture Solution, Achieving Quality Goals.

### **TEXT BOOKS:**

1. Software Architectures in Practice , Len Bass, Paul Clements, Rick Kazman, 2nd Edition, Pearson Publication.
2. Software Architecture , Mary Shaw and David Garlan, First Edition, PHI Publication, 1996.

### **REFERENCES BOOKS:**

1. **Software Design: From Programming to Architecture**, Eric Braude, Wiley, 2004.
2. N. Domains of Concern in Software Architectures and Architecture Description Languages. Medvidovic and D. S. Rosenblum. USENIX.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech IV-I Sem. (CSE)**

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**15A05705      COMPUTER GRAPHICS  
(CBCC-II)****Course Objectives:**

- To provide students with an understanding of the algorithms and theories that form the basis of computer graphics and modeling.
- To give students skills necessary in the production of 2D & 3D models.

**Course Outcomes:**

- Acquire familiarity with the relevant mathematics of computer graphics.
- Be able to design basic graphics application programs, including animation
- Be able to design applications that display graphic images to given specifications

**UNIT I**

**Introduction**, Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices

Output primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

**UNIT II**

**2-D Geometrical transforms:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

**2-D Viewing :** The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

**UNIT III**

**3-D Object representation:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces. Basic illumination models, polygon rendering methods.

**UNIT IV**

**3-D Geometric transformations:** Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

#### **UNIT V**

**Visible surface detection methods:** Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods  
**Computer animation:** Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

#### **TEXT BOOKS:**

1. "Computer Graphics C version", Donald Hearn and M. Pauline Baker, Pearson education.
2. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

#### **REFERENCE BOOKS:**

1. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc Graw hill edition.
2. "Procedural elements for Computer Graphics", David F Rogers, Tata Mc Graw hill, 2nd edition.
3. "Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
4. "Principles of Computer Graphics", Shalini, Govil-Pai, Springer.
5. "Computer Graphics", Steven Harrington, TMH.
6. Computer Graphics, F.S.Hill, S.M.Kelley, PHI.
7. Computer Graphics, P.Shirley, Steve Marschner & Others, Cengage Learning.
8. Computer Graphics & Animation, M.C.Trivedi, Jaico Publishing House.
9. An Integrated Introduction to Computer Graphics and Geometric Modelling, R.Goldman, CRC Press, Taylor & Francis Group.
10. Computer Graphics, Rajesh K.Maurya, Wiley India.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech IV-I Sem. (CSE)**

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**15A05706      MACHINE LEARNING  
(CBCC-II)****Course Objectives:**

- To understand the basic theory underlying machine learning.
- To be able to formulate machine learning problems corresponding to different applications.
- To understand a range of machine learning algorithms along with their strengths and weaknesses.
- To be able to apply machine learning algorithms to solve problems of moderate complexity.

**Course Outcomes:**

- Ability to understand what is learning and why it is essential to the design of intelligent machines.
- Ability to design and implement various machine learning algorithms in a wide range of real-world applications.
- Acquire knowledge deep learning and be able to implement deep learning models for language, vision, speech, decision making, and more

**Unit I:**

What is Machine Learning?, Examples of machine learning applications, supervised Learning: learning a class from examples, Vapnik- Chervonenkis dimension, probably approximately correct learning, noise, learning multiple classes, regression, model selection and generalization, dimensions of a supervised machine learning algorithm. Decision Tree Learning: Introduction, Decisions Tree representation, Appropriate problems for decision tree learning, the basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, issues in decision tree learning, Artificial Neural Networks: Introduction, Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithm, Remarks on the BACKPROPGRATION Algorithm, An illustrative Example: Face Recognition, Advanced Topics in Artificial Neural Networks.

**Unit 2:**

Evaluating Hypotheses: Motivation, Estimating hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, differences in error of two hypothesis, comparing learning algorithms, Bayesian Learning: Introduction, Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and least

squared error hypothesis, Maximum Likelihood hypothesis for predicting probabilities, Minimum Description Length Principle, Bayes Optimal Classifier, Gibbs Algorithm, Naïve Bayes Classifier, Bayesian Belief Network, EM Algorithm

### **Unit 3:**

Dimensionality Reduction: Introduction, Subset selection, principle component analysis, feature embedding, factor analysis, singular value decomposition and matrix factorization, multidimensional scaling, linear discriminant analysis, canonical correlation analysis, Isomap, Locally linear embedding, laplacian eigenmaps, Clustering: Introduction, Mixture densities, K- Means clustering, Expectations-Maximization algorithm, Mixture of latent variable models, supervised learning after clustering, spectral clustering, Hierarchical clustering, Choosing the number of clusters, Nonparametric Methods: Introduction, Non Parametric density estimation, generalization to multivariate data, nonparametric classification, condensed nearest neighbor, Distance based classification, outlier detection, Nonparametric regression: smoothing models, how to choose the smoothing parameter

### **Unit 4:**

Linear Discrimination: Introduction, Generalizing the linear model, geometry of the linear discrimination, pair wise separation, parametric discrimination revisited, gradient descent, logistic discrimination, discrimination by regression, learning to rank, Multilayer Perceptrons: Introduction, the perceptron, training a perceptron, learning Boolean functions, multilayer perceptrons, MLP as a universal approximator, Back propagation algorithm, Training procedures, Tuning the network size, Bayesian view of learning, dimensionality reduction, learning time, deep learning

### **Unit 5:**

Kernel Machines: Introduction, Optimal separating hyperplane, the non separable case: Soft Margin Hyperplane, v-SVM, kernel Trick, Vectorial kernels, defining kernels, multiple kernel learning, multicast kernel machines, kernel machines for regression, kernel machines for ranking, one-class kernel machines, large margin nearest neighbor classifier, kernel dimensionality reduction, Graphical models: Introduction, Canonical cases for conditional independence, generative models, d separation, belief propagation, undirected Graphs: Markov Random files, Learning the structure of a graphical model, influence diagrams.

### **Text Books:**

- 1) Machine Learning by Tom M. Mitchell, Mc Graw Hill Education, Indian Edition, 2016.
- 2) Introduction to Machine learning, Ethem Alpaydin, PHI, 3<sup>rd</sup> Edition, 2014

### **References Books:**

- 1) Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis, Page 167

B. Tech IV-I Sem. (CSE)

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15A05707

### SOFTWARE PROJECT MANAGEMENT (CBCC-III)

#### **Course Objectives:**

The main goal of software development projects is to create a software system with a predetermined functionality and quality in a given time frame and with given costs. For achieving this goal, models are required for determining target values and for continuously controlling these values. This course focuses on principles, techniques, methods & tools for model-based management of software projects, assurance of product quality and process adherence (quality assurance), as well as experience-based creation & improvement of models (process management). The goals of the course can be characterized as follows:

- Understanding the specific roles within a software organization as related to project and process management
- Describe the principles, techniques, methods & tools for model-based management of software projects, assurance of product quality and process adherence (quality assurance), as well as experience-based creation & improvement of models (process management).
- Understanding the basic infrastructure competences (e.g., process modeling and measurement)
- Understanding the basic steps of project planning, project management, quality assurance, and process management and their relationships

#### **Course Outcomes:**

- Describe and determine the purpose and importance of project management from the perspectives of planning, tracking and completion of project.
- Compare and differentiate organization structures and project structures
- Implement a project to manage project schedule, expenses and resources with the application of suitable project management tools

#### **UNIT I**

**Conventional Software Management:** The waterfall model, conventional software Management performance. Evolution of Software Economics: Software Economics, pragmatic software cost estimation

## **UNIT II**

**Improving Software Economics:** Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

**The old way and the new:** The principles of conventional software engineering, principles of modern software management, transitioning to an iterative process

## **UNIT III**

**Life cycle phases:** Engineering and production stages, inception, Elaboration, construction, transition phases.

**Artifacts of the process:** The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts. Model based software architectures: A Management perspective and technical perspective.

## **UNIT IV**

**Work Flows of the process:** Software process workflows, Inter Trans workflows. Checkpoints of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Interaction planning process, Pragmatic planning.

**Project Organizations and Responsibilities:** Line-of-Business Organizations, Project Organizations, evolution of Organizations.

**Process Automation:** Automation Building Blocks, The Project Environment

## **UNIT V**

**Project Control and Process instrumentation:** The server care Metrics, Management indicators, quality indicators, life cycle expectations pragmatic Software Metrics, Metrics automation. Tailoring the Process: Process discriminates, Example.

**Future Software Project Management:** Modern Project Profiles Next generation Software economics, modern Process transitions.

**Case Study:** The Command Center Processing and Display System-Replacement (CCPDS-R)

### **Text Books:**

1. Software Project Management, Walker Royce, Pearson Education.
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, Tata McGraw Hill



**Reference Books :**

1. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006
2. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
3. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, second edition, Wiley India, 2004.
4. Agile Project Management, Jim Highsmith, Pearson education, 2004
5. The art of Project management, Scott Berkun, O'Reilly, 2005.
6. Software Project Management in Practice, Pankaj Jalote, Pearson Education, 2002

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech IV-I Sem. (CSE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>15A05708</b>	<b>DISTRIBUTED SYSTEMS (CBCC-III)</b>			

**Course Objectives:**

The student should be made to:

- Understand the issues involved in studying process and resource management.
- Understand in detail the system level and support required for distributed system.
- Introduce the idea of peer to peer services and file system.
- Understand foundations of Distributed Systems.

**Course Outcomes:**

Student should be able to:

- Design process and resource management systems.
- Apply remote method invocation and objects.
- Apply network virtualization.
- Discuss trends in Distributed Systems.

**UNIT I****INTRODUCTION**

Examples of Distributed Systems – Trends in Distributed Systems – Focus on resource sharing – Challenges. Case study: World Wide Web.

**UNIT II****COMMUNICATION IN DISTRIBUTED SYSTEM**

System Model – Inter process Communication - the API for internet protocols – External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation And Objects: Remote Invocation – Introduction - Request-reply protocols - Remote procedure call - Remote method invocation. Case study: Java RMI - Group communication - Publish-subscribe systems - Message queues - Shared memory approaches - Distributed objects - Case study: Enterprise Java Beans -from objects to components.

**UNIT III****PEER TO PEER SERVICES AND FILE SYSTEM**

Peer-to-peer Systems – Introduction - Napster and its legacy - Peer-to-peer – Middleware - Routing overlays. Overlay case studies: Pastry, Tapestry- Distributed File Systems –Introduction - File service architecture – Andrew File system. File System: Features-File model -File accessing models - File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

**UNIT IV****SYNCHRONIZATION AND REPLICATION**

Introduction - Clocks, events and process states - Synchronizing physical clocks- Logical time and logical clocks - Global states – Coordination and Agreement – Introduction - Distributed mutual exclusion – Elections – Transactions and Concurrency Control– Transactions -Nested transactions – Locks – Optimistic concurrency control - Timestamp ordering – Atomic Commit protocols -Distributed deadlocks – Replication – Case study – Coda.

**UNIT V****PROCESS & RESOURCE MANAGEMENT**

Process Management: Process Migration: Features, Mechanism - Threads: Models, Issues, Implementation. Resource Management: Introduction- Features of Scheduling Algorithms –Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

**TEXT BOOK:**

1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.

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**15A05709****REAL TIME SYSTEMS  
(CBCC-III)****Course Objectives:**

- Acquire skills necessary to design and develop embedded applications by means of real-time operating systems
- Understand embedded real-time operating systems

**Course Outcomes:**

- Characterize real-time systems and describe their functions
- Analyze, design and implement a real-time system
- Apply formal methods to the analysis and design of real-time systems
- Apply formal methods for scheduling real-time systems
- Characterize and describe reliability and fault tolerance issues and approaches.

**Unit-1**

**Typical Real time Applications:** Digital control, High-level control, Signal processing, other Real-time Applications.

**Hard versus Soft Real-Time Systems:** Jobs and processors, Release time, dead lines and Timing constraints, Hard and soft timing constraints, Hard Real time systems, Soft Real-time Systems.

**A Reference Model of Real Time Systems:** Processors and resources, Temporal parameters of Real time workload, periodic task model, precedence constraints and data dependency, Functional parameter, Resource Parameters of Jobs and Parameters of Resources, Scheduling Hierarchy.

**Commonly used Approaches to real time Scheduling:** Clock-Driven Approach, Weighted Round-Robin Approach, Priority driven Approach, Dynamic vs Static Systems, Effective release time and deadlines, Optimality of the EDF and LST algorithms, Nonoptimality of the EDF and LST algorithms, Challenges in validating timing constraints in priority driven System, Off line vs On line scheduling, summary.

**Unit-2**

Clock-Driven Scheduling: Notations and Assumptions, static, Timer-Driven scheduler, General Structure of the Cyclic Scheduler, Improving the average response time of Aperiodic Jobs, Scheduling sporadic Jobs, Practical considerations and generalizations, Algorithm for generating Static Schedules, Pros and cons of Clock-driven scheduling, summary.

### Unit-3

**Priority-Driven Scheduling of periodic Tasks :** Static Assumption, Fixed-priority vs Dynamic-priority Algorithms, Maximum Schedulable Utilization, Optimality of the RM and DM Algorithms, A Schedulability test for Fixed-priority tasks with Short Response time, A Schedulability test for Fixed-priority tasks with arbitrary Response time, Sufficient Schedulability conditions for the RM and DM Algorithms, summary.

### Unit-4

**Scheduling Aperiodic and Sporadic Jobs in Priority Driven Systems:** Assumptions and approaches, Diferrable servers, Sporadic Servers, Constant utilization, total bandwidth and weighted fair –Queueing servers, Slack stealing in Dead-line Driven System, Stack stealing in Fixed-priority systems, Scheduling of sporadic jobs, Real-time performance for jobs with soft timing constraints, A two-level scheme for Integrated scheduling.

### Unit-5

**Resources and Resource access control:** Assumptions on Resources and their usage, Effects of Resource contention and resource access control, Non Preemptive critical section, Basic Priority inheritance protocol, Basic Priority ceiling protocol, Stack –based, Priority ceiling protocol, Use of priority ceiling protocol in Dynamic priority systems, pre-emption ceiling protocol, Controlling accesses to Multiple unit Resources, Controlling concurrent accesses to data objects.

**Multiprocessor Scheduling, Resource access control, and Synchronization:** Model of Multiprocessor and Distributed Systems, Task assignment, Multiprocessor Priority ceiling protocol, Elements of Scheduling Algorithms for End-to-End Periodic Tasks, Schedulability of Fixed-priority End-to-End periodic Tasks, End to End tasks in heterogeneous Systems, Predictability and validation of Dynamic Multiprocessor Systems, Summary.

### Text Book:

1. “Real-Time Systems” by Jane W.S Liu, Pearson Edition, 2006.

### Reference Text Book:

1. Real-Time Systems: Scheduling, Analysis, and Verification, Cheng, A. M. K.: Wiley, 2002.
2. Z.: Scheduling in Real-Time Systems, by Cottet, F., Delacroix, J., Kaiser, C., Mammeri John Wiley & Sons, 2002.
3. Real-Time Systems, C. M., Shin, K. G. McGraw-Hill, Krishna 1997.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech IV-I Sem. (CSE)

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## 15A05710 GRID AND CLOUD COMPUTING LABORATORY

**Course Objectives:**

- The student should be made to:
- Be familiar with developing web services/Applications in grid framework.
- Be exposed to tool kits for grid and cloud environment.
- Learn to use Hadoop
- Learn to run virtual machines of different configuration.

**Course Outcomes:**

The student should be able to  
 Design and Implement applications on the Cloud.  
 Design and implement applications on the Grid.  
 Use the grid and cloud tool kits.

**GRID COMPUTING PROGRAMS USING GRIDSIM**

- 1 Program to creates one Grid resource with three machines
- 2 *Program to to create one or more Grid users. A Grid user contains one or more Gridlets*
- 3 *Program to shows how two GridSim entities interact with each other ; main( ie example3 ) class creates Gridlets and sends them to the other GridSim entities, i.e. Test class*
- 4 Program shows how a grid user submits its Gridlets or tasks to one grid resource entity
- 5 Program to show how a grid user submits its Gridlets or task to many grid resource entities
- 6 Program to show how to create one or more grid users and submits its Gridlets or task to many grid resource entities
- 7 Program to creates one Grid resource with three machines

***Grid computing programs using Use Globus Toolkit or equivalent:***

- 1 Develop a new Web Service for Calculator.
- 2 Develop new OGSA-compliant Web Service.
- 3 Using Apache Axis develop a Grid Service.
- 4 Develop applications using Java or C/C++ Grid APIs
- 5 Develop secured applications using basic security mechanisms available in Globus Toolkit.

- 6 Develop a Grid portal, where user can submit a job and get the result. Implement it with and without GRAM concept.

### CLOUD COMPUTING

#### Programs on SaaS

- 1 Create an word document of your class time table and store locally and on the cloud with doc, and pdf format . ( use [www.zoho.com](http://www.zoho.com) and [docs.google.com](https://docs.google.com))
- 2 Create a spread sheet which contains employee salary information and calculate gross and total sal using the formula  
 $DA = 10\% \text{ OF BASIC}$   
 $HRA = 30\% \text{ OF BASIC}$   
 $PF = 10\% \text{ OF BASIC IF BASIC} \leq 3000$   
 $12\% \text{ OF BASIC IF BASIC} > 3000$   
 $TAX = 10\% \text{ OF BASIC IF BASIC} \leq 1500$   
 $= 11\% \text{ OF BASIC IF BASIC} > 1500 \text{ AND BASIC} \leq 2500$   
 $= 12\% \text{ OF BASIC IF BASIC} > 2500$   
 ( use [www.zoho.com](http://www.zoho.com) and [docs.google.com](https://docs.google.com))  
 $NET\_SALARY = BASIC\_SALARY + DA + HRA - PF - TAX$
- 3 Prepare a ppt on cloud computing –introduction , models, services ,and architecture  
***Ppt should contain explanations, images and at least 20 pages***  
 ( use [www.zoho.com](http://www.zoho.com) and [docs.google.com](https://docs.google.com))
- 4 Create your resume in a neat format using google and zoho cloud

#### Programs on PaaS

- 1 Write a Google app engine program to generate n even numbers and deploy it to google cloud
- 2 Google app engine program multiply two matrices
- 3 Google app engine program to validate user ; create a database login(username, password) in mysql and deploy to cloud
- 4 Write a Google app engine program to display nth largest no from the given list of numbers and deploy it into google cloud
- 5 Google app engine program to validate the user Use mysql to store user info and deploy on to the cloud
- 6 Implement Prog 1-5 using Microsoft Azure

**CASE STUDY- cloud computing**

<b>Sr. No.</b>	<b>Title of Experiment</b>	<b>Aim of the Experiment</b>	<b>Demonstration Equipments/ Components to be required</b>	<b>Type of Experiment/ Demonstration (Lab/Classroom)</b>
1	Case Study of Amazon	To understand the services of Amazon elastic cloud.	Computers with Internet Connection	Experiment: Student perform practical under supervision of faculty and Lab technician.
2	Case Study of Azure	To understand the services of Microsoft azure.	Computers with Internet Connection	Experiment: Student perform practical under supervision of faculty and Lab technician.
3	Case Study of Hadoop	To understand the services of hadoop.	Computers with Internet Connection	Experiment: Student perform practical under supervision of faculty and Lab technician.
4	Case Study of Aneka	To understand the services of aneka elastic cloud.	Computers with Internet Connection	Experiment: Student perform practical under supervision of faculty and Lab technician.
5	Case Study of Google Apps	To understand the services of google apps engine.	Computers with Internet Connection	Experiment: Student perform practical under supervision of



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				faculty and Lab technician.
6	Google apps business solution for data access and data upload	To understand the business solution application of Google apps.	Computers with Internet Connection	Experiment: Student perform practical under supervision of faculty and Lab technician.
7	Control panel software manager Application of hypervisors	To understand the application of hypervisors.	Computers with Internet Connection	Experiment: Student perform practical under supervision of faculty and Lab technician.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech IV-I Sem. (CSE)

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15A05711 MOBILE APPLICATION DEVELOPMENT LABORATORY

**Course Objectives:**

- To understand fundamentals of android operating systems.
- Illustrate the various components, layouts and views in creating android applications
- To understand fundamentals of android programming.

**Course Outcomes:**

- Create data sharing with different applications and sending and intercepting SMS.
- Develop applications using services and publishing android applications.
- To demonstrate their skills of using Android software development tools

**1. Setting Up the Development Environment****1.1 Download/Install the SDK**

For in-depth instructions, visit [Android Installation Documentation](#). Otherwise perform the following steps.

- Go to <http://developer.android.com/sdk/index.html>.
- Unpack to a convenient location - Remember the full path to this location, we will refer to it as <android\_sdk\_dir> for the rest of the lab.
  - <android\_sdk\_dir> would then be /home/<username>/android\_dir.
- Add the path to the <android\_sdk\_dir>/tools directory to your system PATH
  - Windows:
    1. Right-click My Computer.
    2. Click Properties.
    3. Click Advanced tab.
    4. Click Environment Variables button.
    5. Double Click Path under System Variables.
    6. Add ; <android\_sdk\_dir>/tools;<android\_sdk\_dir>/platform-tools to the end of the Variable Values text field.
- Navigate to your <android\_sdk\_dir>/tools directory and type android. Add the appropriate components. See step 4 in <http://developer.android.com/sdk/installing.html>.
- Test your installation by running adb from the command line. If you did everything right, you should get a long list of help instructions.

## 1.2 Download/Install the Eclipse Plugin

- It is recommended that you use Eclipse 3.4 or later
  - Lab Machines - Fedora Eclipse based on 3.4.2  
The version of Eclipse used by the lab machines is missing a vital component and requires adding an additional Eclipse plugin in order to use the Android plugin:
    1. Click the menu Help -> Software Updates.
    2. Click the tab Available Software -> Add Site button.
    3. Enter <http://download.eclipse.org/releases/ganymede> into the Location field.
    4. Click OK button.
    5. Enter WST Common UI into the search/text box at the top of the window (give it a second, it tries to search as you type and its kind of slow).
    6. Click the checkbox next to WST Common UI.
    7. Click the Install button.
    8. Click the Next button.
    9. Accept the terms, click Finish.
    10. Restart Eclipse.
    11. Follow the steps in the next bullet 3.4 Ganymede.
  - Eclipse 3.4 Ganymede:
    1. Click the menu Help -> Software Updates.
    2. Click Available Software tab -> Add Site button.
    3. Enter <https://dl-ssl.google.com/android/eclipse/> into the "Location" field.
    4. Click OK button.
    5. Click the checkbox next to Developer Tools.
    6. Click the Install button.
    7. Click the Next button.
    8. Accept the terms, click Finish.
    9. Restart Eclipse.
  - Eclipse 3.5 Galileo:
    1. Click Help -> Install New Software .
    2. Click Add... button.
    3. Enter a name for the site into the Name field.
    4. Enter <https://dl-ssl.google.com/android/eclipse/> into the Location field.
    5. Click OK button.
    6. Click the checkbox next to Developer Tools.
    7. Click the Next button.
    8. Accept the terms, click Finish.
    9. Restart Eclipse.

- Point Eclipse to <android\_sdk\_dir>:
  1. Click the menu Window -> Preferences.
  2. Click Android from the Hierarchy view on the left hand side.
  3. Enter <android\_sdk\_dir> into the SDK Location field.
  4. Click the Apply button.
  5. Click the OK button.

### 1.3 Download/Install the SDK Platform Components

At the time of writing this lab there are eight different versions of the Android Platform available, ranging from 1.1 to 2.2. It is best practice to develop for the oldest platform available that still provides the functionality you need. This way you can be assured that your application will be supported by as many devices as possible. However, you will still want to download newer versions of the platforms so that you can test your applications against these as well. Due to the size of each platform component you will only be required to download and develop on one platform for the whole class. We will target the highest platform that the G1 phones support, Android 1.6 (API 4). Before we can begin developing we must download and install this platform:

- Select the menu Window -> "Android SDK and AVD Manager", or click on the black phone shaped icon in the toolbar.
- Select Available Packages on the left hand side.
- Expand the Google Android site in the "Site, Packages, and Archives" Tree.
- Check the following items:
  - SDK Platform Android 1.6, API 4 Revision 3
  - Google APIs by Google Inc., Android API 4, Revision 2
  - *NOTE: Those of you developing on Lab Machines should follow these instructions: <http://sites.google.com/site/androidhowto/how-to-1/set-up-the-sdk-on-lab-machines-linux>.*
- Click Install Selected.
- Accept the Terms for all packages and click Install Accepted.

We're now ready to develop our application.

## 2. Create "Hello World" Application

- 2.1 Create a new Android Project
- 2.2 Run "Hello World" on the Emulator
- 2.3 On a Physical Device
- 2.4 Greeting the User

## 3. Create Application by Using Widgets

- 3.1 Creating the Application by using the Activity class
  - (i) onCreate()
  - (ii) onStart()
  - (iii) onResume()

- (iv) onPause()
  - (v) onStop()
  - (vi) onDestroy()
  - (vii) onRestart()
- 3.2 Creating the Application by using Text Edit control.
- 3.3 Creating the Application Choosing Options
  - (i) CheckBox
  - (ii) RadioButton
  - (iii) RadioGroup
  - (iv) Spinner
- 4. Create Application by Using Building Blocks for Android Application Design
  - 4.1 Design the Application by using
    - (i) Linear Layout
    - (ii) Relative Layout
    - (iii) Absolute Layout
  - 4.2 Create the Application to play the Audio and Video clips.
- 5. Create Application by Using Building Menus and Storing Data
  - 5.1 Design the Application for Menus and Action Bar
    - 5.2 Design the application to display the Drop-Down List Action Bar

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech IV-II Sem. (CSE)**

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**15A05801****DATA ANALYTICS  
(MOOCS-II)****Course Objectives:**

- To introduce the terminology, technology and its applications
- To introduce the concept of Analytics for Business
- To introduce the tools, technologies & programming languages which is used in day to day analytics cycle

**Course Outcomes:**

- Ability to work with different data types.
- Ability to solve various problems related to businesses.
- Ability to effectively utilize the time and involve in collaborative tasks.

**Unit I****Introduction to Analytics and R programming (NOS 2101)**

Introduction to R, RStudio (GUI): R Windows Environment, introduction to various data types, Numeric, Character, date, data frame, array, matrix etc., Reading Datasets, Working with different file types .txt,.csv etc. Outliers, Combining Datasets, R Functions and loops. Summary Statistics - Summarizing data with R, Probability, Expected, Random, Bivariate Random variables, Probability distribution. Central Limit Theorem etc.

**Unit II****SQL using R & Correlation and Regression Analysis (NOS 2101)**

Introduction to NoSQL, Connecting R to NoSQL databases. Excel and R integration with R connector. Regression Analysis, Assumptions of OLS Regression, Regression Modelling. Correlation, ANOVA, Forecasting, Heteroscedasticity, Autocorrelation, Introduction to Multiple Regression etc.

**Unit III****Understand the Verticals - Engineering, Financial and others (NOS 2101)**

Understanding systems viz. Engineering Design, Manufacturing, Smart Utilities, Production lines, Automotive, Technology etc. Understanding Business problems related to various businesses

**Unit IV****Manage your work to meet requirements (NOS 9001)**

Understanding Learning objectives, Introduction to work & meeting requirements, Time Management, Work management & prioritization, Quality & Standards Adherence,

### **Unit V**

#### **Work effectively with Colleagues (NOS 9002)**

Introduction to work effectively, Team Work, Professionalism, Effective Communication skills, etc. NOS \* National Occupational Standards

#### **Text Books:**

1. Student's Handbook for Associate Analytics.
2. Introduction to Scientific Programming and Simulation Using R, Owen Jones, Robert Maillardet and Andrew Robinson, Second Edition, CRC Press, 2014
3. A First Course in Statistical Programming with R, Braun W. J., Murdoch D. J.. — Cambridge University Press, 2007
4. Data Manipulation with R, Jaynal Abedin and Kishor Kumar Das, Second Edition, Packt publishing, BIRMINGHAM – MUMBAI.
5. Beginning R The Statistical Programming language- Mark Gardener, John Wiley & Sons, Inc, 2012

#### **Reference Books:**

1. Introduction to Probability and Statistics Using R, ISBN: 978-0-557-24979-4, is a textbook written for an undergraduate course in probability and statistics.
2. An Introduction to R, by Venables and Smith and the R Development Core Team. This may be downloaded for free from the R Project website (<http://www.r-project.org/>, see Manuals). There are plenty of other free references available from the R Project website.
3. Time Series Analysis and Mining with R, Yanchang Zhao
4. Graphics for Statistics and Data Analysis with R – Kevin J. Keen, CRC Press, 2010
5. Data Analysis and Graphics Using R, Third Edition, John Maindonald, W. John Braun, Cambridge University Press, 2010
6. Exploratory Data Analysis with R – Roger D. Peng, Leanpub publications, 2015
7. Introduction to Probability and Statistics Using R, G. Jay Kerns, First Edition, 2011
8. The Art of Data Science- A Guide for anyone Who Works with Data – Roger D. Peng and Elizabeth Matsui, Leanpub Publications, 2014
9. Montgomery, Douglas C., and George C. Runger, Applied statistics and probability for

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engineers. John Wiley & Sons, 2010. The Basic Concepts of Time Series Analysis.  
<http://anson.ucdavis.edu/~azari/sta137/AuNotes.pdf>



## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech IV-II Sem. (CSE)

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**15A05802 MOBILE COMPUTING  
(MOOCS-II)****Course Objectives:**

- Understand mobile ad hoc networks, design and implementation issues, and available solutions.
- Acquire knowledge of sensor networks and their characteristics.

**Course Outcomes:**

- Students able to use mobile computing more effectively
- Students gain understanding of the current topics in MANETs and WSNs, both from an industry and research point of views.
- Acquire skills to design and implement a basic mobile ad hoc or wireless sensor network via simulations.

**UNIT-I:**

**Wireless LANS and PANS:** Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.

**Wireless Internet:**

Wireless Internet, Mobile IP, TCP in Wireless Domain, WAP, Optimizing Web over Wireless.

**UNIT-II:**

**AD HOC Wireless Networks:** Introduction, Issues in Ad Hoc Wireless Networks, AD Hoc Wireless Internet.

**MAC Protocols for Ad Hoc Wireless Networks:** Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

**UNIT -III:**

**Routing Protocols:** Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand

Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

**Transport Layer and Security Protocols:** Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks, Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad Hoc Wireless Networks.

#### **UNIT –IV:**

**Quality of Service:** Introduction, Issues and Challenges in Providing QoS in Ad Hoc Wireless Networks, Classification of QoS Solutions, MAC Layer Solutions, Network Layer Solutions, QoS Frameworks for Ad Hoc Wireless Networks.

**Energy Management:** Introduction, Need for Energy Management in Ad Hoc Wireless Networks, Classification of Ad Hoc Wireless Networks, Battery Management Schemes, Transmission Power Management Schemes, System Power Management Schemes.

#### **UNIT –V:**

**Wireless Sensor Networks:** Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

#### **TEXT BOOKS:**

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, PHI, 2004.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press

#### **REFERENCE BOOKS:**

1. Ad hoc Mobile Wireless Networks – Subir Kumar sarkar, T G Basvaraju, C Puttamadappa, Auerbach Publications,2012.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer.
3. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh , Pearson Education.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

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**15A05803      INNOVATIONS AND IT MANAGEMENT  
(MOOCS-II)**

**Course Objectives:**

- Understand the rule of information technology in businesses, in state or central government departments and in remote parts of India.
- Understand the future of information systems and the manner in which they are shaping the world around us.
- Understand the Ethical and Social issues concerning information systems.

**Course Outcomes:**

- Ability to do Business over the Internet.
- Ability to solve Business problems by applying analytics.
- Ability to use ICT to participate in Democratic process.

**Unit-1:**

**Organisations and Information Systems:** Modern organization, Information systems in organisations, The role of Internet, , Managing in the Internet Era, Managing Information Systems in Organisations, Challenges for the Manager. **Concepts of MIS:** Data and information, Information as a Resource, Information in Organisational Functions, Types of Information Technology, Types of Information Systems, Decision Making with MIS, Communication in Organisations. **Information systems and Management Strategy:** The Competitive environment of Business, Using IT for Competing, Information goods, Information systems and competitive Strategy.

**Unit- 2:**E-Commerce technology, HTML and E-mail, Business over the Internet, E-Business, E-Governance. **Managing Information Systems:** Challenges of managing the IT Function, Vendor Management, The role of CIO, Ethical Issues, and Social Issues.

**Unit- 3: Infrastructure of IT:** What is IT Infrastructure, IT infrastructure Decisions, Infrastructure components, networks, solutions, cloud computing, Virtualization, Enterprise systems, IT Outsourcing, Networks in organisation and what has to be managed. **Information systems security and control:** Threats to the organization, Technologies for handling security, managing security.

**Unit- 4:** Analysis of Business Process, Business Process Integration, Motivation for Enterprise systems (ES), Supply chain management systems, Customer Relationship Management systems, Challenges for ES implementations, International Information systems, Decision support systems (DSS), Components of DSS, Analytical and Business Intelligence, Knowledge Management.

**Unit-5:** ICT Development, Types of ICT interventions, Examples, E-Governance concepts, E-Government, E-Participation, Social Dynamics of the internet, Services of the Internet, Technology of the Internet, Social Issues, Social networks in the Enterprise, concept of open source software, open source licences, open source in business and Government, open Data Standards and the open community.

**Text book:**

1. "MIS: Managing information Systems and in Business, Government and Society" Rahul De, Wiley publications.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech IV-II Sem. (CSE)**

L	T	P	C
3	1	0	3

**15A05804 BUILDING LARGE SCALE SOFTWARE SYSTEMS  
(MOOCS-III)****Course Objectives:**

- To introduce the architecture of large c programs.
- To introduce the concept Case study for design of large C programs using Linux kernel.
- To introduce the tools, technologies & programming languages.

**Course Outcomes:**

- Student able to understand coupling and cohesion
- Student able to design large c and c++ programs using Linux kernel
- Student able to understand how to design Linux kernel
- Ability to solve various problems related to Object Oriented Software using patterns

**Unit I:** Architecture of Large C Programs : Coupling and Cohesion concepts , types of cohesion functional, sequential, procedural, temporal, logical and coincidental; types of coupling – data,stamp, control, common, content coupling.

**Unit II:** Designing Large C programs having good cohesion and coupling; C modules- notion of separate compilation; Case study for design of large C programs using linux kernel.

**Unit III:** Tools for building large programs – version control using git and building large programs using make – bug tracking systems – bugzilla.

**Unit IV:** Building Large C++ programs – Architecture of Large C ++ programs – Coupling and Cohesion of C++ programs, Metrics for measuring the quality of C++ programs, Chidamber and Krammer. Metric suite- MOOD metrics – improving the design of C++ programs; Case study of redesigning Linux kernel into Minimalistic Object Oriented Linux (MOOL).

**Unit V:** Pattern Oriented Software Architecture: Building object oriented programs using design patterns identification of design patterns in source code- refactoring existing programs into design pattern based programs- case studies of building software with design patterns.

**Text Books:**

1. D. Janakiram, "Building Large Scale Software Systems", McGraw Hill Education, 2013.
2. John Lakos, "Large-Scale C++ Software Design", Addison Wesley, 1996.

**References:**

1. Scott W. Ambler, Barbara Hanscome, "Process Patterns: Building Large-Scale Systems Using Object Technology", 1st Edition, Cambridge University Press, 1998.
2. Peter van der Linden, "Expert C Programming: Deep C Secrets 1st Edition", Prentice Hall.
3. Andrei Alexandrescu, "Modern C++ Design: Generic Programming and Design Patterns Applied", 1st Edition, Addison Wesley, 2011.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech IV-II Sem. (CSE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A05805                      ENABLING TECHNOLOGIES FOR DATA SCIENCE  
& ANALYTICS: IoT**

**Course objectives:**

- Students will be explored to the interconnection and integration of the physical world and the cyber space. They are also able to design & develop IoT Devices.

**Course Outcomes:**

- Able to understand the application areas of IoT
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Able to understand building blocks of Internet of Things and characteristics.

**UNIT I: Introduction to Internet of Things**

Introduction, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies.

**Domain Specific IoTs**

Introduction, Home Automation, cities, Environment, Retail, Agriculture, Industry, Health & Lifestyle.

**UNIT II:****IoT and M2M**

Introduction, M2M, Difference between IoT and M2M, SDN and NFV for IoT.

**IoT System Management with NETCONF-YANG**

Need for IoT Systems Management, Simple Network Management Protocol (SNMP), Network Operator requirements, NETCONF, YANG, IoT System Management with NETCONF-YANG.

**UNIT III: Developing Internet of Things**

Introduction, IoT Design Methodology, Case Study on IoT System for Weather Monitoring.

**Case Studies Illustrating IoT Design:**

Introduction, Home Automation, Cities, Environment, Agriculture, Productivity Applications.

**UNIT IV****Advanced Topics:**

Introduction, Apache Hadoop, Using Hadoop Map Reduce for Batch Data Analysis.

**IEEE 802.15.4:**

The IEEE 802 committee family of protocols, The physical layer, The Media Access control layer, Uses of 802.15.4, The Future of 802.15.4: 802.15.4e and 802.15.4g.

**UNIT V:****ZigBee:**

Development of the standard, ZigBee Architecture, Association, The ZigBee network layer, The ZigBee APS Layer, The ZigBee Devices Object (ZDO) and the ZigBee Device Profile (ZDP), Zigbee Security, The ZigBee Cluster Library (ZCL), ZigBee Applications profiles, The ZigBee Gateway Specifications for network devices.

**TEXT BOOKS:**

1. Internet of Things a Hands-on Approach by Arshdeep Bahga and Vijay Madisetti. University Press.
2. The Internet of Things key applications and protocols by Oliver Hersent, David Boswarthick and Omar elloumi, Wiley Student Edition.

**REFERENCE BOOKS:**

1. Internet of Things: Architecture, Design Principles and Applications by Raj Kamal MCGraw Hill Edition.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech IV-II Sem. (CSE)**

L	T	P	C
3	1	0	3

**15A05806 CYBER SECURITY  
(MOOCS-III)****Course Objectives:**

- Appraise the current structure of cyber security roles across the DoD enterprise, including the roles and responsibilities of the relevant organizations.
- Evaluate the trends and patterns that will determine the future state of cyber security

**Course Out comes:**

- Analyze threats and risks within context of the cyber security architecture
- Appraise cyber security incidents to apply appropriate response
- Evaluate decision making outcomes of cyber security scenarios

**Unit-I**

Cyber crime: Mobile and Wireless devices-Trend mobility-authentication service security-Attacks on mobile phones-mobile phone security Implications for organizations-Organizational measurement for Handling mobile-Security policies and measures in mobile computing era. Cases.

**Unit-II**

Tools and methods used in cyber crime-Proxy servers and Anonymizers-Phishing>Password cracking-Key loggers and Spy wares-Virus and worms-Trojan Horse and Backdoors-Steganography-SQL Injection-Buffer overflow-Attacks on wireless network. Cases.

**Unit-III**

Understanding computer forensic-Historical background of cyber forensicForensic analysis of e-mail-Digital forensic life cycle-Network forensic-Setting up a computer forensic Laboratory-Relevance of the OSI 7 Layer model to computer Forensic-Computer forensic from compliance perspectives. Cases.

**Unit-IV**

Forensic of Hand –Held Devices-Understanding cell phone working characteristics-Hand-Held devices and digital forensic- Toolkits for Hand-Held device-Forensic of i-pod and digital music devices-Techno legal Challenges with evidence from hand-held Devices. Cases.

**Unit-V**

Cyber Security –Organizational implications-cost of cybercrimes and IPR issues Web threats for organizations: the evils and Perils-Social media marketing Security and privacy Implications-Protecting people privacy in the organizations Forensic best practices for organizations. Cases.

**Text book:**

1. Nina Godbole & Sunit Belapure “Cyber Security”, Wiley India, 2012.

**REFERENCES:**

1. Harish Chander, “cyber laws & IT protection”, PHI learning pvt.ltd, 2012.
2. Dhiren R Patel, “Information security theory & practice”, PHI learning pvt ltd, 2010.
3. MS.M.K.Geetha & Ms.Swapne Raman”Cyber Crimes and Fraud Management, ”MACMILLAN,2012. Pankaj Agarwal : Information Security& Cyber Laws (Acme Learning), Excel, 2013.
4. Vivek Sood, Cyber Law Simplified, TMH, 2012.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR***(Established by Govt. of A.P., Act. No. 30 of 2008)***ANANTHAPURAMU – 515 002 (A.P.) INDIA.****Course Structure for B.Tech-R15 Regulations****ELECTRICAL & ELECTRONICS ENGINEERING****I B.Tech. - I Semester**

S.No	Course code	Subject	L	T	P	Drg	C
1.	15A52101	Functional English	3	1	-	-	3
2.	15A54101	Mathematics – I	3	1	-	-	3
3.	15A05101	Computer Programming	3	1	-	-	3
4.	15A56101	Engineering Physics	3	1	-	-	3
5.	15A03101	Engineering Drawing	0	-	-	6	3
6.	15A52102	English Language Communication Skills Lab	-	-	4	-	2
7.	15A56102	Engineering Physics Lab	-	-	4	-	2
8.	15A05102	Computer Programming Lab	-	-	4	-	2
Total			12	4	12	6	21

**I-II Semester**

S.No	Course code	Subject	L	T	P	C
1.	15A54201	Mathematics – II	3	1	-	3
2.	15A52201	English for Professional Communication	3	1	-	3
3.	15A51101	Engineering Chemistry	3	1	-	3
4.	15A01101	Environmental Studies	3	1	-	3
5.	15A02201	Electrical Circuits – I	3	1	-	3
6.	15A51102	Engineering Chemistry Lab	-	-	4	2
7.	15A02202	Electrical Circuits Lab	-	-	4	2
8.	15A99201	Engineering & IT Workshop	-	-	4	2
Total			15	5	12	21

- \* L - Lecture hours
- \* T - Tutorial hours
- \* P - Practical hours
- \* Drg - Drawing
- \* C - Credits

**II B. Tech (EEE) – I Sem**

S. No	Course Code	Subject	L	T	P	C
1	15A54301	Mathematics –III	3	1	-	3
2	15A02301	Electrical Circuits – II	3	1	-	3
3	15A02302	Electrical Machines – I	3	1	-	3
4	15A02303	Control Systems Engineering	3	1	-	3
5	15A04301	Electronic Devices & Circuits	3	1	-	3
6	15A05201	Data Structures	3	1	-	3
7	15A02305	Electric Circuits Simulation Laboratory	-		4	2
8	15A04305	Electronic Devices & Circuits Laboratory	-		4	2
Total			18	6	8	22

**II B. Tech (EEE) – II Sem**

S. No	Course Code	Subject	L	T	P	C
1	15A54402	Mathematics – IV	3	1	-	3
2	15A52301	Managerial Economics and Financial Analysis	3	1	-	3
3	15A02401	Electrical Machines – II	3	1	-	3
4	15A02402	Electrical Power Generating Systems	3	1	-	3
5	15A02403	Electromagnetic Fields	3	1	-	3
6	15A04409	Analog Electronic Circuits	3	1	-	3
7	15A02404	Electrical Machines Laboratory – I	-	-	4	2
8	15A02405	Control Systems & Simulation Laboratory	-	-	4	2
9	15A02406	Comprehensive Online Examination – I	-	-	-	1
Total			18	6	8	23

**B.Tech III-I Semester (EEE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A02501	Electrical Measurements	3	1	-	3
2.	15A04509	Linear & Digital IC Applications	3	1	-	3
3.	15A02502	Electrical Power Transmission Systems	3	1	-	3
4.	15A02503	Power Electronics	3	1	-	3
5.	15A02504	Electrical Machines – III	3	1	-	3
6.	15A04510 15A02505	<b>MOOCS -I</b> Digital Circuits and Systems Networks Signals and Systems	3	1	-	3
7.	15A02506	Electrical Machines Laboratory – II	-	-	4	2
8.	15A02507	Electrical Measurements Laboratory	-	-	4	2
9.	15A99501	Audit course – Social Values & Ethics	2	0	2	0
<b>Total</b>			<b>20</b>	<b>6</b>	<b>10</b>	<b>22</b>

**B.Tech III-II Semester (EEE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A52601	Management Science	3	1	-	3
2.	15A02601	Power Semiconductor Drives	3	1	-	3
3.	15A02602	Power System Protection	3	1	-	3
4.	15A04601	Microprocessors & Microcontrollers	3	1	-	3
5.	15A02603	Power System Analysis	3	1	-	3
6.	15A02604 15A02605 15A02606 15A01608	<b>CBCC -I</b> 1) Neural Networks & Fuzzy Logic 2) Programmable Logic Controller & Its Applications 3) Optimization Techniques 4) Intellectual Property Rights	3	1	-	3
7.	15A04607	Microprocessors & Microcontrollers Laboratory	-	-	4	2
8.	15A02607	Power Electronics & Simulation Laboratory	-	-	4	2
9.	15A52602	Advanced English Language Communication Skills (AELCS) Laboratory (Audit Course)	-	-	2	-
10.	15A02608	Comprehensive Online Examination - II	-	-	-	1
<b>Total</b>			<b>18</b>	<b>6</b>	<b>12</b>	<b>23</b>

**B.Tech IV-I Semester (EEE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A02701	Electrical Distribution Systems	3	1	-	3
2.	15A04603	Digital Signal Processing	3	1	-	3
3.	15A02702	Power System Operation and Control	3	1	-	3
4.	15A02703	Utilization of Electrical Energy	3	1	-	3
5.	15A02704 15A02705 15A02706	<b>CBCC-II</b> a) Modern Control Theory b) Switched Mode Power Converters c) Energy Auditing & Demand Side Management	3	1	-	3
6.	15A02707 15A02708 15A02709	<b>CBCC-III</b> a) Smart Grid b) Flexible AC Transmission Systems c) Power Quality	3	1	-	3
7.	15A04608	Digital Signal Processing Laboratory	-	-	4	2
8.	15A02710	Power Systems & Simulation Laboratory	-	-	4	2
<b>Total</b>			<b>18</b>	<b>6</b>	<b>8</b>	<b>22</b>

**B.Tech IV-II Semester (EEE)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A02801 15A02802 15A02803	<b>MOOCS – II</b> 1. Instrumentation 2. Power System Dynamics and Control 3. Industrial Automation & Control	3	1	-	3
2.	15A02804 15A04702 15A02805	<b>MOOCS – III</b> 1. HVDC Transmission 2. Embedded Systems 3. Energy Resources & Technology	3	1	-	3
3.	15A02806	Comprehensive Viva Voce	-	-	4	2
4.	15A02807	Technical Seminar	-	-	4	2
5.	15A02808	Project Work	-	-	24	12
<b>Total</b>			<b>6</b>	<b>2</b>	<b>32</b>	<b>22</b>

**Minor Discipline in EEE**

<b>S. No.</b>	<b>Course Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	15A02303	Control Systems Engineering	3	1	-	3
2	15A02402	Electrical Power Generating Systems	3	1	-	3
3	15A02502	Electrical Power Transmission Systems	3	1	-	3
4	15A02603	Power System Analysis	3	1	-	3
5	15M02101	Minor Discipline Project	-	-	-	8
		<b>Total</b>	<b>12</b>	<b>4</b>	<b>-</b>	<b>20</b>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A52101) FUNCTIONAL ENGLISH****(Common to All Branches)****Preamble:**

English is an international language as well as a living and vibrant one. People have found that knowledge of English is a passport for better career, better pay, and advanced knowledge and for communication with the entire world. As it is a language of opportunities in this global age, English is bound to expand its domain of use everywhere. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**Objectives:**

- To enable the students to communicate in English for academic and social purpose.
- To enable the students to acquire structure and written expressions required for their profession.
- To develop the listening skills of the students.
- To inculcate the habit of reading and critical thinking skills.
- To enhance the study skills of the students with emphasis on LSRW skills.

**UNIT –I**



**Topics:** Paragraph writing, writing letters, role play, reading graphs, prepositions, designing posters, tenses, making recommendations.

**Text:** ENVIRONMENTAL CONSCIOUSNESS' from *MINDSCAPES*  
Climate Change - Green Cover – Pollution

## **UNIT –II**

**Topics:** Compound nouns, imperatives, writing instructions, interpreting charts and pictures, note making, role play, prefixes, subject-verb agreement.

**Text:** EMERGING TECHNOLOGIES from *MINDSCAPES*  
Solar Thermal Power - Cloud Computing - Nanotechnology

## **UNIT –III**

**Topics:** Making conversations, homonyms and homophones, SMS and use of emotions, past participle for irregular verbs, group discussion, E - mail communication, antonyms, Preparing projects

**Text:** GLOBAL ISSUES from *MINDSCAPES*  
Child Labour - Food Crisis - Genetic Modification - E-Waste - Assistive Technology

## **UNIT –IV**

**Topics:** Group discussion, affixes, double consonants, debates, writing a book / film review, predicting and problem-solving-future tense, adverbs

**Text:** SPACE TREK from *MINDSCAPES*  
Hubble Telescope - Chandrayan-2 - Anusat - Living Quarters - Space Tourism

## **UNIT –V**

**Topics:** Compare and contrast, effective writing, group discussion, writing reports, writing advertisements, tweeting and blogging, types of interviews, framing questions.

**Text:** MEDIA MATTERS from *MINDSCAPES*  
History of Media - Language and Media - Milestone in Media - Manipulation by Media  
- Entertainment Media - Interviews

**Text Books:**

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1. MINDSCAPES: English for Technologists and Engineers, Orient Blackswan, 2014.

**References:**

1. A Practical Course in Effective English Speaking Skills by J.K.Gangal, PHI Publishers, New Delhi.2012
2. Technical Communication, Meenakshi Raman, Oxford University Press,2011.
3. Spoken English, R.K. Bansal & JB Harrison, Orient Longman,2013, 4<sup>Th</sup> edition.
4. Murphy's English Grammar with CD, Murphy, Cambridge University Press,3<sup>Rd</sup> edition.
5. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO,2008.

**Outcomes:**

- Have improved communication in listening, speaking, reading and writing skills in general.
- Have developed their oral communication and fluency in group discussions and interviews.
- Have improved awareness of English in science and technology context.
- Have achieved familiarity with a variety of technical reports.

**B. Tech I-I Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A54101) MATHEMATICS – I**

**(Common to All Branches)**

**Objectives:**

- To train the students thoroughly in Mathematical concepts of ordinary differential equations and their applications.
- To prepare students for lifelong learning and successful careers using mathematical concepts of differential and Integral calculus, ordinary differential equations and vector calculus.
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate and modeling the problems, to think creatively and to synthesize information.

**UNIT – I**

Exact, linear and Bernoulli equations, Applications to first order equations; Orthogonal trajectories, Simple electric circuits.

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax} V(x)$ ,  $xV(x)$ .

**UNIT – II**

Method of variation of parameters, linear equations with variable coefficients: Euler-Cauchy Equations, Legendre's linear equation. Applications of linear differential equations- Mechanical and Electrical oscillatory circuits and Deflection of Beams.

**UNIT – III**

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature.

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**UNIT – IV**

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes in Cartesian and polar coordinates using double and triple integral.

**UNIT – V**

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's, Stoke's and Gauss's Theorems.

**Text Books:**

1. Engineering Mathematics-I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher
2. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.

**References:**

1. Engineering Mathematics Volume-I, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

**Outcomes:**

- The students become familiar with the application of differential and integral calculus, ordinary differential equations and vector calculus to engineering problems.
- The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications.

**B. Tech I-I Sem. (EEE)**

L	T	P	C
3	1	0	3

**(15A05101) COMPUTER PROGRAMMING****(Common to All Branches)****Objectives:**

- Understand problem solving techniques
- Understand representation of a solution to a problem
- Understand the syntax and semantics of C programming language
- Understand the significance of Control structures
- Learn the features of C language

**UNIT - I**

Overview of Computers and Programming - Electronic Computers Then and Now - Computer Hardware - Computer Software - Algorithm - Flowcharts - Software Development Method - Applying the Software Development Method.

Types, Operators and Expressions: Variable Names - Data Types and Sizes - Constants - Declarations - Arithmetic Operators - Relational and Logical Operators - Type Conversions - Increment and Decrement Operators - Bitwise Operators - Assignment Operators and Expressions - Conditional Expressions - Precedence and Order of Evaluation.

**UNIT - II**

Selections Statements – Iteration Statements – Jump Statements- Expression Statements - Block Statements.

Single Dimensional Arrays – Generating a Pointer to an Array – Passing Single Dimension Arrays to Functions – Strings – Two Dimensional Arrays – Indexing Pointers – Array Initialization – Variable Length Arrays

**UNIT - III**

Pointer Variables – Pointer Operators - Pointer Expressions – Pointers And Arrays – Multiple Indirection – Initializing Pointers – Pointers to Functions – C's Dynamic Allocation Functions – Problems with Pointers.

Understanding the scope of Functions – Scope Rules – Type Qualifiers – Storage Class Specifiers- Functions Arguments –The Return Statement.

## UNIT - IV

Command line arguments – Recursion – Function Prototypes – Declaring Variable Length Parameter Lists

Structures – Arrays of Structures – Passing Structures to Functions – Structure Pointers – Arrays and Structures within Structures – Unions – Bit Fields – Enumerations – typedef

## UNIT - V

Reading and Writing Characters – Reading and Writing Strings – Formatted Console I/O – Printf - Scanf – Standard C Vs Unix File I/O – Streams and Files – File System Basics – Fread and Fwrite – Fseek and Random Access I/O – Fprintf ( ) and Fscanf ( ) – The Standard Streams – The Preprocessor Directives #define and #include.

### Text Books:

1. “The Complete Reference C”- Fourth Edition- Herbert Schildt- McGrawHill Education.
2. “The C Programming Language” Second Edition- Brian W. Kernighan- Dennis M. Ritchie- Prentice Hall-India. (UNIT- I)

### References:

1. Programming in C, Second Edition – Pradip Dey, Manas Ghosh, Oxford University Press.
2. “C From Theory to Practice”- George S. Tselikis- Nikolaos D. Tselikas- CRC Press.
3. “Programming with C”- R S Bichkar- University Press.
4. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education. (UNIT-I)
5. Computer Fundamentals and C Programming- Second Edition- P.Chenna Reddy- Available at Pothi.com (<http://pothi.com/pothi/book/dr-p-chenna-reddy-computer-fundamentals-and-c-programming>).

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**Outcomes:**

- Apply problem solving techniques in designing the solutions for a wide-range of problems
- Choose appropriate control structure depending on the problem to be solved
- Modularize the problem and also solution

<b>B. Tech I-I Sem. (EEE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A56101) ENGINEERING PHYSICS****(Common to CSE/EEE/CIVIL)****Objectives:**

- To evoke interest on applications of superposition effects like interference and diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric waveguides along with engineering applications.
- To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays and non-destructive evaluation using ultrasonic techniques.
- To get an insight into the microscopic meaning of conductivity, classical and quantum free electron model, the effect of periodic potential on electron motion, evolution of band theory to distinguish materials and to understand electron transport mechanism in solids.
- To open new avenues of knowledge and understanding semiconductor based electronic devices, basic concepts and applications of semiconductors and magnetic materials have been introduced which find potential in the emerging micro device applications.
- To give an impetus on the subtle mechanism of superconductors in terms of conduction of electron pairs using BCS theory, different properties exhibited by them and their fascinating applications. Considering the significance of microminiaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties and applications in emerging technologies are elicited.

**UNIT - I****PHYSICAL OPTICS, LASERS AND FIBRE OPTICS**

*Physical Optics:* Interference (Review) – Interference in thin film by reflection – Newton's rings – Diffraction (Review) - Fraunhofer diffraction due to single slit, double slit and diffraction grating.

*Lasers:* Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients — Population inversion – Excitation mechanism and optical



resonator – Nd:YAG laser - He-Ne laser – Semiconductor Diode laser - Applications of lasers

*Fiber optics:* Introduction - construction and working principle of optical fiber – Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in Optical fibers –Block diagram of Optical fiber communication system – Applications of optical fibers

## **UNIT – II**

### **CRYSTALLOGRAPHY AND ULTRASONICS**

*Crystallography:* Introduction – Space lattice –Unit cell – Lattice parameters –Bravias lattice – Crystal systems – Packing fractions of SC, BCC and FCC - Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction - Bragg's law – Powder method.

*Ultrasonics:* Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

## **UNIT – III**

### **QUANTUM MECHANICS AND ELECTRON THEORY**

*Quantum Mechanics:* Matter waves – de'Broglie hypothesis and properties - Schrodinger's time dependent and independent wave equations – Physical significance of wave function - Particle in one dimensional infinite potential well.

*Electron theory:* Classical free electron theory – Equation for electrical conductivity - Quantum free electron theory – Fermi-Dirac distribution – Source of electrical resistance – Kronig-Penny model (qualitative treatment) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

## **UNIT – IV**

### **SEMICONDUCTORS AND MAGNETIC MATERIALS**

*Semiconductors:* Intrinsic and extrinsic semiconductors (Qualitative treatment) – Drift & diffusion currents and Einstein's equation – Hall effect - Direct and indirect band gap semiconductors – Formation of p-n junction.

*Magnetic materials:* Introduction and basic definitions – Origin of magnetic moments – Bohr magneton – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials (Qualitative treatment) – Hysteresis - Soft and hard magnetic materials, applications of magnetic materials.

## UNIT – V

### SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS

*Superconductivity:* Introduction - Effect of magnetic field - Meissner effect – Type I and Type II superconductors – Flux quantization – Penetration depth - BCS theory (qualitative treatment) — Josephson effects –Applications of superconductors.

*Physics of Nanomaterials:* Introduction - Significance of nanoscale and types of nanomaterials – Physical properties: optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials by Top down and bottom up approaches: ball mill, chemical vapour deposition, and sol gel –Applications of nanomaterials.

#### Text Books:

1. Engineering Physics – K.Thyagarajan, 5<sup>th</sup> Edition, MacGraw Hill Publishers, NewDelhi, 2014.
2. Physics for Engineers - N.K Verma, 1<sup>st</sup> Edition, PHI Learning Private Limited, New Delhi,2014.

#### References:

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, 10<sup>th</sup> Edition, S.Chand and Company, New Delhi, 2014.
2. Engineering Physics – D K Pandey, S. Chaturvedi, 2<sup>nd</sup> Edition, Cengage Learning, New Delhi, 2013.
3. Engineering Physics – D.K Bhattacharya, Poonam Tandon, 1<sup>nd</sup> Edition, Oxford University Press, New Delhi, 2015.

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**Outcomes:**

- The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics.
- The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques.
- The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.
- The electronic and magnetic properties of materials were successfully explained by free electron theory and the bases for the band theory are focused.
- The properties and device applications of semiconducting and magnetic materials are illustrated.
- The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.

B. Tech I-I Sem. (EEE)

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**(15A03101) ENGINEERING DRAWING****(Common to CSE/EEE/CIVIL)****Objectives:**

- To gain and understanding of the basics of geometrical constructions of various planes and solids, understanding system of graphical representation of various objects and various views to draft and read the products to be designed and eventually for manufacturing applications.
- To learn about various projections, to understand complete dimensions and details of object.
- Ultimately student must get imaginary skill to put an idea of object, circuit, assembly of parts in black & white, to design a product and to understand the composition, which can be understood universally.

**UNIT I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their Significance- Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice. a) Conic Sections including the Rectangular Hyperbola- General method only, b) Cycloid, Epicycloid and Hypocycloid

**UNIT II**

**Scales:** Plain, Diagonal and Vernier;

**Projection of Points:** Principles of orthographic projection – Convention – First angle projections, projections of points.

**UNIT III**

**Projections of Lines:** lines inclined to one or both planes, Problems on projections, Finding True lengths.

**Projections of Planes:** Projections of regular plane surfaces- plane surfaces inclined to both planes.

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**UNIT IV**

**Projections of Solids:** Projections of Regular Solids with axis inclined to both planes.

**Developments of Solids:** Development of Surfaces of Right Regular Solids-Prism, Cylinder, Pyramid, Cone.

**UNIT V**

**Isometric and Orthographic Projections:** Principles of isometric projection- Isometric Scale- Isometric Views- Conventions- Isometric Views of lines, Planes, Simple solids (cube, cylinder and cone). Isometric projections of spherical parts. Conversion of isometric Views to Orthographic Views.

***Text Books:***

- 1. Engineering Drawing, N.D. Bhatt, Charotar Publishers*
- 2. Engineering Drawing, K.L. Narayana & P. Kannaih, Scitech Publishers, Chennai*

***References:***

- 1. Engineering Drawing, Johle, Tata McGraw-Hill Publishers*
- 2. Engineering Drawing, Shah and Rana, 2/e, Pearson Education*
- 3. Engineering Drawing and Graphics, Venugopal/New age Publishers*
- 4. Engineering Graphics, K.C. John, PHI, 2013*
- 5. Engineering Drawing, B.V.R. Gupta, J.K. Publishers*

**Outcomes:**

- Drawing 2D and 3D diagrams of various objects.
- Learning conventions of Drawing, which is an Universal Language of Engineers.
- Drafting projections of points, planes and solids.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (EEE)**

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**(15A52102) ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB**
**(Common to All Branches)**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

**Objectives:**

- To enable students to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

**UNIT - 1**

1. Phonetics -importance
2. Introduction to Sounds of Speech
3. Vowels and consonants sounds
4. Phonetic Transcription

**UNIT - II**

5. Word Stress
6. Syllabification
7. Rules of word stress
8. Intonation

**UNIT - III**

9. Situational Dialogues
10. Role Plays
11. JAM
12. Describing people/objects/places

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**UNIT - IV**

13. Debates
14. Group Discussions
15. Interview skills

**UNIT - V**

16. Video speech writing
17. Book reviews -oral and written

**Minimum Requirements for ELCS Lab:**

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab: The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.  
System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

**Suggested Software:**

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – part II
3. K-Van Advanced Communication Skills
4. Walden InfoTech Software.

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**References:**

1. A Textbook of English Phonetics for Indian Students 2<sup>nd</sup> Ed T. Balasubramanian. (Macmillian),2012.
2. A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd
3. Speaking English Effectively, 2<sup>nd</sup> Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. A Hand book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books,2011
5. Spring Board Succes, Sharada Kouhik, Bindu Bajwa, Orient Blackswan, Hyderabad, 2010.

**Outcomes:**

- Become active participants in the learning process and acquire proficiency in spoken English.
- Speak with clarity and confidence thereby enhance employability skills.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (EEE)**

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**(15A56102) ENGINEERING PHYSICS LABORATORY****(Common to CSE/EEE/CIVIL)****Objectives:**

- Will recognize the important of optical phenomenon like Interference and diffraction.
- Will understand the role of optical fiber parameters and signal losses in communication.
- Will recognize the importance of energy gap in the study of conductivity and hall effect in a semiconductor
- Will understand the applications of B H curve.
- Will acquire a practical knowledge of studying the crystal structure in terms of lattice constant.
- Will recognize the application of laser in finding the particle size and its role in diffraction studies.
- Will learn to synthesis of the nanomaterials and recognize its importance by knowing its nano particle size and its impact on its properties.

**Any 10 of the following experiments has to be performed during the I year I semester**

1. Determination of radius of curvature of a Plano-convex lens by forming Newton's rings.
2. Determination of wavelength of given source using diffraction grating in normal incidence method.
3. Determination of Numerical aperture, acceptance angle of an optical fiber.
4. Energy gap of a Semiconductor diode.
5. Hall effect – Determination of mobility of charge carriers.
6. B-H curve – Determination of hysteresis loss for a given magnetic material.
7. Determination of Crystallite size using X-ray pattern (powder) using debye-scheerer method.
8. Determination of particle size by using laser source.
9. Determination of dispersive power of a prism.
10. Determination of thickness of the thin wire using wedge Method.
11. Laser : Diffraction due to single slit
12. Laser : Diffraction due to double slit
13. Laser: Determination of wavelength using diffraction grating

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14. Magnetic field along the axis of a current carrying coil – Stewart and Gee's method.
  15. Synthesis of nanomaterial by any suitable method.

**References:**

1. Engineering Physics Practicals – NU Age Publishing House, Hyderabad.
2. Engineering Practical physics – Cengage Learning, Delhi.

**Outcomes:**

- Would recognize the important of optical phenomenon like Interference and diffraction.
- Would have acquired the practical application knowledge of optical fiber, semiconductor, dielectric and magnetic materials, crystal structure and lasers by the study of their relative parameters.
- Would recognize the significant importance of nanomaterials in various engineering fields.

**B. Tech I-I Sem. (EEE)**

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**(15A05102) COMPUTER PROGRAMMING LAB**

**(Common to All branches)**

**Objectives:**

- Learn C Programming language
- To make the student solve problems, implement algorithms using C language.

**List of Experiments/Tasks**

1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. Study of the Editors, Integrated development environments, and Compilers in chosen platform.
3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.
4. Practice programs: Finding the sum of three numbers, exchange of two numbers, maximum of two numbers, To read and print variable values of all data types of C language, to find the size of all data types, to understand the priority and associativity of operators using expressions, to use different library functions of C language.
5. Write a program to find the roots of a Quadratic equation.
6. Write a program to compute the factorial of a given number.
7. Write a program to check whether the number is prime or not.
8. Write a program to find the series of prime numbers in the given range.
9. Write a program to generate Fibonacci numbers in the given range.
10. Write a program to find the maximum of a set of numbers.
11. Write a program to reverse the digits of a number.
12. Write a program to find the sum of the digits of a number.
13. Write a program to find the sum of positive and negative numbers in a given set of numbers.
14. Write a program to check for number palindrome.
15. Write a program to evaluate the sum of the following series up to 'n' terms  

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$$
16. Write a program to generate Pascal Triangle.
17. Write a program to read two matrices and print their sum and product in the matrix form.
18. Write a program to read matrix and perform the following operations.
  - i. Find the sum of Diagonal Elements of a matrix.
  - ii. Print Transpose of a matrix.

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- iii. Print sum of even and odd numbers in a given matrix.
19. Write a program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters.
  20. Write a program to insert a substring in to a given string and delete few characters from the string. Don't use library functions related to strings.
  21. Write a program to perform the operations addition, subtraction, multiplication of complex numbers.
  22. Write a program to split a 'file' in to two files, say file1 and file2. Read lines into the 'file' from standard input. File1 should consist of odd numbered lines and file2 should consist of even numbered lines.
  23. Write a program to merge two files.
  24. Write a program to implement numerical methods Lagrange's interpolation, Trapezoidal rule.
  25. Write a program to read a set of strings and sort them in alphabetical order.
  26. Write a program to read two strings and perform the following operations without using built-in string Library functions and by using your own implementations of functions.
    - i. String length determination
    - ii. Compare Two Strings
    - iii. Concatenate them, if they are not equal
    - iv. String reversing
  27. Write programs using recursion for finding Factorial of a number, GCD, LCM, and solving Towers of Hanoi problem.
  28. Write a program to exchange two numbers using pointers.
  29. Write a program to read student records into a file. Record consists of rollno, name and marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per JNTUA rules. Write the first class, second class, third class and failed students lists separately to another file.
  30. A file consists of information about employee salary with fields employeeid, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employeeid, name, and basic have valid values. HRA is taken as 10% of the basic, DA is taken as 80% of basic, IT is 20% of the basic, other deductions is user specified. Compute the Gross and Net salary of the employee and update the file.
  31. Write a program to perform Base (decimal, octal, hexadecimal, etc) conversion.
  32. Write a program to find the square root of a number without using built-in library function.
  33. Write a program to convert from string to number.
  34. Write a program to implement pseudo random generator.
  35. Write a program to generate multiplication tables from 11 to 20.
  36. Write a program to express a four digit number in words. For example 1546 should be written as one thousand five hundred and forty six.

37. Write a program to generate a telephone bill. The contents of it and the rate calculation etc should be as per BSNL rules. Student is expected to gather the required information through the BSNL website.
38. Write a program to find the execution time of a program.
39. Design a file format to store a person's name, address, and other information. Write a program to read this file and produce a set of mailing labels

**Note:**

1. Instructors are advised to conduct the lab in LINUX/UNIX environment also
2. The above list consists of only sample programs. Instructors may choose other programs to illustrate certain concepts, wherever is necessary. Programs should be there on all the concepts studied in Theory. Instructors are advised to change atleast 25% of the programs every year until the next syllabus revision.

**References:**

1. “How to Solve it by Computer”, R.G. Dromey, Pearson.
2. “The C Programming Language”, Brian W. Kernighan, Dennis M. Ritchie, Pearson.
3. “Let us C”, Yeswant Kanetkar, BPB publications
4. “Pointers in C”, Yeswant Kanetkar, BPB publications.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education.

**Outcomes:**

- Apply problem solving techniques to find solutions to problems
- Able to use C language features effectively and implement solutions using C language.
- Improve logical skills.

B. Tech I-II Sem. (EEE)

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**(15A54201) MATHEMATICS – II****(Common to All Branches)**

**Objectives:** Our emphasis will be more on conceptual understanding and application of Fourier series, Fourier, Z and Laplace transforms and solution of partial differential equations.

**UNIT – I**

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

**UNIT – II**

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions- Parseval's formula- Complex form of Fourier series.

**UNIT – III**

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

**UNIT – IV**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

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**UNIT – V**

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

**TEXT BOOKS:**

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.

**REFERENCES:**

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
2. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

**Outcomes:** The student gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and partial differential equations.

B. Tech I-II Sem. (EEE)

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**(15A52201) ENGLISH FOR PROFESSIONAL COMMUNICATION****1. INTRODUCTION:**

English is a global language and has international appeal and application. It is widely used in a variety of contexts and for varied purposes. The students would find it useful both for social and professional development. There is every need to help the students acquire skills useful to them in their career as well as workplace. They need to write a variety of documents and letters now extending into professional domain that cuts across business and research also. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**2. OBJECTIVES:**

1. To develop confidence in the students to use English in everyday situations.
2. To enable the students to read different discourses so that they appreciate English for science and technologies.
3. To improve familiarity with a variety of technical writings.
4. To enable the students to acquire structure and written expressions required for their profession.
5. To develop the listening skills of the students.

**3. SYLLABUS:**



**UNIT –I**

**Topics:** Group discussion, cause and effect, events and perspectives, debate, if conditional, essay writing.

**Text: LESSONS FROM THE PAST** from *MINDSCAPES*

Importance of History - Differing Perspectives - Modern Corporatism - Lessons From The Past

**UNIT-II**

**Topics:** Idioms, essay writing, power point presentation, modals, listening and rewriting, preparing summary, debate, group discussion, role play, writing a book review, conversation

**Text: ‘ENERGY’** from *MINDSCAPES*

Renewable and Non-Renewable Sources - Alternative Sources - Conservation -Nuclear Energy

**UNIT-III**

**Topics:** Vocabulary, impromptu speech, creative writing, direct and indirect speech, fixed expressions, developing creative writing skills, accents, presentation skills, making posters, report writing

**Text: ‘ENGINEERING ETHICS’** from *MINDSCAPES*

Challenger Disaster - Biotechnology - Genetic Engineering - Protection From Natural Calamities

**UNIT-IV**

**Topics:** Vocabulary, Conversation, Collocation, Group discussion, Note-making, Clauses, Interpreting charts and tables, Report writing.

**Text: 'TRAVEL AND TOURISM' from *MINDSCAPES***

Advantages and Disadvantages of Travel - Tourism - Atithi Devo Bhava - Tourism in India

## **UNIT-V**

**Topics:** Vocabulary, phrasal verbs, writing a profile, connectives, discourse markers, problem-solving, telephone skills, application letters, curriculum vitae, interviews (telephone and personal)

**Text: 'GETTING JOB-READY' from *MINDSCAPES***

SWOT Analysis - Companies And Ways Of Powering Growth - Preparing For Interviews

### **Prescribed Text**

***MINDSCAPES*:** English for Technologists and Engineers, Orient Blackswan, 2014.

### **REFERENCES:**

1. **Effective Tech Communication**, [Rizvi](#), Tata McGraw-Hill Education, 2007.
2. **Technical Communication**, Meenakshi Raman, Oxford University Press.
3. **English Conversations Prcatice**, Grant Taylor, Tata Mc GrawHill publications, 2013.
4. **Practical English Grammar**. Thomson and Martinet, OUP, 2010.

### **Expected Outcomes:**

At the end of the course, students would be expected to:

1. Have acquired ability to participate effectively in group discussions.
2. Have developed ability in writing in various contexts.
3. Have acquired a proper level of competence for employability.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech I-II Sem. (EEE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**(15A51101) ENGINEERING CHEMISTRY**

**(Common to All Branches)**

**Objectives:**

- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.
- After the completion of the course, the student would understand the concepts of chemistry and apply to various materials for engineering applications.

**UNIT – I                      WATER QUALITY AND TREATMENT**

Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ozonisation)

Industrial Use of water:

For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water:

Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.

External Treatment: Ion-Exchange and Permutit processes.

Demineralisation of brackish water: Reverse Osmosis and Electrodialysis

## **UNIT – II            POLYMERS**

i) Introduction: Basic concepts of polymerisation, Types of polymerisation (Chain Growth (Addition), Step growth (Condensation)), Mechanism: cationic, anionic, free radical and coordination covalent.

Plastomers: Thermosetting and Thermoplastics, Preparation, properties and Engineering applications of PVC, Teflon, Bakelite and nylons.

Elastomers

Natural Rubber; Processing of natural rubbers, Compounding of Rubber

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, Buna-N, Polyurethane, Polysulfide (Thiokol) rubbers

ii) Conducting polymers: Mechanism, synthesis and applications of polyacetylene, polyaniline.

iii) Inorganic Polymers: Basic Introduction, Silicones, Polyphosphazins (- (R)<sub>2</sub>-P=N-) applications

## **UNIT – III            ELECTROCHEMISTRY**

i) Galvanic cells, Nernst Equation, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries), Fuels cells: (Hydrogen-Oxygen and Methanol-Oxygen, Solid oxide)

ii) Corrosion: Introduction, type of corrosion (Concentration cell corrosion, Galvanic corrosion), Chemical (Dry) and Electrochemical (Wet) Theory of corrosion. Galvanic series, factors affecting the corrosion (Metal and environment). Prevention: Cathodic protection (Sacrificial anode and impressed current), Inhibitors (Anodic and cathodic), electroplating (Copper, nickel and chromium) and electroless plating (Copper and nickel)

## **UNIT – IV            FUELS AND COMBUSTION**

Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems.

Solid Fuels: Coal-Classification and Analysis (proximate and ultimate), Coke :Characteristics of metallurgical coke, Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

Liquid Fuels:

Petroleum: Refining of Petroleum, Gasoline- Octane Number, Diesel - Cetane Number, Synthetic Petrol: Bergius Processes, Fischer Tropsch's synthesis

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

Gaseous Fuels: Natural gas, Producer gas, Water gas, Coal gas and Biogas. Determination calorific value of Gases fuels by Junker's calorimeter.

Combustion: Basic principles and numerical problems, Flue Gas analysis by Orsat's apparatus.

## **UNIT – V            CHEMISTRY OF ENGINEERING MATERIALS**

i) Cement: Composition, Classification, preparation (Dry and Wet processes), Setting and Hardening (Hydration and Hydrolysis)

- ii) Refractories: Introduction, Classification , properties and applications
- iii) Lubricants: Introduction, classification (Solid, liquid, semi solid, emulsion and synthetic), Theory of lubrication (Thin film, Thick film & Extreme pressure) , properties of lubricants and applications.
- iv) Carbon clusters: Fullerenes and Carbon Nano Tubes (CNT)

### **Text Books:**

1. Engineering Chemistry, First Edition, Jayaveera KN, Subba Reddy GV and Ramachandraiah C, McGraw Hill Higher Education, New Delhi, 2013.
2. A Text Book of Engineering Chemistry, 15<sup>th</sup> Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013.

### **References:**

1. A Text book of Engineering Chemistry, 12<sup>th</sup> Edition, SS Dhara, Uma, S. Chand Publications, New Delhi, 2010.
2. Engineering Chemistry, First edition, K.B. Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited, 2010.
3. Engineering Chemistry, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson Education, 2013.

### **Outcomes:** The student is expected to:

- Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.
- Understand the electrochemical sources of energy
- Understand industrially based polymers, various engineering materials.

B. Tech I-II Sem. (EEE)

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**(15A01101) ENVIRONMENTAL STUDIES**

**OBJECTIVE:** *To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.*

**UNIT – I**

**MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:** – Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and

ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION :** Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### **UNIT – III**

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards



**SOLID WASTE MANAGEMENT :** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

#### **UNIT – IV**

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

#### **UNIT – V**

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK :** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-

Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

**TEXT BOOKS :**

1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.

**REFERENCES :**

1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

**Outcomes :**

- (1) Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
- (2) Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
- (3) Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.

- 
- (4) By studying environmental sciences, students is exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.

At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.

B. Tech I-II Sem. (EEE)	L	T	P	C
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**(15A02201) ELECTRICAL CIRCUITS - I****Objectives:**

To make the student learn about

- Basic characteristics of R,L,C parameters
- The concepts of real power, reactive power, complex power, phase angle and phase difference
- How to compute two port network parameters
- Network reduction techniques, star to delta and delta to star transformations
- Series and parallel resonances, bandwidth, current locus diagrams
- Network theorems and their applications

**UNIT- I                      INTRODUCTION TO ELECTRICAL & MAGNETIC CIRCUITS**

**Electrical Circuits:** Circuit Concept, R, L and C Parameters - Independent and Dependent Voltage and Current Sources -Source Transformation, Voltage - Current Relationship for Passive Elements (For Different Input Signals: Square, Ramp, Saw Tooth, Triangular. Kirchhoff's Laws, Network Reduction Techniques: Series, Parallel, Series Parallel, Star-to-Delta or Delta-to-Star Transformation. Examples

**Magnetic Circuits:** Faraday's Laws of Electromagnetic Induction, Concept of Self and Mutual Inductance, Dot Convention, Coefficient of Coupling, Composite Magnetic Circuit-Analysis of Series and Parallel Magnetic Circuits, MMF Calculations.

**UNIT- II     SINGLE PHASE A.C CIRCUITS**

R.M.S, Average Values and Form Factor for Different Periodic Wave Forms: Sinusoidal Alternating Quantities. Phase and Phase Difference, Complex and Polar Forms Of Representations, j-Notation, Steady State Analysis of R, L and C (In Series, Parallel and Series Parallel Combinations) With Sinusoidal Excitation, Concept of Power Factor, Concept of Reactance, Impedance, Susceptance and Admittance-Real and Reactive Power and Complex Power. Examples.

**UNIT- III     LOCUS DIAGRAMS & RESONANCE**

Series R-L, R-C, R-L-C and Parallel Combination with Variation of Parameters. Resonance: Series, Parallel Circuits, Concept of Bandwidth and Q Factor.

**UNIT- IV     NETWORK THEOREMS**

Thevenin's, Norton's, Maximum Power Transfer, Millman's Theorems, Tellegen's, Superposition, Reciprocity and Compensation Theorems for D.C And Sinusoidal Excitations.

**UNIT- V     TWO PORT NETWORKS**

Two Port Network Parameters: Impedance, Admittance, Transmission and Hybrid Parameters and their Relations. Concept of Transformed Network, Two Port Network Parameters Using Transformed Variables.

**Outcome:**

After completing the course, the student should be able to do the following:

- Given a network, find the equivalent impedance by using network reduction techniques
- Given a circuit and the excitation, determine the real power, reactive power, power factor etc.,
- Determine the current through any element and voltage across any element
- Apply the network theorems suitably

**TEXT BOOKS:**

1. Electrical Circuit Theory and Technology 4th Edition, John Bird, Routledge/T&F, 2011.
2. Network Analysis 3<sup>rd</sup> Edition, M.E Van Valkenberg, PHI.

**REFERENCES:**

1. Circuit Theory (Analysis & Synthesis) 6<sup>th</sup> Edition, A. Chakrabarti, Dhanpat Rai & Sons, 2008.
2. Electric Circuits by N.Sreenivasulu, REEM Publications
3. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6<sup>th</sup> edition.
4. Circuits & Networks by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill

B. Tech I-II Sem. (EEE)	L	T	P	C
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**(15A51102) ENGINEERING CHEMISTRY LAB****(Common to All Branches)****Objectives:**

- Will learn practical understanding of the redox reaction
- Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications
- Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology.

**List of Experiments:**

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
5. Determination of Alkalinity of Water
6. Determination of acidity of Water
7. Preparation of Phenol-Formaldehyde (Bakelite)
8. Determination of Viscosity of oils using Redwood Viscometer I
9. Determination of Viscosity of oils using Redwood Viscometer II
10. Determination of calorific value of gaseous fuels by Junker's Calorimeter

11. Conductometric estimation of strong acid using standard sodium hydroxide solution
12. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
13. Potentio metric determination of iron using standard potassium dichromate
14. Colorometric estimation of manganese.
15. PH meter calibration and measurement of PH of water and various other samples.

(Any 10 experiments from the above list)

**References:**

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. Chemistry Practical- Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.

**Outcomes:**

- Would be confident in handling energy storage systems and would be able combat chemical corrosion
- Would have acquired the practical skill to handle the analytical methods with confidence.
- Would feel comfortable to think of design materials with the requisite properties
- Would be in a position to technically address the water related problems.



B. Tech I-II Sem. (EEE)

L	T	P	C
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**(15A02202) ELECTRICAL CIRCUITS LAB****OBJECTIVES:**

To make the student learn about:

- Experimental verification of theorems
- Experimental verification of Resonance phenomenon
- Drawing current locus diagrams
- Practical determination of two port network parameters
- Practical implementation of active and reactive power measurement techniques

**List of Experiments:**

- 1) Verification of Thevenin's and Norton's Theorems
- 2) Verification of Superposition Theorem and Maximum Power Transfer Theorem
- 3) Verification of Compensation Theorem
- 4) Verification of Reciprocity , Millmann's Theorems
- 5) Locus Diagrams of RL and RC Series Circuits
- 6) Series and Parallel Resonance
- 7) Determination of Self, Mutual Inductances and Coefficient of Coupling
- 8) Z and Y Parameters
- 9) Transmission and Hybrid Parameters
- 10) Measurement of Active Power for Star and Delta Connected Balanced Loads
- 11) Measurement of Reactive Power for Star and Delta Connected Balanced Loads
- 12) Measurement of 3-Phase Power by Two Wattmeter Method for Unbalanced Loads

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**OUTCOMES:**

After completing the course, the student should be able to do the following:

- Apply suitable theorems for circuit analysis and verify the results theoretically
- Experimental determination of two port network parameters and theoretical verification
- Measure active and reactive power experimentally and verify the theoretical values
- Experimentally determine self inductance, mutual inductance and coefficient of coupling
- Practically determine band width, Q-factor and verify with theoretical values.

B. Tech I-II Sem. (EEE)

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**(15A99201) ENGINEERING & I.T. WORKSHOP****ENGINEERING WORKSHOP****Course Objective:**

*The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.*

**1. TRADES FOR EXERCISES:**

- Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
- Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock
- Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet
- House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
- Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.
- Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

## 2. TRADES FOR DEMONSTRATION:

- a. Plumbing
- b. Machine Shop
- c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

### **References:**

1. *Engineering Work shop practice for JNTU*, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009
2. *Work shop Manual* / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. *Engineering Practices Lab Manual*, Jeyapoovan, SaravanaPandian, 4/e Vikas
4. *Dictionary of Mechanical Engineering*, GHF Nayler, Jaico Publishing House.

## I.T. WORKSHOP

### **Course Objective:**

- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- To learn about Networking of computers and use Internet facility for Browsing and Searching.

### **Learning Outcome:**

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors

- 
- Prepare Slide presentations using the presentation tool
  - Interconnect two or more computers for information sharing
  - Access the Internet and Browse it to obtain the required information
  - Install single or dual operating systems on computer

### **Preparing your Computer ( 5 weeks)**

**Task 1: Learn about Computer:** Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

**Task 2: Assembling a Computer:** Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

**Task 3: Install Operating system:** Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

**Task 4: Operating system features:** Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

### **Networking and Internet (4 weeks)**

**Task 5: Networking:** Students should connect two computers directly using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share

information. Crimpling activity, logical configuration etc should be done by the student. The entire process has to be documented.

**Task 6: Browsing Internet:** Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc.

If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

**Task 7: Antivirus:** Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

### **Productivity tools (6 weeks)**

**Task 8: Word Processor:** Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

**Task 9: Spreadsheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing

charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

**Task 10: Presentations :** creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

### **Optional Tasks:**

**Task 11: Laboratory Equipment:** Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material
- Air conditioner
- UPS and Inverter
- RO system
- Electrical Rectifier
- CRO
- Function Generator
- Microwave benches

**Task 12: Software:** Students may submit a report on specifications of various software that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. The software may be

proprietary software or Free and Open source software. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop operating system
- Server operating system
- Antivirus software
- MATLAB
- CAD/CAM software
- AUTOCAD

**References:**

1. Introduction to Computers, Peter Norton, Mc Graw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams”, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs”, Bigelows, TMH



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (EEE)**

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**(15A54301) MATHEMATICS-III****(Common to All Branches)****Objectives:**

- This course aims at providing the student with the concepts of Matrices, Numerical Techniques and Curve fitting.

**UNIT – I**

Elementary row transformations-Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations. Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonalization of matrix. Calculation of powers of matrix and inverse of a matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

**UNIT – II**

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout's triangularisation method, Gauss - Seidal iteration method.

**UNIT – III**

**Interpolation:** Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

**UNIT – IV**

Curve fitting: Fitting of a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation for Newton's interpolation formula. Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

**UNIT – V**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.

**TEXT BOOKS:**

3. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
4. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

**REFERENCES:**

3. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
4. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

**Outcomes:** The student will be able to analyze engineering problems using the concepts of Matrices and Numerical methods.

B. Tech II-I Sem. (EEE)

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**(15A02301) ELECTRICAL CIRCUITS- II****OBJECTIVES:**

To make the students learn about:

- How to determine the transient response of R-L, R-C, R-L-C series circuits for D.C. and A.C. excitations
- The analysis of three phase balanced and unbalanced circuits
- How to measure active and reactive power in three phase circuits
- Applications of Fourier transforms to electrical circuits excited by non-sinusoidal sources
- Study of Network topology, Analysis of Electrical Networks, Duality and Dual Networks
- Different types of filters and equalizers

**UNIT- I TRANSIENT RESPONSE ANALYSIS**

**D.C Transient Analysis:** Transient Response of R-L, R-C, R-L-C Series Circuits for D.C Excitation-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms, Response of R-L & R-C Networks to Pulse Excitation.

**A.C Transient Analysis:** Transient Response of R-L, R-C, R-L-C Series Circuits for Sinusoidal Excitations-Initial Conditions-Solution Method Using Differential Equations and Laplace Transforms

**UNIT- II THREE PHASE A.C CIRCUITS**

Phase Sequence- Star and Delta Connection-Relation between Line and Phase Voltages and Currents in Balanced Systems-Analysis of Balanced and unbalanced Three Phase Circuits- Measurement of Active and Reactive Power in Balanced and Unbalanced Three Phase Systems. Loop Method- Application of Millman's Theorem- Star Delta Transformation Technique – for balanced and unbalanced circuits, Measurement of Active and reactive Power.

**UNIT- III FOURIER TRANSFORMS**

Fourier Theorem- Trigonometric Form and Exponential Form of Fourier Series – Conditions of Symmetry- Line Spectra and Phase Angle Spectra- Analysis of Electrical Circuits excited by Non Sinusoidal sources of Periodic Waveforms. Fourier Integrals and Fourier Transforms – Properties of Fourier Transforms and Application to Electrical Circuits.

#### **UNIT- IV NETWORK TOPOLOGY**

Definitions – Graph – Tree, Basic Cut set and Basic Tie set Matrices for Planar Networks – Loop and Nodal Methods of Analysis of Networks with Dependent & Independent Voltage and Current Sources – Duality & Dual Networks. Nodal Analysis, Mesh Analysis, Super Node and Super Mesh for D.C Excitations.

#### **UNIT - V FILTER DESIGN & CIRCUIT SIMULATION**

Filters – Low Pass – High Pass and Band Pass – RC, RL filters– derived filters and composite filters design.

Circuit simulation – Description of Circuit elements, nodes, and sources, Input and Output variables – Modeling of the above elements – DC analysis.

#### **OUTCOMES:**

After completing the course, the student should be able to do the following:

- Determine the transient response of R-L, R-C, R-L-C circuits for D.C. and A.C. excitations
- Analyze three phase balanced and unbalanced circuits and determine line voltages, line currents, phase voltages and phase currents
- Measure active and reactive power consumed by a given three phase circuit
- Apply Fourier transforms to electrical circuits excited by non-sinusoidal sources
- Analysis of electrical networks, duality and dual networks
- Design different types of filters
- Simulate D.C. Circuits

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**TEXT BOOKS:**

1. Electrical Circuit Theory and Technology, John Bird, ELSEVIER, 4th Edition, 2010.
2. Network Analysis, M.E Van Valkenburg, Pearson Education, 3<sup>rd</sup> Edition, 2015.

**REFERENCES:**

1. Circuit Theory (Analysis & Synthesis), A. Chakrabarti, Dhanpat Rai & Co., 6<sup>th</sup> Edition, 2008.
2. Electric Circuits by N.Sreenivasulu, REEM Publications Pvt. Ltd., 2012
3. Engineering circuit analysis by William Hayt, Jack E. Kemmerly and Steven M. Durbin, Mc Graw Hill Education (India) Pvt. Ltd., 6<sup>th</sup> Edition, 2013.

B. Tech II-I Sem. (EEE)

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**(15A02302) ELECTRICAL MACHINES - I****OBJECTIVES:** To make the students learn about:

- The constructional features of DC machines and different types of windings employed in DC machines
- The phenomena of armature reaction and commutation
- Characteristics of generators and parallel operation of generators
- Methods for speed control of DC motors and applications of DC motors
- Various types of losses that occur in DC machines and how to calculate efficiency
- Testing of DC motors

**UNIT – I PRINCIPLES OF ELECTROMECHANICAL ENERGY CONVERSION**

Electromechanical Energy Conversion – Forces and Torque In Magnetic Field Systems – Energy Balance – Energy and Force in a Singly Excited Magnetic Field System, Determination of Magnetic Force - Co-Energy – Multi Excited Magnetic Field Systems.

**UNIT – II D.C. GENERATORS - I**

D.C. Generators – Principle of Operation – Constructional Features – Armature Windings – Lap and Wave Windings – Simplex and Multiplex Windings – Use of Laminated Armature – E. M.F Equation– Numerical Problems – Parallel Paths-Armature Reaction – Cross Magnetizing and De-Magnetizing AT/Pole – Compensating Winding – Commutation – Reactance Voltage – Methods of Improving Commutation.

**UNIT-III D.C GENERATORS – II**

Methods of Excitation – Separately Excited and Self Excited Generators – Build-Up of E.M.F - Critical Field Resistance and Critical Speed - Causes for Failure to Self Excite and

Remedial Measures-Load Characteristics of Shunt, Series and Compound Generators – Parallel Operation of D.C Series Generators – Use of Equalizer Bar and Cross Connection of Field Windings – Load Sharing.

#### **UNIT – IV                    D.C. MOTORS**

D.C Motors – Principle of Operation – Back E.M.F. – Circuit Model – Torque Equation – Characteristics and Applications of Shunt, Series and Compound Motors – Armature Reaction and Commutation.

Speed Control of D.C. Shunt and Series Motors. Motor Starters (3 Point and 4 Point Starters) – Protective Devices-Calculation of Starter Steps for D.C Shunt Motors.

#### **UNIT – V                    TESTING OF DC MACHINES**

Losses – Constant & Variable Losses – Calculation of Efficiency – Condition for Maximum Efficiency.

Methods of Testing – Direct, Indirect – Brake Test – Swinburne's Test – Hopkinson's Test – Field's Test – Retardation Test

#### **OUTCOMES:**

After completing the course, the student should be able to do the following:

- Calculate the e.m.f. generated on open circuit and find terminal voltage on load
- Diagnose the failure of DC generator to build up voltage
- Compute the load shared by each generator when several generators operate in parallel
- Determine the gross torque and useful torque developed by DC motor
- Identify suitable method and conditions for obtaining the required speed of DC motor
- Calculate the losses and efficiency of DC generators and motors

#### **TEXT BOOKS:**

1. Electrical Machinery, P.S. Bimbhra, Khanna Publishers, 7<sup>th</sup> Edition, 2011.
2. Electrical Machines, S K Bhattacharya, Mc Graw Hill Education (India) Pvt. Ltd., 4<sup>th</sup> Edition, 2014, 3<sup>rd</sup> Reprint 2015.

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**REFERENCES:**

1. The Performance and Design of Direct Current Machines, A.E. Clayton and N. N. Hancock, ELBS Publishers, First published 1927, First Edition of e-book 2012.
2. Electric Machinery, A.E.Fitzgerald, C.Kingsley and S. Umans, Mc Graw Hill Education (India) Pvt. Ltd., 6<sup>th</sup> Edition, 2005.
3. Electric Machines 4<sup>th</sup> edition, D.P.Kothari and I.J. Nagrath, Mc Graw Hill Education (India) Pvt. Ltd., 4<sup>th</sup> Edition, 2010, 16<sup>th</sup> Reprint 2015.



B. Tech II-I Sem. (EEE)

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**(15A02303) CONTROL SYSTEMS ENGINEERING****OBJECTIVES:**

To make the students learn about:

- Merits and demerits of open loop and closed loop systems; the effects of feedback
- The use of block diagram algebra and Mason's gain formula to find the effective transfer function between two nodes
- Transient and steady state responses , time domain specifications
- The concept of Root loci
- Frequency domain specifications, Bode diagrams and Nyquist plots
- The fundamental aspects of modern control

**UNIT – I INTRODUCTION**

Open Loop and closed loop control systems and their differences- Examples of control systems- Classification of control systems, Feedback Characteristics, Effects of positive and negative feedback. Mathematical models – Differential equations of Translational and Rotational mechanical systems, and Electrical Systems, Block diagram reduction methods – Signal flow graph - Reduction using Mason's gain formula. Transfer Function of DC Servo motor - AC Servo motor - Synchro transmitter and Receiver

**UNIT-II TIME RESPONSE ANALYSIS**

Step Response - Impulse Response - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants

**UNIT – III STABILITY**

The concept of stability – Routh's stability criterion – Stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci- effects of adding poles and zeros to  $G(s)H(s)$  on the root loci.

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**UNIT – IV                      FREQUENCY RESPONSE ANALYSIS**

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Stability Analysis from Bode Plots. Polar Plots-Nyquist Plots- Phase margin and Gain margin-Stability Analysis.

Compensation techniques – Lag, Lead, Lag-Lead Compensator design in frequency Domain.

**UNIT – V                      STATE SPACE ANALYSIS**

Concepts of state, state variables and state model, derivation of state models from differential equations. Transfer function models. Block diagrams. Diagonalization. Solving the Time invariant state Equations- State Transition Matrix and it's Properties. System response through State Space models. The concepts of controllability and observability.

**OUTCOMES:**

After completing the course, the student should be able to do the following:

- Evaluate the effective transfer function of a system from input to output using (i) block diagram reduction techniques (ii) Mason's gain formula
- Compute the steady state errors and transient response characteristics for a given system and excitation
- Determine the absolute stability and relative stability of a system
- Draw root loci
- Design a compensator to accomplish desired performance
- Derive state space model of a given physical system and solve the state equation

**TEXT BOOKS:**

1. Modern Control Engineering, Katsuhiko Ogata, PEARSON, 1<sup>st</sup> Impression 2015.
2. Control Systems Engineering, I. J. Nagrath and M. Gopal, New Age International Publishers, 5<sup>th</sup> edition, 2007, Reprint 2012.

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**REFERENCE BOOKS:**

1. Automatic Control Systems, Farid Golnaraghi and Benjamin. C. Kuo, WILEY, 9<sup>th</sup> Edition, 2010.
2. Control Systems, Dhanesh N. Manik, CENGAGE Learning, 2012.
3. John J D'Azzo and C. H. Houpis , "Linear Control System Analysis and Design: Conventional and Modern", McGraw - Hill Book Company, 1988.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (EEE)**

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**(15A04301) ELECTRONIC DEVICES AND CIRCUITS****Course Objectives:**

To give understanding on semiconductor physics of the intrinsic, p and n materials, characteristics of the p-n junction diode, diode's application in electronic circuits, Characteristics of BJT, FET, MOSFET, characteristics of special purpose electronic devices. To familiarize students with dc biasing circuits of BJT, FET and analyzing basic transistor amplifier circuits.

**Course Outcomes:**

Upon completion of the course, students will:

- Analyze the operating principles of major electronic devices, its characteristics and applications.
- Design and analyze the DC bias circuitry of BJT and FET.
- Design and analyze basic transistor amplifier circuits using BJT and FET.

**UNIT- I**

**Junction Diode Characteristics** : Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

**Special Semiconductor Diodes:** Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, DIAC, TRIAC, SCR, UJT. Construction, operation and characteristics of all the diodes is required to be considered.

**UNIT- II**

**Rectifiers and Filters:** Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter, Capacitor filter, L- section filter,  $\Pi$ -section filter, Multiple L- section and Multiple  $\Pi$  section filter, comparison of various filter circuits in terms of ripple factors.

**UNIT- III****Transistor Characteristics:**

**BJT:** Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a

transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

**FET:** FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

## UNIT- IV

**Transistor Biasing and Thermal Stabilization :** Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self bias, Stabilization against variations in  $V_{BE}$ ,  $I_c$ , and  $\beta$ , Stability factors, ( $S$ ,  $S'$ ,  $S''$ ), Bias compensation, Thermal runaway, Thermal stability.  
FET Biasing- methods and stabilization.

## UNIT- V

### Small Signal Low Frequency Transistor Amplifier Models:

**BJT:** Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

**FET:** Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

### TEXT BOOKS:

1. J. Millman, C. Halkias, "Electronic Devices and Circuits", Tata Mc-Graw Hill, 4<sup>th</sup> Edition, 2010.
2. David A. Bell, "Electronic Devices and Circuits", Fifth Edition, Oxford University Press, 2009.
3. Salivahanan, Kumar, Vallavaraj, "Electronic Devices and Circuits", Tata Mc-Graw Hill, Second Edition

### REFERENCES:

1. Jacob Millman, C. Halkies, C.D. Parikh, "Integrated Electronics", Tata Mc-Graw Hill, 2009.
2. R.L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuits", Pearson Publications, 9<sup>th</sup> Edition, 2006.
3. BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, "Electronic Devices and Circuits", Pearson, 2<sup>nd</sup> edition.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (EEE)**

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**(15A05201) DATA STRUCTURES**  
**(Common to all branches of Engineering)**

**Objectives:**

- Understand different Data Structures
- Understand Searching and Sorting techniques

**Unit-1**

**Introduction and overview:** Asymptotic Notations, One Dimensional array- Multi Dimensional array- pointer arrays.

**Linked lists:** Definition- Single linked list- Circular linked list- Double linked list- Circular Double linked list- Application of linked lists.

**Unit-2**

**Stacks:** Introduction-Definition-Representation of Stack-Operations on Stacks- Applications of Stacks.

**Queues:** Introduction, Definition- Representations of Queues- Various Queue Structures- Applications of Queues. **Tables:** Hash tables.

**Unit-3**

**Trees:** Basic Terminologies- Definition and Concepts- Representations of Binary Tree- Operation on a Binary Tree- Types of Binary Trees-Binary Search Tree, Heap Trees, Height Balanced Trees, B. Trees, Red Black Trees.

**Graphs:** Introduction- Graph terminologies- Representation of graphs- Operations on Graphs- Application of Graph Structures: Shortest path problem- topological sorting.

**Unit-4**

**Sorting :** Sorting Techniques- Sorting by Insertion: Straight Insertion sort- List insertion sort- Binary insertion sort- Sorting by selection: Straight selection sort- Heap Sort- Sorting by Exchange- Bubble Sort- Shell Sort-Quick Sort-External Sorts: Merging Order Files-Merging Unorder Files- Sorting Process.

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**Unit-5**

**Searching:** List Searches- Sequential Search- Variations on Sequential Searches- Binary Search- Analyzing Search Algorithm- Hashed List Searches- Basic Concepts- Hashing Methods- Collision Resolutions- Open Addressing- Linked List Collision Resolution- Bucket Hashing.

**Text Books:**

1. “Classic Data Structures”, Second Edition by Debasis Samanta, PHI.
2. “Data Structures A Pseudo code Approach with C”, Second Edition by Richard F. Gilberg, Behrouz A. Forouzan, Cengage Learning.

**Reference Books:**

1. Fundamentals of Data Structures in C – Horowitz, Sahni, Anderson- Freed, Universities Press, Second Edition.
2. Schaum’ Outlines – Data Structures – Seymour Lipschutz – McGrawHill-Revised First Edition.
3. Data structures and Algorithms using C++, Ananda Rao Akepogu and Radhika Raju Palagiri, Pearson Education.

B. Tech II-I Sem. (EEE)

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**(15A02305) ELECTRIC CIRCUITS SIMULATION LABORATORY****Objectives:**

- To understand the various electric circuit concepts through circuit simulation using PSPICE software
- To know performance of RLC series and parallel circuits through simulation studies
- To know the analysis of 3-phase balanced and unbalanced circuits by simulation
- To understand the occurrence of transients in electric circuits with both DC and AC excitations

**List of Experiments**

- 1) Simulation of DC Circuits
- 2) DC Transient Response
- 3) Mesh Analysis
- 4) Nodal Analysis
- 5) Frequency response of RLC Series Circuits
- 6) Analysis of RL and RC Series circuits for DC Excitation
- 7) Analysis of RL and RC Series circuits for AC Excitation
- 8) Analysis of Three Phase balanced systems
- 9) Analysis of Three Phase unbalanced systems
- 10) Verification of the maximum power dissipation (plot the power dissipated versus the load).

**Outcomes:**

The student should be able to do the following at the end of the lab course:

- Explain electric circuit concepts by interpreting the simulation results
- Design RLC series circuit for specified frequency response
- Analyze three phase balanced and unbalanced circuits
- Design RL, RC and RLC circuits for specified transient response



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**REFERENCES:**

1. Simulation of Power Electronics Circuit, M B Patil, V Ramanarayan and V T Ranganat, Alpha Science International Ltd., 2009.
2. Public Domain Simulator: [http:// www.ee.iitb.ac.in/~sequel](http://www.ee.iitb.ac.in/~sequel)
3. PSPICE A/D user's manual – Microsim, USA.
4. PSPICE reference guide – Microsim, USA.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech II-I Sem. (EEE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>(15A04305) ELECTRONIC DEVICES AND CIRCUITS LABORATORY</b>				

**Course Outcomes:**

- Students able to learn electrical model for various semiconductor devices and learns the practical applications of the semiconductor devices

**PART A: Electronic Workshop Practice**

- Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils, Gang Condensers, Relays, Bread Boards.
- Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
- Soldering Practice- Simple circuits using active and passive components.
- Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter,

Function Generator, Regulated Power Supply and CRO.

**PART B: List of Experiments**

(For Laboratory Examination-Minimum of Ten Experiments)

- P-N Junction Diode Characteristics

Part A: Germanium Diode (Forward bias & Reverse bias)

Part B: Silicon Diode (Forward bias only)

- Zener Diode Characteristics

Part A: V-I Characteristics

Part B: Zener Diode act as a Voltage Regulator

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### 3. Rectifiers (without and with c-filter)

Part A: Half-wave Rectifier

Part B: Full-wave Rectifier

### 4. BJT Characteristics(CE Configuration)

Part A: Input Characteristics

Part B: Output Characteristics

### 5. FET Characteristics(CS Configuration)

Part A: Drain (Output) Characteristics

Part B: Transfer Characteristics

### 6. SCR Characteristics

### 7. UJT Characteristics

### 8. Transistor Biasing

### 9. CRO Operation and its Measurements

### 10. BJT-CE Amplifier

### 11. Emitter Follower-CC Amplifier

### 12. FET-CS Amplifier

PART C: Equipment required for Laboratory

1. Regulated Power supplies
2. Analog/Digital Storage Oscilloscopes
3. Analog/Digital Function Generators
4. Digital Multimeters
5. Decade Résistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Ammeters (Analog or Digital)
8. Voltmeters (Analog or Digital)
9. Active & Passive Electronic Components
10. Bread Boards

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## 11. Connecting Wires

CRO Probes etc.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (EEE)**

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**(15A54402) MATHEMATICS –IV**  
**(Common to ECE, EEE)**

**Objectives:** To enable the students to understand the mathematical concepts of special functions & complex variables and their applications in science and engineering.

**UNIT – I: Special Functions:** Gamma and Beta Functions – their properties – Evaluation of improper integrals. Series Solutions of ordinary differential equations (Power series and Frobenius Method).

**UNIT – II:** Bessel functions – Properties – Recurrence relations – Orthogonality. Legendre polynomials – Properties – Rodrigue’s formula – Recurrence relations – Orthogonality.

**UNIT – III**

Functions of a complex variable – Continuity – Differentiability – Analyticity – Properties – Cauchy-Riemann equations in Cartesian and polar coordinates. Harmonic and conjugate harmonic functions – Milne – Thomson method.

Conformal mapping: Transformation of  $e^z$ ,  $\ln z$ ,  $z^2$ ,  $\sin z$ ,  $\cos z$ , Bilinear transformation - Translation, rotation, magnification and inversion – Fixed point – Cross ratio – Determination of bilinear transformation.

**UNIT – IV**

Complex integration: Line integral – Evaluation along a path and by indefinite integration – Cauchy’s integral theorem – Cauchy’s integral formula – Generalized integral formula.

Complex power series: Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point – Isolated singular point – Pole of order m – Essential singularity.

## UNIT – V

Residue – Evaluation of residue by formula and by Laurent's series – Residue theorem.

Evaluation of integrals of the type

(a) Improper real integrals  $\int_{-\infty}^{\infty} f(x) dx$  (b)  $\int_0^{2\pi} f(\cos \theta, \sin \theta) d\theta$  (c)  $\int_{-\infty}^{\infty} e^{imx} f(x) dx$

## TEXT BOOKS:

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - III, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher

## REFERENCES:

1. Mathematics III by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.
2. Advanced Engineering Mathematics, Peter V.O'Neil, CENGAGE publisher.
3. Advanced Engineering Mathematics by M.C. Potter, J.L. Goldberg, Edward F.Aboufadel, Oxford.

**Outcomes:** The student achieves the knowledge to analyse the problems using the methods of special functions and complex variables

B. Tech II-II Sem. (EEE)

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**(15A52301) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**Course Objectives:** The objective of this course is to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to impart analytical skills in helping them take sound financial decisions for achieving higher organizational productivity.

**Unit I: INTRODUCTION TO MANAGERIAL ECONOMICS**

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Relationship of Managerial Economics with Financial Accounting and Management. **Demand Analysis:** Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of elasticity of demand - Demand Forecasting- factors governing demand forecasting- methods of demand forecasting.

**UNIT II: THEORY OF PRODUCTION AND COST ANALYSIS**

**Production Function-** Least cost combination- Short-run and Long- run production function- Isoquants and Isocosts, MRTS - Cobb-Douglas production function - Laws of returns - Internal and External economies of scale - **Cost Analysis:** Cost concepts and cost behavior- Break-Even Analysis (BEA) -Determination of Break Even Point (Simple Problems)-Managerial significance and limitations of Break- Even Point.

**UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT**

**Market structures:** Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition- Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole

Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization.

#### **UNIT IV: INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS**

Financial Accounting – Concept - Emerging need and Importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

#### **UNIT V: CAPITAL AND CAPITAL BUDGETING**

Concept of Capital - Over and Undercapitalization – Remedial Measures - Sources of Short term and Long term Capital - Estimating Working Capital Requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

**Learning Outcome:** After completion of this course, the student will be able to understand various aspects of Managerial Economics and analysis of financial statements and inputs therein will help them to make sound and effective decisions under different economic environment and market situations.

#### **TEXT BOOKS:**

1. Managerial Economics 3/e, Ahuja H.L, S.Chand, 2013.
2. Financial Management, I.M.Pandey, Vikas Publications, 2013.

#### **REFERENCES**

1. Managerial Economics and Financial Analysis, 1/e, Aryasri, TMH, 2013.
2. Managerial Economics and Financial Analysis, S.A. Siddiqui and A.S. Siddiqui, New Age International, 2013.
3. Accounting and Financial Management, T.S.Reddy & Y. Hariprasad Reddy, Margham Publishers.



**B. Tech II-II Sem. (EEE)**

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**(15A02401) ELECTRICAL MACHINES – II****OBJECTIVES:**

To make the student learn about:

- Constructional details of transformer and its operation (i) on no load (ii) on load
- Predetermination of regulation and efficiency of transformer from OC and SC test results
- Parallel operation of transformers
- Constructional details, principle of operation and the importance of slip in Induction motor operation
- The slip-torque characteristics and torque calculations of Induction motor
- Methods of starting and speed control of Induction motor

**UNIT-I SINGLE PHASE TRANSFORMERS**

Single Phase Transformers- Constructional Details- Hysteresis and Eddy Current Losses- Emf Equation - Operation on No Load and on Load - Phasor Diagrams.

Equivalent Circuit - Losses and Efficiency-Regulation. All Day Efficiency - Effect of Variations of Frequency & Supply Voltage on Iron Losses.

**UNIT-II TESTING OF TRANSFORMERS, THREE PHASE TRANSFORMERS**

OC and SC Tests - Sumpner's Test - Predetermination of Efficiency and Regulation- Separation of Losses Test-Parallel Operation with Equal and Unequal Voltage Ratios - Auto Transformers-Equivalent Circuit - Comparison with Two Winding Transformers. Three Phase Transformers - Connections - Y/Y, Y/ $\Delta$ ,  $\Delta$ /Y,  $\Delta$ / $\Delta$  and Open  $\Delta$ , Third Harmonics in Phase Voltages-Three Winding Transformers-Tertiary Windings- Scott Connection.

**UNIT-III THREE-PHASE INDUCTION MOTORS**

Polyphase Induction Motors-Constructional Details of Cage and Wound Rotor Machines-Production of Rotating Magnetic Field - Principle of Operation – Slip - Rotor Emf and Rotor Frequency - Rotor Reactance, Rotor Current and Power factor at

Standstill and under running conditions - Rotor Power Input, Rotor Copper Loss and Mechanical Power Developed and Their Inter Relationship.

#### **UNIT-IV      3-PHASE INDUCTION MOTOR CHARACTERISTICS**

Torque Equation - Expressions for Maximum Torque and Starting Torque - Torque Slip Characteristic – Load characteristics - Equivalent Circuit - Phasor Diagram - Crawling and Cogging -Circle Diagram-No Load and Blocked Rotor Tests-Predetermination of Performance.

#### **UNIT-V      STARTING AND SPEED CONTROL OF INDUCTION MOTORS**

Starting Methods and Starting Current and Torque Calculations, Speed Control-Change of Frequency; Pole Changing and Methods of Consequent Poles; Cascade Connection. Injection of an Emf.

#### **OUTCOMES:**

After completing the course, the student should be able to do the following:

- Draw the equivalent circuit of transformer
- Conduct O.C, S.C tests and predetermine the regulation and efficiency of transformer
- Compute the load shared by each transformer when several transformers operate in parallel
- Draw the circle diagram of a three phase Induction motor and predetermine the performance characteristics
- Determine the starting torque, maximum torque, slip at maximum torque using given data

#### **TEXT BOOKS:**

1. Electrical Machinery, P.S. Bimbhra, Khanna Publishers, 7<sup>th</sup> Edition, 2011.
2. Electric Machines 4<sup>th</sup> edition, D.P.Kothari and I.J. Nagrath, Mc Graw Hill Education (India) Pvt. Ltd., 4<sup>th</sup> Edition, 2010, 16<sup>th</sup> Reprint 2015.

#### **REFERENCE BOOKS:**

1. The Performance and Design of Alternating Current Machines, M. G. Say, CBS Publishers, 3<sup>rd</sup> Edition, 2002.
2. Theory of Alternating Current Machinery, Alexander S. Langsdorf, Tata McGraw-Hill, 2<sup>nd</sup> edition, 1999, 35<sup>th</sup> Reprint.
3. A Textbook of Electrical Machines, K R Siddhapura and D B Raval, Vikas Publishing House Pvt. Ltd., 2014.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (EEE)**

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**(15A02402) ELECTRICAL POWER GENERATING SYSTEMS****OBJECTIVES:**

To make the student learn about:

- Structure, essential components and their layout in thermal power station
- Selection of site for thermal power station
- Selection of site for hydro power generation
- Various aspects and issues involved in Nuclear power generation
- Electric power generation from renewable energy sources as sun, wind and ocean
- Cost of generation and tariff methods

**UNIT-I: THERMAL POWER GENERATING SYSTEMS**

Block Diagram of Thermal Power Station (TPS) showing paths of Coal, Steam, Water, Air, Ash and Flue Gasses - Brief Description of TPS Components: Economizers, Boilers, Super Heaters, Turbines, Condensers, Chimney and Cooling Towers.

**UNIT-II: HYDRO & NUCLEAR POWER GENERATING SYSTEMS**

**Hydro Power:** Selection of Site, Classification, Layout, Description of Main Components.

**Nuclear Power:** Nuclear Fission and Chain Reaction.- Nuclear Fuels.- Principle of Operation of Nuclear Reactor.-Reactor Components: Moderators, Control Rods, Reflectors and Coolants.- Radiation Hazards: Shielding and Safety Precautions.- Types of Nuclear Reactors and Brief Description of PWR, BWR and FBR.

**UNIT –III: SOLAR & WIND POWER GENERATING SYSTEMS**

**Solar Power Generation:** Role and Potential of Solar Energy Options, Principles of Solar Radiation, Flat Plate and Concentrating Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.

**Wind Power Generation:** Role and potential of Wind Energy Option, Horizontal and Vertical Axis Wind Mills- Performance Characteristics- Power- Speed & Torque- Speed Characteristics-Pitch & Yaw Controls – Power Electronics Application – Economic Aspects.

#### **UNIT-IV: BIOGAS & GEOTHERMAL POWER GENERATING SYSTEMS**

**Biogas Power Generation:** Principles of Bioconversion, Types of Biogas Digesters – Characteristics of Bio-Gas- Utilization- Economic and Environmental Aspects.

**Geothermal and Ocean Power Generation:** Principle of Geothermal Energy Methods of Harnessing-Principle of Ocean Energy-Tidal and Wave Energy- Mini Hydel Plants- Economic Aspects.

#### **UNIT-V: ECONOMIC ASPECTS OF POWER GENERATION**

Load Curve, Load Duration and Integrated Load Duration Curves-Load Demand, Diversity, Capacity, Utilization and Plant Use Factors- Numerical Problems. Costs Of Generation and their Division Into Fixed, Semi-Fixed and Running Costs. Tariff Methods: Desirable Characteristics of a Tariff Method.- Flat Rate, Block-Rate, Two-Part, Three –Part, and Power Factor Tariff Methods and Numerical Problems.

**OUTCOMES:** After completing the course, the student should be able to do the following:

- Estimate the coal requirement, cost per kWh generation and number of units generated for thermal power station
- Estimate the required flow of river water, cost of generation and number of units generated in hydel power generation
- Compute various factors like load factor, plant factor
- Evaluate the tariffs to be charged for the consumers
- Plot the load curve, load duration curve and hence determine the load capacity of the plant

#### **TEXT BOOKS:**

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.
2. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd., 2005.
3. Non Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.

**REFERENCE BOOKS:**

1. Renewable Energy Resources – John Twidell and Tony Weir, Second Edition, Taylor and Francis Group, 2006.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.
4. Wind Electrical Systems by S. N. Bhadra, D. Kastha & S. Banerjee – Oxford University Press, 2013.

B. Tech II-II Sem. (EEE)

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**(15A02403) ELECTROMAGNETIC FIELDS****OBJECTIVES:**

To make the student learn about:

- The laws concerning static electric fields: Coulomb's law, Gauss law; the laws concerning static magnetic fields: Biot-savart law, Ampere circuital law
- The equations concerned with static electric fields
- The equations concerned with static magnetic fields
- The difference between the behaviors of conductors and dielectrics in electric fields
- The energy stored and energy density in (i) static electric field (ii) magnetic field
- Electric dipole and dipole moment, magnetic dipole and dipole moment

**UNIT-I ELECTROSTATICS**

Electrostatic Fields - Coulomb's Law - Electric Field Intensity(EFI) due to Line, Surface and Volume charges- Work Done in Moving a Point Charge in Electrostatic Field-Electric Potential due to point charges, line charges and Volume Charges - Potential Gradient - Gauss's Law-Application of Gauss's Law-Maxwell's First Law – Numerical Problems.

Laplace's Equation and Poisson's Equations - Solution of Laplace's Equation in one Variable. Electric Dipole - Dipole Moment - Potential and EFI due to Electric Dipole - Torque on an Electric Dipole in an Electric Field – Numerical Problems.

**UNIT- II CONDUCTORS AND DIELECTRICS**

Behavior of Conductors in an Electric Field-Conductors and Insulators – Electric Field Inside a Dielectric Material – Polarization – Dielectric Conductors and Dielectric Boundary Conditions – Capacitance-Capacitance of Parallel Plate, Spherical & Co-axial capacitors – Energy Stored and Energy Density in a Static Electric Field – Current Density – Conduction and Convection Current Densities – Ohm's Law in Point Form – Equation of Continuity – Numerical Problems.

**UNIT-III MAGNETO STATICS**

Static Magnetic Fields – Biot-Savart Law – Oerstead's experiment – Magnetic Field Intensity(MFI) due to a Straight, Circular & Solenoid Current Carrying Wire – Maxwell's Second Equation. Ampere's Circuital Law and its Applications Viz., MFI Due to an Infinite Sheet of Current and a Long Current

Carrying Filament – Point Form of Ampere’s Circuital Law – Maxwell’s Third Equation – Numerical Problems.

Magnetic Force — Lorentz Force Equation – Force on Current Element in a Magnetic Field - Force on a Straight and Long Current Carrying Conductor in a Magnetic Field - Force Between two Straight and Parallel Current Carrying Conductors – Magnetic Dipole and Dipole moment – A Differential Current Loop as a Magnetic Dipole – Torque on a Current Loop Placed in a Magnetic Field – Numerical Problems.

#### **UNIT – IV MAGNETIC POTENTIAL**

Scalar Magnetic Potential and Vector Magnetic Potential and its Properties - Vector Magnetic Potential due to Simple Configuration – Vector Poisson’s Equations.

Self and Mutual Inductances – Neumann’s Formulae – Determination of Self Inductance of a Solenoid and Toroid and Mutual Inductance Between a Straight, Long Wire and a Square Loop Wire in the Same Plane – Energy Stored and Intensity in a Magnetic Field – Numerical Problems.

#### **UNIT-V TIME VARYING FIELDS**

Faraday’s Law of Electromagnetic Induction – It’s Integral and Point Forms – Maxwell’s Fourth Equation. Statically and Dynamically Induced E.M.F’s – Simple Problems – Modified Maxwell’s Equations for Time Varying Fields – Displacement Current.

Wave Equations – Uniform Plane Wave Motion in Free Space, Conductors and Dielectrics – Velocity, Wave Length, Intrinsic Impedence and Skin Depth – Poynting Theorem – Poynting Vector and its Significance.

**OUTCOMES:** After going through this course the student acquires:

- Knowledge on basic principles, concepts and fundamental laws of electromagnetic fields.
- The knowledge to understand 3-dimensional co-ordinate systems, electrostatics, magneto statics, time-varying fields and interaction between electricity and magnetism.
- The knowledge to calculate the quantities associated with uniform plane wave motion in different media of transmission.

#### **TEXT BOOKS:**

1. Engineering Electromagnetics, William.H.Hayt, Mc.Graw Hill, 2010.
2. Principles of Electromagnetics, 6<sup>th</sup> Edition, Sadiku, Kulkarni, OXFORD University Press, 2015.

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**REFERENCE BOOKS:**

1. Field Theory, K.A.Gangadhar, Khanna Publications, 2003.
2. Electromagnetics 5<sup>th</sup> edition, J.D.Kraus,Mc.Graw – Hill Inc, 1999.
3. Electromagnetics, Joseph Edminister, Tata Mc Graw Hill, 2006.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech II-II Sem. (EEE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>(15A04409) ANALOG ELECTRONIC CIRCUITS</b>				

**Course Objective**

The aim of this course is to familiarize the student with the analysis and design of basic transistor amplifier circuits, Oscillators, Multi-vibrators and wave shaping.

**Course Outcomes**

On completion of this course the student will be able to understand the

- Methods of biasing transistors & Design of simple amplifier circuits.
- Mid – band analysis of amplifier circuits using small - signal equivalent circuits to determine gain, input impedance and output impedance.
- Method of calculating cutoff frequencies and to determine bandwidth.
- Design and analyse different Oscillator circuits.
- Design of circuits for linear wave shaping and Multi-vibrators.

**UNIT I****Multistage Amplifiers**

BJT and FET RC Coupled Amplifiers – Frequency Response. Cascaded Amplifiers. Calculation of Band Width of Single and Multistage Amplifiers. Concept of Gain Bandwidth Product.

**UNIT II****Feedback Amplifiers**

Concept of Feedback Amplifiers – Effect of Negative feedback on the amplifier Characteristics. Four Feedback Amplifier Topologies. Method of Analysis of Voltage Series, Current Series, Voltage Shunt and Current Shunt feedback Amplifiers.

### **UNIT III**

#### **Sinusoidal Oscillators**

Condition for oscillations –LC Oscillators – Hartley, Colpitts, Clapp and Tuned Collector Oscillators – Frequency and amplitude Stability of Oscillators – Crystal Oscillators – RC Oscillators -- RC Phase Shift and Weinbridge Oscillators.

### **UNIT IV**

#### **Large Signal Amplifiers**

Class A power Amplifier, Maximum Value of Efficiency of Class A Amplifier, Transformer coupled amplifier – Push-Pull Amplifier – Complimentary Symmetry Circuits (Transformer Less Class B Power Amplifier) – Phase Inverters, Transistor Power Dissipation, Thermal Runaway, Heat Sinks.

### **UNIT V**

**Linear wave shaping:** High pass, Low pass RC circuits-response for sinusoidal, Step, Pulse, Square and Ramp inputs, Clippers and Clampers

**Multi-Vibrators:** Analysis of Diode and transistor switching times, Analysis and Design of Bistable, Monostable and Astable Multi-vibrators, Schmitt trigger Using Transistors.

#### **Text Books :**

1. Integrated Electronics – Millman and Halkias
2. Pulse, Digital & Switching Waveforms by Jacob Milliman, Harbert Taub and Mothiki S Prakash Rao, 2<sup>nd</sup> edition 2008, Tata McGraw Hill Companies

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**References:**

1. K.Lal Kishore, "Electronic Circuit Analysis", Second Edition, BSP
2. Electronic Devices and Circuits, G.S.N. Raju, IK International Publications, New Delhi, 2006
3. Electronic Devices and Circuits – Mottershead
4. A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2005.
5. David A. Bell, "Solid State Pulse Circuits", 4<sup>th</sup> edition, 2002 PHI.

B. Tech II-II Sem. (EEE)

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**(15A02404) ELECTRICAL MACHINES LABORATORY - I****OBJECTIVES:** The student has to learn about:

- No load and load characteristics of DC generators
- Various tests on DC motors
- The speed control techniques of DC motors

**The following experiments are required to be conducted as compulsory experiments:**

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Brake test on DC shunt motor. Determination of performance curves.
4. Load test on DC compound generator. Determination of characteristics.
5. Hopkinson's tests on DC shunt machines. Predetermination of efficiency.
6. Fields test on DC series machines. Determination of efficiency.
7. Swinburne's test and speed control of DC shunt motor. Predetermination of efficiencies.
8. Brake test on DC compound motor. Determination of performance curves.

**In addition to the above eight experiments, atleast any two of the experiments from the following list are required to be conducted.**

9. Load test on DC series generator. Determination of characteristics.
10. Retardation test on DC shunt motor. Determination of losses at rated speed.
11. Separation of losses in DC shunt motor.

**OUTCOMES:** The student should be able to do the following:

- Conduct experiments to obtain the no-load and load characteristics of D.C. Generators
- Conduct tests on D.C. motors for predetermination of efficiency
- Conduct tests on D.C. motors for determination of efficiency
- Control the speed of D.C. motor in a given range using appropriate method
- Identify the reason as to why D.C. Generator is not building up voltage

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech II-II Sem. (EEE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>(15A02405) CONTROL SYSTEMS AND SIMULATION LABORATORY</b>				

The objectives of this lab course are to make the student practically learn about

- The effects of feedback on system performance
- Determination of transfer function of DC Machine.
- The design of controllers/compensators to achieve desired specifications.
- The characteristics of servo mechanisms used in automatic control applications.

**Any Eight of the following experiments are to be conducted:**

1. Time Response of Second Order System
2. Characteristics of Synchros
3. Programmable Logic Controller – Study and Verification of Truth Tables of Logic Gates, Simple Boolean Expressions and Application of Speed Control of Motor.
4. Effect of Feedback on DC Servo Motor
5. Transfer Function of DC Machine
6. Effect of P, PD, PI, PID Controller on a Second Order System.
7. Lag and Lead Compensation – Magnitude and Phase Plot
8. Temperature Controller Using PID
9. Characteristics of Magnetic Amplifiers
10. Characteristics of AC Servo Motor

**Any two simulation experiments are to be conducted:**

1. PSPICE Simulation of Op-Amp Based Integrator and Differentiator Circuits.
2. Linear System Analysis (Time Domain Analysis, Error Analysis) Using MATLAB.
3. Stability Analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant System Using MATLAB
4. State Space Model for Classical Transfer Function Using MATLAB – Verification.

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**OUTCOMES:** At the end of the course the student should be able to

- Design the controllers/compensators to achieve desired specifications.
- Understand the effect of location of poles and zeros on transient and steady state behavior of systems.
- Assess the performance, in terms of time domain specifications, of first and second order systems.
- Use MATLAB/SIMULINK software for control system analysis and design.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (EEE)**

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**15A02501 ELECTRICAL MEASUREMENTS****Course Objectives:**

The objectives of the course are to make the student learn about

- The basic principles of different types of electrical instruments for the Measurement of voltage, current, power factor, power and energy.
- The measurement of R, L, and C parameters using bridge circuits.
- The principles of magnetic measurements.
- The principle of working of CRO and its applications.
- The use of Current Transformers, Potential Transformers, and Potentiometers.

**UNIT- I****MEASURING INSTRUMENTS**

Classification – Ammeters and Voltmeters – PMMC, Dynamometer, Moving Iron Type Instruments – Expression for the Deflecting Torque and Control Torque – Errors and Compensations, Range Extension.

Cathode Ray Oscilloscope- Cathode Ray tube-Time base generator-Horizontal and Vertical Amplifiers – Applications of CRO – Measurement of Phase , Frequency, Current & Voltage- Lissajous Patterns

**UNIT – II****D.C & A.C BRIDGES**

Methods of Measuring Low, Medium and High Resistances – Sensitivity of Wheatstone's Bridge – Kelvin's Double Bridge for Measuring Low Resistance, Measurement of High Resistance – Loss of Charge Method. Measurement of Inductance - Maxwell's Bridge, Anderson's Bridge. Measurement of Capacitance and Loss Angle - Desauty Bridge. Wien's Bridge – Schering Bridge.

**UNIT – III****MEASUREMENT OF POWER AND ENERGY**

Single Phase Dynamometer Wattmeter, LPF and UPF, Double Element and Three Element Dynamometer Wattmeter, Expression for Deflecting and Control Torques. Types of P.F. Meters – Dynamometer and Moving Iron Type – 1-ph and 3-ph Meters. Single Phase Induction Type Energy Meter – Driving and Braking Torques – Errors and Compensations. Three Phase Energy Meter.

**UNIT –IV****INSTRUMENT TRANSFORMERS AND POTENTIOMETERS**

Current Transformers and Potential Transformers – Ratio and Phase Angle Errors – Methods for Reduction of Errors-Design Considerations.

Potentiometers: Principle and Operation of D.C. Crompton's Potentiometer – Standardization – Measurement of unknown Resistance, Current, Voltage.

A.C. Potentiometers: Polar and Coordinate types- Standardization – Applications.

**UNIT – V****MAGNETIC MEASUREMENTS**

Ballistic Galvanometer – Equation of Motion – Flux Meter – Constructional Details, Comparison with Ballistic Galvanometer. Determination of B-H Loop - Methods of Reversals - Six Point Method – A.C. Testing – Iron Loss of Bar Samples.

**OUTCOMES:** The student should have learnt how to

- Use wattmeters, pf meters, and energy meters in a given circuit.
- Extend the range of ammeters and voltmeters
- Measure active power, reactive power, power factor, and energy in both 1-phase and 3-phase circuits
- Determine the resistance values of various ranges, L and C values using appropriate bridges.
- Analyze the different characteristic features of periodic, and aperiodic signals using CRO.
- Use CTs and PTs for measurement of very large currents and high voltages

**TEXT BOOKS:**

1. Electrical & Electronic Measurement & Instruments, A.K.Sawhney and Dhanpat Rai & Co. Publications, 2011, Reprint 2014.
2. Electrical Measurements and measuring Instruments 5<sup>th</sup> Edition, E.W. Golding and F.C. Widdis, Reem Publications, 5<sup>th</sup> Edition, 2011.

**REFERENCE BOOKS:**

1. Electronic Instrumentation, 3<sup>rd</sup> Edition, H. S. Kalsi, Tata Mcgrawhill, 2011.
2. Electrical Measurements, Buckingham and Price, Prentice Hall, 1970.
3. Electrical Measurements: Fundamentals, Concepts, Applications, Reissland, M.U., New Age International (P) Limited, 2010.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (EEE)**

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**15A04509 LINEAR & DIGITAL IC APPLICATIONS****Course Objective:**

- To make the student understand the basic concepts in the design of electronic circuits using linear integrated circuits and their applications. To introduce some special function ICs.
- To be able to use computer-aided design tools for development of complex digital logic circuits
- To be able to model, simulate, verify, analyze, and synthesize with hardware description languages
- To be able to design and prototype with standard cell technology and programmable logic
- To be able to design tests for digital logic circuits, and design for testability

**Learning Outcome:**

- Upon completion of the course, students will be able to:
- Understand the basic building blocks of linear integrated circuits and its characteristics.
- Analyze the linear, non-linear and specialized applications of operational amplifiers.
- Understand the theory of ADC and DAC.
- Able to use computer-aided design tools for development of complex digital logic circuits.
- Able to model, simulate, verify, analyze, and synthesize with hardware description languages.
- Able to design and prototype with standard cell technology and programmable logic.
- Able to design tests for digital logic circuits, and design for testability.

**UNIT I****OP-AMP CHARACTERISTICS:**

Basic information of Op-amp, ideal and practical Op-amp, internal circuits, Op-amp characteristics - DC and AC characteristics, 741 Op-amp and its features, modes of operation-inverting, non-inverting, differential. Basic applications of Op-amp, instrumentation amplifier, AC amplifier, V to I and I to V converters, sample & Hold circuits, multiplier and divider, Differentiator and Integrator, Comparators, Schmitt trigger, Multivibrators, Introduction to voltage regulators, features of 723 General

purpose regulator.

## UNIT II

### **TIMERS, PHASE LOCKED LOOPS & D-A AND A-D CONVERTERS:**

Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger, PLL – Introduction, block schematic, principles and description of individual blocks of 565. Basic DAC techniques, Weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs – parallel comparator type ADC, Counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC specifications.

## UNIT III

### **ACTIVE FILTERS & OSCILLATORS:**

Introduction, 1<sup>st</sup> order LPF, HPF filters, Band pass, Band reject and all pass filters. Oscillator types and principle of operation- RC, Wien, and quadrature type, waveform generators- triangular, sawtooth, square wave and VCO.

## UNIT IV

### **INTEGRATED CIRCUITS:**

Classification, Chip size and circuit complexity, Classification of integrated circuits, comparison of various logic families, standard TTL NAND Gate-Analysis & characteristics, TTL open collector o/p's, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate, IC interfacing-TTL driving CMOS & CMOS driving TTL.

## UNIT V

### **COMBINATIONAL & SEQUENTIAL CIRCUITS**

**COMBINATIONAL:** Code converters, Decoders, Demultiplexers, decoders & drives for LED & LCD display. Encoder, priority Encoder, Multiplexers & their applications, priority generators/checker circuits. Digital arithmetic circuits-parallel binary adder/subtractor circuits using 2's Complement system. Digital comparator circuits.

**SEQUENTIAL:** Latches, Flip-flops & their conversions. Design of synchronous counters, Decade counter, shift registers & applications, familiarities with commonly available 74XX and CMOS 40XX series of IC counters.

### **Text Books:**

1. *Linear Integrated Circuits – D.Roy Chowdhury, New Age International (p) Ltd, 2<sup>nd</sup> Edition., 2003.*
2. *Digital Design Principles & Practices – John F. Wakerly, PHI/ Pearson Education Asia, 3<sup>rd</sup> Ed., 2005.*

**Reference Books:**

1. *Operational Amplifiers & Linear Integrated Circuits* – R.F.Coughlin & Fredric F.Driscoll, PHI.
2. *Operational Amplifiers & Linear Integrated Circuits: Theory & Applications* – Denton J.Daibey, TMH.
3. *Design with Operational amplifiers & Analog Integrated circuits*-Sergio Franco, Mc Graw Hill, 3<sup>rd</sup> Edition , 2002.
4. *Digital Fundamentals* – Floyd and Jain, Pearson Education, 8<sup>th</sup> Edition 2005.
5. *A VHDL Primer* – J. Bhasker, Pearson Education/ PHI, 3<sup>rd</sup> Edition.
6. *Op-amps & Linear ICs* – Ramakanth A.Gayakwad, PHI, 1987.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (EEE)**

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**15A02502 ELECTRICAL POWER TRANSMISSION SYSTEMS****Course Objectives :**

The objectives of the course are to make the student learn about

- The computation of the parameters of a Transmission line.
- Classification of transmission lines and representation by suitable equivalent circuits
- the various factors that affect the performance of Transmission lines
- The Travelling wave phenomenon on transmission lines.
- Underground cables: construction, types, and grading

**UNIT- I****TRANSMISSION LINE PARAMETERS**

Types of Conductors – ACSR, Bundled and Stranded Conductors- Resistance For Solid Conductors – Skin Effect- Calculation of Inductance for Single Phase and Three Phase, Single and Double Circuit Lines, Concept of GMR & GMD, Symmetrical and Asymmetrical Conductor Configuration with and without Transposition, Numerical Problems, Capacitance Calculations for Symmetrical and Asymmetrical Single and Three Phase, Single and Double Circuit Lines, Effect of Ground on Capacitance, Numerical Problems.

**UNIT- II****PERFORMANCE OF TRANSMISSION LINES:**

Classification of Transmission Lines - Short, Medium and Long Lines and Their Exact Equivalent Circuits- Nominal-T, Nominal- $\pi$ . Mathematical Solutions to Estimate Regulation and Efficiency of All Types of Lines. Long Transmission Line-Rigorous Solution, Evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations – Surge Impedance and Surge Impedance Loading - Wavelengths and Velocity of Propagation – Ferranti Effect , Charging Current-Numerical Problems.

**UNIT- III****MECHANICAL DESIGN OF TRANSMISSION LINES**

Overhead Line Insulators: Types of Insulators, String Efficiency and Methods for Improvement, Capacitance Grading and Static Shielding.

Corona: Corona Phenomenon, Factors Affecting Corona, Critical Voltages and Power Loss, Radio Interference.

Sag and Tension Calculations: Sag and Tension Calculations with Equal and Unequal Heights of Towers, Effect of Wind and Ice on Weight of Conductor, Stringing Chart and Sag Template and Its Applications, Numerical Problems.

#### **UNIT – IV**

##### **POWER SYSTEM TRANSIENTS & TRAVELLING WAVES**

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of Lines with Different Types of Conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems). Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

#### **UNIT-V**

##### **CABLES**

Types of Cables, Construction, Types of Insulating Materials, Calculations of Insulation Resistance and Stress in Insulation, Numerical Problems. Capacitance of Single and 3-Core Belted Cables, Numerical Problems. Grading of Cables - Capacitance Grading, Numerical Problems, Description of Inter-Sheath Grading.

Course **Outcomes:** At the end of the course the student will be able to

- Compute the transmission line parameters.
- Model a given transmission line.
- Estimate the performance of a given transmission line.
- Analyze the effect of over voltages on transmission lines.
- Explain the construction, types and grading of underground cables and analyze cable performance.

#### **TEXT BOOKS:**

1. Electrical power systems, C.L.Wadhwa, New Age International (P) Limited, 6<sup>th</sup> Edition, 2010, Reprint 2014.
2. A Text Book on Power System Engineering, M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakrabarti, Dhanpat Rai & Co. Pvt. Ltd., 1999.

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**REFERENCE BOOKS:**

1. Power system Analysis 4th edition, John J Grainger and William D Stevenson, JR, Mc Graw Hill Education, 2003, Reprint 2015.
2. Power System Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill Education (India) Pvt. Ltd., 2<sup>nd</sup> Edition, 2008, 23<sup>rd</sup> Reprint 2015.
3. Electric Power Transmission System Engineering: Analysis and Design, Turan Gonen, 2<sup>nd</sup> Edition, CRC Press, Taylor & Francis group, 2009, 1<sup>st</sup> Indian Reprint 2010.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (EEE)**

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**15A02503 POWER ELECTRONICS****Course Objectives:**

The objectives of the course are to make the student learn about

- the basic power semiconductor switching devices and their principles of operation.
- the various power conversion methods, controlling and designing of power converters.
- the applications of Power electronic conversion to domestic, industrial, aerospace, commercial and utility systems etc.
- the equipment used for DC to AC, AC to DC, DC to Variable DC, and AC to Variable frequency AC conversions.

**UNIT I****POWER SEMI CONDUCTOR DEVICES**

Semiconductor Power Diodes, Thyristors – Silicon Controlled Rectifiers (SCR's) – TRIACs, GTOs - Characteristics and Principles of Operation and other Thyristors – Classification of Switching Devices Based on Frequency and Power Handling Capacity- BJT – Power Transistor - Power MOSFET – Power IGBT – Basic Theory of Operation of SCR – Static Characteristics – Turn On and Turn Off Methods- Dynamic Characteristics of SCR - Two Transistor Analogy – Triggering Circuits— Series and Parallel Connections of SCR's – Snubber Circuits – Specifications and Ratings of SCR's, BJT, IGBT.

**UNIT II****PHASE CONTROLLED CONVERTERS**

Phase Control Technique – Single Phase Line Commutated Converters – Mid Point and Bridge Connections – Half Controlled Converters, Fully Controlled Converters with Resistive, RL Loads and RLE Load– Derivation of Average Load Voltage and Current – Line Commutated Inverters -Active and Reactive Power Inputs to the Converters without and with Free Wheeling Diode, Effect of Source Inductance – Numerical Problems. Three Phase Line Commutated Converters – Three Pulse and Six Pulse Converters – Mid Point and Bridge Connections - Average Load Voltage with R and RL Loads – Effect of Source Inductance–Dual **Converters (Both Single Phase and Three Phase) - Waveforms –Numerical Problems.**

### UNIT III CHOPPERS AND REGULATORS

Commutation Circuits – Time Ratio Control and Current Limit Control Strategies – Step Down and Step up Choppers Derivation of Load Voltage and Currents with R, RL and RLE Loads- Step Up Chopper – Load Voltage Expression– Problems. Study of Buck, Boost and Buck-Boost regulators, buck regulator e.g. TPS54160, hysteretic buck regulator e.g. LM3475, Switching Regulator and characteristics of standard regulator ICs – TPS40200, TPS40210, TPS 7A4901, TPS7A8300

### UNIT IV INVERTERS

Inverters – Single Phase Inverter – Basic Series Inverter – Basic Parallel Capacitor Inverter Bridge Inverter – Waveforms – Simple Forced Commutation Circuits for Bridge Inverters – Single Phase Half and Full Bridge Inverters-Pulse Width Modulation Control-Harmonic Reduction Techniques-Voltage Control Techniques for Inverters – Numerical Problems, Three Phase VSI in  $120^\circ$  And  $180^\circ$  Modes of Conduction.

### UNIT V AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS

**AC Voltage Controllers** – Single Phase Two SCR's in Anti Parallel – With R and RL Loads – Modes of Operation of TRIAC – TRIAC with R and RL Loads – Derivation of RMS Load Voltage, Current and Power Factor Wave Forms – Firing Circuits -Numerical Problems - Thyristor Controlled Reactors; Switched Capacitor Networks.

**Cyclo Converters** – Single Phase Mid Point Cycloconverters with Resistive and Inductive Load (Principle of Operation only) – Bridge Configuration of Single Phase Cycloconverter (Principle of Operation only) – Waveforms

#### Course Outcomes:

After going through this course, the student acquires knowledge about:

- Basic operating principles of power semiconductor switching devices.
- the operation of power electronic converters, choppers, inverters, AC voltage controllers, and cycloconverters, and their control.
- How to apply the learnt principles and methods to practical applications.

#### TEXT BOOKS:

1. Power Electronics, M. D. Singh and K. B. Khanchandani, Mc Graw Hill Education (India) Pvt. Ltd., 2<sup>nd</sup> Edition, 2007, 23<sup>rd</sup> Reprint 2015.
2. Power Electronics: Circuits, Devices and Applications, Muhammad H. Rashid, Pearson, 3<sup>rd</sup> Edition, 2014, 2<sup>nd</sup> Impression 2015.



**REFERENCE BOOKS:**

1. Power Electronics, K. R. Varmah, Chikku Abraham, CENGAGE Learning, 1<sup>st</sup> Edition, 2016.
2. Power Electronics, P. S. Bimbhra, Khanna Publishers, 2012.
3. Power Electronics: Devices, Circuits, and Industrial Applications, V. R. Moorthi, OXFORD University Press, 1<sup>st</sup> Edition, 2005, 12<sup>th</sup> Impression 2012.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (EEE)**

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**15A02504 ELECTRICAL MACHINES – III****Course Objectives:**

The objectives of the course are to make the student learn about

- the construction and principle of working of synchronous machines
- different methods of predetermining the regulation of alternators
- the concepts and computation of load sharing among alternators in parallel.
- the performance characteristics of synchronous motors and their use as synchronous condensers for power factor improvement.
- different types of single phase motors and special motors used in house hold appliances and control systems.
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**UNIT – I****SYNCHRONOUS GENERATORS**

Principle and Constructional Features of Salient Pole and Round Rotor Machines – Armature Windings, Concentrated and Distributed Windings, Integral Slot and Fractional Slot Windings – Pitch, Distribution, and Winding Factors – E.M.F Equation- Harmonics in Generated E.M.F – Space and Slot Harmonics – Elimination of Harmonics- Armature Reaction – Synchronous Reactance and Impedance – Load Characteristics - Phasor Diagram.

**UNIT – II****REGULATION OF SYNCHRONOUS GENERATORS**

Regulation of Salient Pole Alternator – Voltage Regulation Methods – E.M.F Method- MMF Method – ZPF Method – ASA Method – Short Circuit Ratio (SCR) – Two Reaction Theory –Determination of  $X_d$  and  $X_q$  (Slip Test) – Phasor Diagrams.

**UNIT –III****PARALLEL OPERATION OF SYNCHRONOUS GENERATORS**

Power Flow Equation in Alternators (Cylindrical and Salient Pole Machines) – Synchronizing Power and Torque – Parallel Operation and Load Sharing – Effect of Change of Excitation and Mechanical Power Input – Synchronizing Alternators with Infinite Bus Bars – Determination of Sub-Transient, Transient and Steady State Reactances.

**UNIT – IV****SYNCHRONOUS MOTORS**

Theory of Operation – Phasor Diagram – Power Flow Equations in Synchronous Motors- Variation of Current and Power Factor with Excitation – V and Inverted V Curves – Synchronous Condensers – Hunting, and Methods to Eliminate Hunting – Starting Methods of Synchronous Motor – Synchronous Induction Motor - Construction, Principle of operation and control of Brushless DC motor.

**UNIT – V****SINGLE PHASE AND SPECIAL MOTORS**

Single Phase Induction Motors - Constructional Features – Double Revolving Field Theory- Elementary Idea of Cross Field Theory – Split Phase Motors – Capacitor Start and Run Motors – Shaded Pole Motor. Principle and Performance of A.C Series Motor - Universal Motor – Single Phase Synchronous Motors – Reluctance Motor – Hysteresis Motor – Stepper Motor.

Course **Outcomes:** At the end of the course the student will be able to

- predetermine the regulation of synchronous generators using different methods.
- Determine how several alternators running in parallel share the load on the system.
- Analyze the performance characteristics of synchronous motors.
- Make necessary calculations for power factor improvement using synchronous condenser.
- Choose specific 1-phase motor and/or special motors for a given application.

**TEXT BOOKS:**

1. Electrical Machinery, P.S. Bimbhra, Khanna Publishers, 7<sup>th</sup> Edition, 2011.
2. Electric Machinery Fundamentals, Stephen J Chapman, Mc Graw Hill Series in Electrical and Computer Engineering, 4<sup>th</sup> Edition, 2010, 10<sup>th</sup> Reprint 2015.

**REFERENCE BOOKS:**

1. Electric Machines 4<sup>th</sup> edition, D.P.Kothari and I.J. Nagrath, Mc Graw Hill Education (India) Pvt. Ltd., 4<sup>th</sup> Edition, 2010, 16<sup>th</sup> Reprint 2015.
2. Electric Machinery, A.E.Fitzgerald, C.Kingsley and S. Umans, Mc Graw Hill Education (India) Pvt. Ltd., 6<sup>th</sup> Edition, 2005.
3. Electrical Machines, S K Bhattacharya, Mc Graw Hill Education (India) Pvt. Ltd., 4<sup>th</sup> Edition, 2014, 3<sup>rd</sup> Reprint 2015.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (EEE)**

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**15A04510 DIGITAL CIRCUITS AND SYSTEMS  
( MOOCS-I )**
**Course Outcomes:**

Upon completion of the course, students should possess the following skills:

- Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, Gray, and BCD.
- Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
- Be able to design and analyze small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
- Be able to design and analyze small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

**UNIT-I**

Number System and Boolean Algebra And Switching Functions: Number Systems, Base Conversion Methods, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes. Boolean algebra: Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR

**UNIT -II:**

Minimization and Design of Combinational Circuits: Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method, Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code Converters, Wired Logic, Tristate Bus System, Practical Aspects related to Combinational Logic Design, Hazards and Hazard Free Relations.

**UNIT III****SEQUENTIAL CIRCUITS**

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation –Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/sub-tractor- Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment - Excitation table and maps-Circuit implementation - Modulo-n counter, Registers

– shift registers - Universal shift registers – Shift register counters – Ring counter – Shift counters - Sequence generators.

**UNIT IV****MEMORY DEVICES**

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timing wave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – Programmable Logic Devices – Programmable Logic Array (PLA) - Programmable Array Logic (PAL) - Field Programmable Gate Arrays (FPGA) - Implementation of combinational logic circuits using ROM, PLA, PAL

**UNIT V****SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS**

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine – Analysis of Synchronous Sequential Circuits

Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits – Incompletely specified State Machines – Problems in Asynchronous Circuits – Design of Hazard Free Switching circuits. Design of Combinational and Sequential circuits using VERILOG

**TEXT BOOKS:**

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3<sup>rd</sup> Edition, Cambridge.
2. Digital Design- Morris Mano, PHI, 4th Edition. Prentice Hall of India Pvt. Ltd., 2003 / Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003.
3. S. Salivahanan and S. Arivazhagan, Digital Circuits and Design, 3rd Edition., Vikas Publishing House Pvt. Ltd.

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**REFERENCE BOOKS:**

1. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3<sup>rd</sup> Ed, John Wiley & Sons Inc.
2. Digital Fundamentals – A Systems Approach – Thomas L. Floyd, Pearson, 2013.
3. Digital Logic Design - Ye Brian and HoldsWorth, Elsevier
4. Fundamentals of Logic Design- Charles H. Roth, Cengage LEarning, 5<sup>th</sup>, Edition, 2004.
5. John F.Wakerly, Digital Design, Fourth Edition, Pearson/PHI, 2006
6. John.M Yarbrough, Digital Logic Applications and Design, Thomson Learning, 2002.
7. William H. Gothmann, Digital Electronics, 2nd Edition, PHI, 1982.
8. Thomas L. Floyd, Digital Fundamentals, 8th Edition, Pearson Education Inc, New Delhi, 2003

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A02505 NETWORKS SIGNALS AND SYSTEMS  
( MOOCS-I )**

**Course Objectives:** The objectives of the course are to make the students learn about

- Basic characteristics of circuit elements
- How to compute two port parameters
- Study of graph theory and analysis of electrical networks
- Application of Laplace transforms to analyse the frequency response
- Application of Fourier transforms to electrical circuits excited by non-sinusoidal sources.

**Unit – I Introduction**

Network elements and sources – linearity and nonlinearity – Distributed and lumped parameters – Analysis of resistive networks

**Unit – II Two port networks**

Two port parameters short and open circuit – Problems – locus diagrams – Driving point immittance functions – Two element synthesis- Problems

**Unit – III Introduction to signals**

Types of signals – Laplace transforms – problems – Frequency response – bode plot – poles and zeros

**Unit – IV – Graph Theory**

Introduction – Concepts of Graph theory – image impedance and iterative impedance – Computer aided analysis of resistive networks – RLC two terminal network

**Unit – V Synthesis of Network functions**

Parts of Network functions – Problems – Synthesis of two port network – Fourier series – Fourier Transforms

**Outcomes: After completion of Course, the student should be able to**

- Given network, find the equivalent impedance by the concept of two port network
- Analyse the frequency response of electrical network using Laplace transform
- Apply concepts of Fourier series to simplify the electrical network
- Synthesize the network using network functions

**References:**

1. Electrical circuit theory and Technology, Jhon Bird, Elsevier, 4<sup>th</sup> Edition, 2010
2. Network Analysis, M.E. Van Valkenburg, Pearson Education, 3<sup>rd</sup> Edition, 2015
3. Circuit Theory (Analysis & Synthesis), A. Charabarthi, Dhanpat Rai & Co., 6<sup>th</sup> Edition, 2008.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (EEE)**

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**15A02506 ELECTRICAL MACHINES LABORATORY – II****Course Objective:**

- To experiment in detail on Transformers, Induction Motors, Alternators and Synchronous Motors, and evaluate their performance characteristics.

**The following experiments are required to be conducted as compulsory experiments:**

- O.C. & S.C. Tests on Single phase Transformer.
- Sumpner's Test on a Pair of identical Single Phase Transformers
- Scott Connection of Transformers
- No-Load & Blocked Rotor Tests on Three Phase Induction Motor
- Regulation of Three –Phase Alternator by Synchronous Impedance & M.M.F. Methods
- V and Inverted V Curves of 3 Phase Synchronous Motor.
- Equivalent Circuit of Single Phase Induction Motor
- Determination of  $X_d$  and  $X_q$  of Salient Pole Synchronous Machine

**In addition to the above eight experiments, at least any two of the following experiments are required to be conducted:**

- Parallel Operation of Single Phase Transformers
- Separation of Core Losses of Single Phase Transformer
- Brake Test on Three Phase Induction Motor
- Regulation of Three-Phase Alternator by Z.P.F. and A.S.A Methods

**Course Outcomes:**

- After going through this laboratory course, the student acquires sufficiently good practical knowledge about the operation, testing, and characteristics of important A.C equipment like transformers, Induction Motors, Alternators and Synchronous Motors.
- The student should also have acquired the knowledge about the fixation of the rating of transformers, induction motors and synchronous machines.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (EEE)**

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**15A02507 ELECTRICAL MEASUREMENTS LABORATORY****Course Objective:** The objectives of the course are to make the students learn about:

- Calibration of various electrical measuring/recording instruments.
- Accurate determination of resistance, inductance and capacitance using D.C and A.C Bridges.
- Measurement of parameters of choke coil

**The following experiments are required to be conducted as compulsory experiments:**

1. Calibration of Single Phase Energy Meter using Phantom loading method with RSS meter as standard
2. Calibration of Dynamometer Power Factor Meter
3. Crompton D.C. Potentiometer – Calibration of PMMC Ammeter and PMMC Voltmeter
4. Kelvin's Double Bridge – Measurement of very low Resistance values – Determination of Tolerance.
5. Measurement of % Ratio Error and Phase Angle of Given C.T. by Comparison.
6. Schering Bridge & Anderson Bridge for measurement of Capacitance and Inductance values.
7. Measurement of 3 Phase Reactive Power with Single-Phase Wattmeter.
8. Measurement of Parameters of a Choke Coil Using 3 Voltmeter and 3 Ammeter Methods.

**In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:**

9. Optical Bench – Determination of Polar Curve, Measurement of MHCP of Filament Lamps
10. Calibration of LPF Wattmeter – by Phantom Testing
11. Measurement of 3 Phase Power with Two Watt Meter Method (Balanced & Un balanced).
12. Dielectric Oil Testing Using H.T. Testing Kit
13. LVDT and Capacitance Pickup – Characteristics and Calibration
14. Resistance Strain Gauge – Strain Measurement and Calibration
15. Transformer Turns Ratio Measurement Using A.C. Bridge.

**Course Outcomes:** At the end of the course, the student will be able to

- Calibrate various electrical measuring/recording instruments.
- Accurately determine the values of inductance and capacitance using a.c bridges
- Accurately determine the values of very low resistances
- Measure reactive power in 3-phase circuit using single wattmeter
- Determine ratio error and phase angle error of CT

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech III-I Sem. (EEE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A99501 SOCIAL VALUES & ETHICS (AUDIT COURSE)**  
**(Common to all Branches)**

**UNIT - I**

**Introduction and Basic Concepts of Society: Family and Society:** Concept of family, community, PRIs and other community based organizations and society, growing up in the family – dynamics and impact, Human values, Gender Justice.

**Channels of Youth Moments for National Building: NSS & NCC:** History, philosophy, aims & objectives; Emblems, flags, mottos, songs, badge etc.; Organizational structure, roles and responsibilities of various NSS functionaries. **Nehru Yuva Kendra (NYK):** Activities – Socio Cultural and Sports.

**UNIT – II**

Activities of NSS, NCC, NYK:

**Citizenship:** Basic Features Constitution of India, Fundamental Rights and Fundamental Duties, Human Rights, Consumer awareness and the legal rights of the consumer, RTI.

**Youth and Crime:** Sociological and psychological Factors influencing youth crime, Peer Mentoring in preventing crimes, Awareness about Anti-Ragging, Cyber Crime and its prevention, Juvenile Justice

**Social Harmony and National Integration:** Indian history and culture, Role of youth in peace-building and conflict resolution, Role of youth in Nation building.

**UNIT – III**

**Environment Issues:** Environment conservation, enrichment and Sustainability, Climate change, Waste management, Natural resource management (Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation).

**Health, Hygiene & Sanitation:** Definition, needs and scope of health education, Food and Nutrition, Safe drinking water, Sanitation, Swachh Bharat Abhiyan.

**Disaster Management:** Introduction to Disaster Management, classification of disasters, Role of youth in Disaster Management. Home Nursing, First Aid.

**Civil/ Self Defense:** Civil defense services, aims and objectives of civil defense, Need for self defense training – Teakwondo, Judo, karate etc.,

**UNIT – IV**

**Gender Sensitization:** Understanding Gender – Gender inequality – Role of Family, Society and State; Challenges – Declining Sex Ratio – Sexual Harassment – Domestic

Violence; Gender Equality – Initiatives of Government – Schemes, Law; Initiates of NGOs – Awareness, Movements;

## UNIT - V

**Physical Education** : Games & Sports: Health and Recreation – Biological basis of Physical activity – benefits of exercise – Physical, Psychological, Social; Physiology of Muscular Activity, Respiration, Blood Circulation.

**Yoga**: Basics of Yoga – Yoga Protocol, Postures, Asanas, Pranayama: Introduction of Kriyas, Bandhas and Mudras.

### TEXT BOOKS:

1. NSS MANUAL
2. SOCIETY AND ENVIRONMENT: A.S.Chauha, Jain Brothers Publications, 6<sup>th</sup> Edition, 2006
3. INDIAN SOCIAL PROBLEM: G.R.Madan, Asian Publisher House
4. INDIAN SOCIAL PROBLEM: Ram Ahuja, Rawat Publications
5. HUMAN SOCIETY: Kingsley Davis, Macmillan
6. SOCIETY: Mac Iver D Page, Macmillan
7. SOCIOLOGY – THEMES AND PERSPECTIVES: Michael Honalambos, Oxford University Press
8. CONSTITUTION OF INDIA: D.D.Basu, Lexis Nexis Butterworth Publishers
9. National Youth Policy 2014 (available on [www.yas.nic.in](http://www.yas.nic.in))
10. TOWARDS A WORLD OF EQUALS: A.Suneetha, Uma Bhargudanda, Duggirala Vasantha, Rama Melkote, Vasudha Nagraj, Asma Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Tharu
11. LIGHT ON YOGA : B.K.S.Iyengar, Penguin Random House Publishers

[www.un.org](http://www.un.org)

[www.india.gov.in](http://www.india.gov.in)

[www.yas.nic.in](http://www.yas.nic.in)

<http://www.who.int/countries/ind/en/>

<http://www.ndma.gov.in>

<http://ayush.gov.in/event/common-yoga-protocol-2016-0>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A52601 MANAGEMENT SCIENCE**

**Course Objective:** The objective of the course is to equip the student the fundamental knowledge of management science and its application for effective management of human resource, materials and operation of an organization. It also aims to expose the students about the latest and contemporary developments in the field of management.

**UNIT –I:**

**Introduction to Management:** Concept-Nature and Importance of Management, Functions-Evaluation of Scientific Management, Modern management-Motivation Theories-Leadership Styles-Decision Making Process-Designing Organization Structure-Principles and Types of Organization.

**UNIT- II:**

**Operations Management:** Plant location and Layout, Methods of production, Work-Study-Statistical Quality Control through Control Charts, Objectives of Inventory Management, Need for Inventory Control-EOQ&ABC Analysis(Simple Problems)**Marketing Management:**

Meaning,Nature, Functions of Marketing, Marketing Mix, Channels of distribution- Advertisement and sales promotion-Marketing strategies-Product Life Cycle.

**UNIT -III:**

**Human Resource Management(HRM):** Significant and Basic functions of HRM- Human Resource Planning(HRP), Job evaluation, Recruitment and Selection, Placement and Induction-Wage and Salary administration. Employee Training and development-Methods-Performance Appraisal-Employee Grievances-techniques of handling Grievances.

**UNIT –IV:**

**Strategic Management:** Vision, Mission, Goals and Strategy- Corporate Planning Process-Environmental Scanning-SWOT analysis-Different Steps in Strateg Formulation, Implementation and Evaluation. **Project Management:** Network Analysis- PERT, CPM, Identifying Critical Path-Probability-Project Cost Analysis, Project Crashing (Simple Problems).

**UNIT-V:**

**Contemporary Management Practices:** Basic concepts of MIS-Materials Requirement Planning(MRP),Just-In-Time(JIT)System, Total Quality Management(TQM)-Six Sigma

and Capability Maturity Models(CMM) evies, Supply Chain Management, Enterprise Resource Planning(ERP),Performance Management, Business Process Outsourcing(BPO), Business Process Re-Engineering and Bench Marking, Balance Score Card.

**Course Outcome:** This course enables the student to know the principles and applications of management knowledge and exposure to the latest developments in the field. This helps to take effective and efficient management decisions on physical and human resources of an organization. Beside the knowledge of Management Science facilitates for his/her personal and professional development.

### **TEXT BOOKS:**

1. A.R Aryasri: Management Science, TMH, 2013
2. Kumar /Rao/Chalill 'Introduction to Management Science' Cengage, Delhi, 2012.

### **REFERENCE BOOKS:**

1. A.K.Gupta "Engineering Management",S.CHAND, New Delhi, 2016.
2. Stoner, Freeman, Gilbert, Management, Pearson Education,New Delhi, 2012.
3. Kotler Philip & Keller Kevin Lane: Marketing Mangement , PHI,2013.
5. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005.
6. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
7. Memoria & S.V.Gauker, Personnel Management, Himalaya, 25/e, 2005
8. Parnell: Strategic Management, Biztantra, 2003.
9. L.S.Srinath: PERT/CPM,Affiliated East-West Press, 2005.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A02601 POWER SEMICONDUCTOR DRIVES****Course Objectives:** The objectives of the course are to make the students learn about:

- The operation of electric motor drives controlled by power electronic converters.
- The stable steady-state operation and transient dynamics of a motor-load system.
- The operation of the chopper fed DC drive.
- The distinguishing features of synchronous motor drives and induction motor drives.

**UNIT – I****CONVERTER FED DC MOTORS**

Classification of Electric Drives, Basic elements of Electric Drive, Dynamic Control of a Drive system, Stability analysis, Introduction to Thyristor Controlled Drives, Single Phase, Three Phase Semi and Fully Controlled Converters Connected to D.C Separately Excited and D.C Series Motors – Continuous Current Operation – Output Voltage and Current Waveforms – Speed and Torque Expressions – Speed – Torque Characteristics- Problems.

**UNIT – II****FOUR QUADRANT OPERATION OF DC DRIVES**

Introduction to Four Quadrant Operation – Motoring Operations, Electric Braking – Plugging, Dynamic and Regenerative Braking Operations. Four Quadrant Operation of D.C Motors by Dual Converters – Closed Loop Operation of DC Motor (Block Diagram Only)

**UNIT – III****CHOPPER FED DC MOTORS**

Single Quadrant, Two Quadrant and Four Quadrant Chopper Fed DC Separately Excited and Series Excited Motors – Continuous Current Operation – Output Voltage and Current Wave Forms – Speed Torque Expressions – Speed Torque Characteristics – Problems on Chopper Fed D.C Motors



**UNIT – IV****CONTROL OF INDUCTION MOTOR**

Induction Motor Stator Voltage Control and Characteristics. AC Voltage Controllers – Waveforms – Speed Torque Characteristics - Stator Frequency Control and Characteristics. Voltage Source and Current Source Inverter - PWM Control – Comparison of VSI and CSI Operations – Speed Torque Characteristics – Numerical Problems on Induction Motor Drives – Closed Loop Operation of Induction Motor Drives (Block Diagram Only) – Principles of Vector Control

Static Rotor Resistance Control – Slip Power Recovery – V/f control of Induction Motor – Their Performance and Speed Torque Characteristics – Advantages- Applications – Problems

**UNIT – V****CONTROL OF SYNCHRONOUS MOTORS**

Separate Control & Self Control of Synchronous Motors – Operation of Self Controlled Synchronous Motors by VSI and CSI Cycloconverters. Load Commutated CSI Fed Synchronous Motor – Operation – Waveforms – Speed Torque Characteristics – Applications – Advantages and Numerical Problems – Closed Loop Control Operation of Synchronous Motor Drives (Block Diagram Only), Introduction to variable frequency control.

**Course Outcomes:** The student should be able to:

- Identify the choice of the electric drive system based on their applications
- Explain the operation of single and multi quadrant electric drives
- Analyze single phase and three phase rectifiers fed DC motors as well as chopper fed DC motors
- Explain the speed control methods for AC-AC & DC-AC converters fed to Induction motors and Synchronous motors with closed loop, and open loop operations.

**TEXT BOOKS:**

1. Power semiconductor controlled drives, G K Dubey, Prentice Hall, 1995.
2. Modern Power Electronics and AC Drives, B.K.Bose, PHI, 2002.

**REFERENCE BOOKS:**

1. Power Electronics, MD Singh and K B Khanchandani, Tata McGraw-Hill Publishing company, 2008.
2. Power Electronic Circuits, Devices and applications, M.H.Rashid, PHI, 2005.
3. Electric drives Concepts and Applications, Vedam Subramanyam, Tata McGraw Hill Publications, 2<sup>nd</sup> Edition, 2011.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A02602 POWER SYSTEM PROTECTION****Course Objectives:** The objectives of the course are to make the students learn about:

- The different types of electromagnetic relays and microprocessor based relays
- The protection of Generators
- The protection of Transformers
- The protection of feeders and lines
- The technical aspects involved in the operation of circuit breakers
- Generation of over voltages and protection from over voltages

**UNIT – I****RELAYS**

Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection - Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Direction and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT. Static Relays – Comparators – Amplitude and Phase Comparators. Microprocessor Based Relays – Advantages and Disadvantages – Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays and Their Flow Charts.

**UNIT – II****PROTECTION OF GENERATORS & TRANSFORMERS**

Protection of Generators Against Stator Faults, Rotor Faults and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection. Numerical Problems on percentage winding unprotected. Protection of Transformers: Percentage Differential Protection, Numerical Problems on Design of CT Ratio, Buchholtz Relay Protection, Numerical Problems.

**UNIT – III****PROTECTION OF FEEDERS & LINES**

Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line – 3 Zone Protection Using Distance Relays. Carrier Current Protection. Protection of Bus Bars.

**UNIT – IV****CIRCUIT BREAKERS**

Circuit Breakers: Elementary Principles of Arc Interruption, Restriking Voltage and Recovery Voltage - Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB Ratings and Specifications: Types and Numerical Problems. – Auto Reclosures. Description and Operation of Following Types of Circuit Breakers: Minimum Oil Circuit Breakers, Air Blast Circuit Breakers, Vacuum and SF6 Circuit Breakers.

**UNIT – V****OVER VOLTAGES IN POWER SYSTEMS**

Generation of Over Voltages in Power Systems.-Protection against Lightning Over Voltages - Valve Type and Zinc-Oxide Lightning Arresters - Insulation Coordination –BIL.

**Course Outcomes:** At the end of the course the student should be able to:

- Explain the principles of operation of various types of electromagnetic relays, Static relays as well as Microprocessor based relays
- Understanding the protection of generators and determination of what % generator winding is unprotected under fault occurrence
- Understanding the protection of transformers and make design calculations to determine the required CT ratio for transformer protection
- Explain the use of relays in protecting Feeders, lines and bus bars
- Solve numerical problems concerning the arc interruption and recovery in circuit breakers
- Understand why over voltages occur in power system and how to protect the system

**TEXT BOOKS:**

1. Power System Protection and Switchgear, Badri Ram, D.N Viswakarma, TMH Publications, 2011.
2. Switchgear and Protection, Sunil S Rao, Khanna Publishers, 1992.

**REFERENCE BOOKS:**

1. Electrical Power Systems, C.L.Wadhwa, New Age international (P) Limited, Publishers, 2012.
2. Transmission network Protection, Y.G. Paithankar ,Taylor and Francis,2009.
3. Power system protection and switch gear, Bhuvanesh Oza, TMH, 2010.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (EEE)**

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**15A04601 MICROPROCESSORS AND MICROCONTROLLERS****Course Outcomes:****After completion of this subject the students will be able to :**

1. Do programming with 8086 microprocessors
2. Understand concepts of Intel x86 series of processors
3. Program MSP 430 for designing any basic Embedded System
4. Design and implement some specific real time applications  
Using MSP 430 low power microcontroller.

**UNIT I**

Introduction-8086 Architecture-Block Diagram, Register Organization, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagrams, Memory Segmentation, Interrupt structure of 8086 and Interrupt Vector Table. Memory organization and memory banks accessing.

**UNIT II**

Instruction Formats -Addressing Modes-Instruction Set of 8086, Assembler Directives-Macros and Procedures.- Sorting, Multiplication, Division and multi byte arithmetic code conversion. String Manipulation instructions-Simple ALPs.

**UNIT III**

Low power RISC MSP430 – block diagram, features and architecture, Variants of the MSP430 family viz. MSP430x2x, MSP430x4x, MSP430x5x and their targeted applications, MSP430x5x series block diagram, Addressing modes, Instruction set Memory address space, on-chip peripherals (analog and digital), and Register sets. Sample embedded system on MSP430 microcontroller.

**UNIT-IV**

I/O ports pull up/down resistors concepts, Interrupts and interrupt programming. Watchdog timer. System clocks. Low Power aspects of MSP430: low power modes, Active vs Standby current consumption, FRAM vs Flash for low power & reliability. Timer & Real Time Clock (RTC), PWM control, timing generation and measurements. Analog interfacing and data acquisition: ADC and Comparator in MSP430, data transfer using DMA.

**UNIT-V**

Serial communication basics, Synchronous/Asynchronous interfaces (like UART, USB, SPI, and I2C). UART protocol, I2C protocol, SPI protocol. Implementing and programming UART, I2C, SPI interface using MSP430, Interfacing external devices. Implementing Embedded Wi-Fi using CC3100

**Text Books:**

1. "Microprocessor and Microcontrollers", N. Senthil Kumar, M. Saravanan, S. Jeevanathan, Oxford Publishers. 1 st Edition, 2010
2. "The X86 Microprocessors , Architecture, Programming and Inerfacing" , Lyla B. Das, Pearson Publications, 2010
3. MSP430 microcontroller basics. John H. Davies, Newnes Publication, I st Edition, 2008

**References:**

[http://processors.wiki.ti.com/index.php/MSP430\\_LaunchPad\\_Low\\_Power\\_Mode](http://processors.wiki.ti.com/index.php/MSP430_LaunchPad_Low_Power_Mode)  
[http://processors.wiki.ti.com/index.php/MSP430\\_16-Bit\\_Ultra-Low\\_Power\\_MCU\\_Training](http://processors.wiki.ti.com/index.php/MSP430_16-Bit_Ultra-Low_Power_MCU_Training)

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (EEE)**

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<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A02603 POWER SYSTEM ANALYSIS****Course Objectives:** The objectives of the course are to make the students learn about:

- Y bus and Z bus of a Power System network
- Power flow studies by various methods.
- Short circuit analysis of power systems.
- Swing equation and its solution
- Equal area criterion and its applications

**UNIT -I****POWER SYSTEM NETWORK MATRICES**

Representation of Power System Elements, Graph Theory: Definitions, Bus Incidence Matrix,  $Y_{bus}$  Formation by Direct and Singular Transformation Methods, Numerical Problems. Formation of  $Z_{bus}$ : Partial Network, Algorithm for the Modification of  $Z_{bus}$  Matrix for Addition Element for the Following Cases: Addition of Element from a New Bus to Reference, Addition of Element from a New Bus to an Old Bus, Addition of Element Between an Old Bus to Reference and Addition of Element Between Two Old Busses (Derivations and Numerical Problems).- Modification of  $Z_{bus}$  for the Changes in Network ( Problems )

**UNIT – II****SHORT CIRCUIT ANALYSIS**

Per-Unit System of Representation. Per-Unit Equivalent Reactance Network of a Three Phase Power System, Numerical Problems. Symmetrical Fault Analysis: Short Circuit Current and MVA Calculations, Fault Levels, Application of Series Reactors, Numerical Problems. Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero Sequence Components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems. Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without Fault Impedance, Numerical Problems.

**UNIT – III****POWER FLOW STUDIES-I**

Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static Load Flow Equations – Load Flow Solutions using Gauss Seidel Method: Acceleration Factor, Load Flow Solution with and without P-V Buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and Finding Line Flows/Losses for the given Bus Voltages.

**UNIT – IV****POWER FLOW STUDIES-II**

Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Buses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods – DC Load Flow

**UNIT – V****POWER SYSTEM STABILITY ANALYSIS**

Elementary Concepts of Steady State, Dynamic and Transient Stabilities - Description of: Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to Improve Steady State Stability - Derivation of Swing Equation - Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation. Solution of Swing Equation by 4<sup>th</sup> Order Runge Kutta Method (up to 2 iterations) - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

**Course Outcomes:** At the end of the course the student should be able to:

- Form the  $Z_{bus}$  and  $Y_{bus}$  of a given power system network
- Compare different methods used for obtaining load flow solution
- Conduct load flow studies on a given system
- Make fault calculations for various types of faults
- Determine the transient stability by equal area criterion
- Determine steady state stability power limit
- Distinguish between different types of buses used in load flow solution

**TEXT BOOKS:**

1. Power Systems Analysis, Grainger and Stevenson, Tata Mc Graw-hill, 2005.
2. Modern Power system Analysis 2<sup>nd</sup> edition, I.J.Nagrath & D.P.Kothari: Tata McGraw-Hill Publishing Company, 2003.

**REFERENCE BOOKS:**

1. Computer Techniques in Power System Analysis 2<sup>nd</sup> Edition,, M A Pai, TMH, 2005.
2. Computer Techniques and Models in Power Systems, K. Uma Rao, I. K. International, 2007.
3. Electric Power Systems 1<sup>st</sup> Edition, S. A. Nasar, Schaum's Outline Series, TMH, 1997.
4. Computer Methods in Power System Analysis, E. I. Stagg and El-Abiad, Tata Mc Graw Hill, 1969.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
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**15A02604 NEURAL NETWORKS & FUZZY LOGIC  
( CBCC-I )**

**Course Objective:** The objectives of the course are to make the students learn about:

- Importance of AI techniques in engineering applications
- Artificial Neural network and Biological Neural Network concepts
- ANN approach in various Electrical Engineering problems
- Fuzzy Logic and Its use in various Electrical Engineering Applications

**UNIT – I****INTRODUCTION TO ARTIFICIAL INTELLIGENCE**

Introduction and motivation – Approaches to AI – Architectures of AI – Symbolic Reasoning System – Rule based Systems – Knowledge Representation – Expert Systems.

**UNIT – II****ARTIFICIAL NEURAL NETWORKS**

Basics of ANN - Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules – ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories.

**UNIT – III****ANN APPLICATIONS TO ELECTRICAL SYSTEMS**

ANN approach to: Electrical Load Forecasting Problem – System Identification – Control Systems – Pattern Recognition.

**UNIT – IV****FUZZY LOGIC**

Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic System – Fuzzification – Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

**UNIT – V****FUZZY LOGIC APPLICATIONS TO ELECTRICAL SYSTEMS**

Fuzzy Logic Implementation for Induction Motor Control – Switched Reluctance Motor Control – Fuzzy Excitation Control Systems in Automatic Voltage Regulator – Fuzzy Logic Controller in an 18 Bus Bar System.

**Course Outcomes:** The students should acquire awareness about:

- Approaches and architectures of Artificial Intelligence
- Artificial Neural Networks terminologies and techniques
- Application of ANN to Electrical Load Forecasting problem, Control system problem
- Application of ANN to System Identification and Pattern recognition
- The development of Fuzzy Logic concept
- Use of Fuzzy Logic for motor control and AVR operation
- Use of Fuzzy Logic controller in an 18 bus bar system

**Text Books:**

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Neural Networks using MATLAB", McGraw Hill Edition, 2006.
2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", Third Edition, WILEY India Edition, 2012.

**References:**

1. S. N. Sivanandam, S. Sumathi and S. N. Deepa, "Introduction to Fuzzy Logic using MATLAB", Springer International Edition, 2013.
2. Yung C. Shin and Chengying Xu, "Intelligent System – Modeling, Optimization & Control, CRC Press, 2009.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech III-II Sem. (EEE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>15A02605</b>	<b>PROGRAMMABLE LOGIC CONTROLLER AND ITS APPLICATIONS ( CBCC-I )</b>			

**Course Objectives:** The objectives of the course are to make the students learn about:

- PLC and its basics, architecture, connecting devices and programming
- Implementation of Ladder logic for various Industrial applications
- Designing of control circuits for various applications
- PLC logic and arithmetic operations

### **UNIT-I**

PLC Basics: PLC System, I/O Modules and Interfacing, CPU Processor, Programming Equipment, Programming Formats, Construction of PLC Ladder Diagrams, Devices Connected To I/O Modules. PLC Programming: Input Instructions, Outputs, Operational Procedures, Programming Examples Using Contacts and Coils. Drill Press Operation.

### **UNIT-II**

Digital Logic Gates, Programming in the Boolean Algebra System, Conversion Examples. Ladder Diagrams for Process Control: Ladder Diagrams & Sequence Listings, Ladder Diagram Construction and Flowchart for Spray Process System.

### **UNIT-III**

PLC Registers: Characteristics of Registers, Module Addressing, Holding Registers, Input Registers, Output Registers. PLC Functions: Timer Functions & Industrial Applications, Counter Function & Industrial Applications, Arithmetic Functions, Number Comparison Functions, Number Conversion Functions

### **UNIT-IV**

Data Handling Functions: SKIP, Master Control Relay, Jump, Move, FIFO, FAL, ONS, CLR & Sweep Functions and Their Applications. Bit Pattern and Changing a Bit Shift Register, Sequence Functions and Applications, Controlling of Two-Axis & Three Axis Robots With PLC, Matrix Functions.

**UNIT-V**

Analog PLC Operation, Types of PLC Analog Modules and Systems, PLC Analog Signal Processing, BCD or Multibit data Processing, Analog output application examples, PID Modules, PID Tuning, Typical PID Functions, PLC Installation, Troubleshooting and Maintenance.

**Course Outcomes:** The student should be able to:

- Program a PLC for a given application
- Implement Ladder logic for various Industrial applications
- Design control circuits for various applications

**TEXT BOOKS:**

1. Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss, Fifth Edition, ELSEVIER Ltd., 2009.
2. Programmable Logic Controllers 5th Edition, William Bolton, Newnes, ELSEVIER Ltd., 2009.

**REFERENCES:**

1. Programmable Logic Controllers: An Emphasis on design & application, Kelvin T. Erickson, Dogwood Valley Press, 2011.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (EEE)**

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**15A02606 OPTIMIZATION TECHNIQUES  
( CBCC-I )**
**Course Objectives :**

The objectives of the course are to make the students learn about:

- The basic concepts of optimization and classification of optimization problems.
- Different classical Optimization techniques, linear programming, unconstrained and constrained nonlinear programming.
- Soft Computing methods – GA & PSO

**UNIT-I****INTRODUCTION AND CLASSICAL OPTIMIZATION TECHNIQUE**

Statement of an Optimization Problem- Design Vector- Design Constraints- Constraints Surface – Objective Function- Objective Function Surfaces- Classification of Optimization Problems. Classical Optimization Techniques- Single Variable Optimization- Multi Variable Optimization Without Constraints- Necessary and Sufficient Conditions for Minimum/Maximum- Multi Variable Optimization With Equality Constraints Solution by Method of Lagrange Multipliers- Multi Variable Optimization with Inequality Constraints – Kuhn- Tucker Conditions

**UNIT-II****LINEAR PROGRAMMING**

Standard Form of Linear Programming Problem- Geometry of Linear Programming Problems- Definitions and Theorems- Solution of a System of Linear Simultaneous Equations- Pivotal Reduction of a General System of Equations- Motivation to The Simplex Method- Simplex Algorithm – Revised Simplex Method – Two Phase Simplex Method - Initial Basic Feasible Solution by North- West Corner Rule, Approximation Method.

**UNIT-III****UNCONSTRAINED NONLINEAR PROGRAMMING**

One-Dimensional Minimization Methods: Classification, Fibonacci Method and Quadratic Interpolation Method- Unconstrained Optimization Techniques- Univariate Method, Powell's Method, Steepest Descent Method, Newtons Method.

**UNIT-IV****CONSTRAINED NONLINEAR PROGRAMMING**

Characteristics of a Constrained Problem, Classification, Basic Approach of Penalty Function Method; Basic Approaches of Interior and Exterior Penalty Function Methods, Introduction to Convex Programming Problem

**UNIT-V****SOFT COMPUTING METHODS**

Evolutionary programming methods - Introduction to Genetic Algorithms (GA)– Control parameters –Number of generation, population size, selection, reproduction, crossover and mutation – Operator selection criteria – Simple mapping of objective function to fitness function – constraints – Genetic algorithm steps – Stopping criteria –Simple examples.

Swarm intelligence programming methods - Basic Partial Swarm Optimization – Method – Characteristic features of PSO procedure of the global version – Parameters of PSO (Simple PSO algorithm – Operators selection criteria – Fitness function constraints)

**Course Outcomes:**

The student should be able to:

- Develop an objective function and obtain solution for multivariable optimization problem with equality/Inequality constraints
- Apply linear programming techniques for problem solving
- Apply nonlinear programming techniques for unconstrained/constrained optimization
- Use soft computing techniques to solve optimization problems

**TEXT BOOKS:**

1. Engineering optimization: Theory and practice 3<sup>rd</sup> edition, S.S.Rao, New Age International (P) Limited, 1998.
2. Optimization Methods in Operations Research and systems Analysis 3<sup>rd</sup> edition, K.V.Mital and C.Mohan, New Age International (P) Limited, 1996.
3. Soft Computing with Matlab Programming by N.P.Padhy&S.P.Simson, Oxford University Press – 2015

**REFERENCE BOOKS:**

1. Operations Research, Dr.S.D.Sharma, S.Chand & Sons, 2001.
2. Operation Research: An Introduction 6<sup>th</sup> edition, H.A.Taha, PHI , 2003.
3. Optimization for Engineering Design – Algorithms and Examples, Kalyanmoy Deb, 2<sup>nd</sup> Edition, PHI, 2014.
4. Soft Computing Advances and Applications, B. K. Tripathy and J. Anuradha, CENGAGE Learning, 2015.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (EEE)**

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**15A01608 INTELLECTUAL PROPERTY RIGHTS  
( CBCC-I )**
**COURSE OBJECTIVE:**

*This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.*

**UNIT – I**

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

**UNIT – II**

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

**UNIT – III**

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.

Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

**UNIT – IV**

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.

Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

**UNIT – V**

New Developments Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.

International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual Property Rights, Deborah. E. Bouchoux, Cengage Learning.
2. Intellectual Property Rights– Unleashmy The Knowledge Economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing Company Ltd.,

**Course Outcomes:**

*On completion of this course, the student will have an understanding of the following:*

- a) *Intellectual Property Rights and what they mean*
- b) *Trade Marks and Patents and how to register them*
- c) *Laws Protecting the Trade Marks and Patents*
- d) *Copy Right and laws related to it.*



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (EEE)**

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**15A04607 MICROPROCESSORS AND MICROCONTROLLERS LABORATORY****Part A : 8086 Microprocessor Programs using NASM/8086 microprocessor kit.**

1. Introduction to MASM Programming.
2. Programs using arithmetic and logical operations
3. Programs using string operations and Instruction prefix: Move Block, Reverse string, Sorting, String comparison
4. Programs for code conversion
5. Multiplication and Division programs
6. Sorting and multi byte arithmetic
7. Programs using CALL and RET instructions

**Part B Embedded C Experiments using MSP430 Microcontroller**

1. Interfacing and programming GPIO ports in C using MSP430 (blinking LEDs , push buttons)
2. Usage of Low Power Modes: ( Use MSPEXP430FR5969 as hardware platform and demonstrate the low power modes and measure the active mode and standby mode current)
3. Interrupt programming examples through GPIOs
4. PWM generation using Timer on MSP430 GPIO
5. Interfacing potentiometer with MSP430
6. PWM based Speed Control of Motor controlled by potentiometer connected to MSP430 GPIO
7. Using ULP advisor in Code Composer Studio on MSP430
8. Low Power modes and Energy trace++:
  - a. Enable Energy Trace and Energy Trace ++ modes in CCS
  - b. Compute Total Energy, and Estimated lifetime of an AA battery.

**Note : Any six experiment from Part A and Six experiments from Part B are to be conducted**

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<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**15A02607 POWER ELECTRONICS AND SIMULATION LABORATORY****Course Objectives:** The student will understand:

- The characteristics of power electronic devices with gate firing circuits
- Various forced commutation techniques
- The operation of single-phase voltage controller, converters and Inverters circuits with R and RL loads
- Analyze the TPS7A4901, TPS7A8300 and TPS54160 buck regulators

**Any Eight of the Experiments in Power Electronics Lab**

1. Gate Firing Circuits for SCRs
2. Single Phase AC Voltage Controller with R and RL Loads
3. DC Jones Chopper with R and RL Loads
4. Forced Commutation Circuits (Class A, Class B, Class C, Class D and Class E)
5. Three phase fully controlled Bridge converter with R- load
6. Single Phase Parallel, Inverter with R and RL Loads
7. Single phase Cycloconverter with R and RL loads
8. Single Phase Series Inverter with R and RL Loads
9. Single Phase Dual Converter with RL Loads
10. Illumination control / Fan control using TRIAC

**Any Four Experiments of the following (1, 2, 3, A, B, C):**

1. Using TPS7A4901 and TPS7A8300, study-
  - a. Impact of line and load conditions on drop out voltage
  - b. Impact of line and load conditions on efficiency
  - c. Impact of capacitor on PSRR
  - d. Impact of output capacitor on load-transient response
2. Study of DC-DC Buck converter
  - a) Investigate how the efficiency of a TPS54160 buck regulator depends on the line and load conditions and on the switching frequency.
  - b) Analyze the influence of switching frequency  $f_s$  and of capacitance C and resistance ESR of the input and output capacitors on steady-state waveforms of TPS54160 buck regulator.

3. Analyze how the switching frequency  $f_s$ , the DC accuracy and the line noise rejection of the hysteretic buck regulator LM3475 depend on line voltage, the load current, the characteristics of the output capacitor and the impact of speed-up capacitor.

#### WEBENCH EXPERIMENTS:

- A. Design of a Low cost Boost Converter to derive 12V, 100mA from 5V USB
- B. Design of a low cost and power efficient Buck Converter that could be used as a USB charger for mobile devices deriving its power from an automotive battery.
- C. Design of a low cost synchronous buck converter.

**Course Outcomes:** Student should be able to:

- Test the turn on –turn off characteristics of various power electronic devices.
- Test and analyze firing circuits for SCRs
- Test different types of voltage controllers, converters and Inverters with R and RL loads
- Analyze the TPS7A4901, TPS7A8300 and TPS54160 buck regulators

#### REFERENCES:

1. PMLK BUCK Lab manual - <http://www.ti.com/lit/ug/ssqu007/ssqu007.pdf>
2. PMLK LDO Lab manual - <http://www.ti.com/lit/ug/ssqu006/ssqu006.pdf>
3. WEBENCH – [www.ti.com/webench](http://www.ti.com/webench)

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (EEE)**

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**15A52602    ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS  
(AELCS) LAB (Audit Course)**
**1. INTRODUCTION**

With increased globalization and rapidly changing industry expectations, employers are looking for the wide cluster of skills to cater to the changing demand. The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information and to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Taking part in social and professional communication.

**2. OBJECTIVES:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

**3. SYLLABUS:**

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

**UNIT-I: COMMUNICATION SKILLS**

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary Development
4. Common Errors

**UNIT-II: WRITING SKILLS**

1. Report writing
2. Resume Preparation
3. E-mail Writing

**UNIT-III: PRESENTATION SKILLS**

1. Oral presentation
2. Power point presentation
3. Poster presentation

**UNIT-IV: GETTING READY FOR JOB**

1. Debates
2. Group discussions
3. Job Interviews

**UNIT-V: INTERPERSONAL SKILLS**

1. Time Management
2. Problem Solving & Decision Making
3. Etiquettes

**4. LEARNING OUTCOMES:**

- Accomplishment of sound vocabulary and its proper use contextually
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

**5. MINIMUM REQUIREMENT:**

The Advanced English Communication Skills (AECS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

## 6. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and G

1. **Walden Infotech: Advanced English Communication Skills Lab**
2. **K-VAN SOLUTIONS-Advanced English Language Communication Skills lab**
3. **DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.**
4. **TOEFL & GRE**( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
5. **Train2success.com**

## 7. BOOKS RECOMMENDED:

1. **Objective English for Competitive Exams**, Hari Mohana Prasad, 4<sup>th</sup> edition, Tata Mc Graw Hill.
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, O U Press 3<sup>rd</sup> Edn. 2015.
3. **Essay Writing for Exams, Audrone Raskauskiene, Irena Ragaisience & Ramute Zemaitience,OUP, 2016**
4. **Soft Skills for Everyone**, Butterfield Jeff, Cengage Publications, 2011.
5. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. **Campus to Corporate**, Gangadhar Joshi, Sage Publications, 2015
7. **Communicative English**,E Suresh Kumar & P.Sreehari, Orient Blackswan, 2009.
8. **English for Success in Competitive Exams**, Philip Sunil Solomon OUP, 2015

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

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<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A02701 ELECTRICAL DISTRIBUTION SYSTEMS****Course Objectives:** The student has to acquire knowledge about:

- The classification of distribution systems
- The technical aspects and design considerations in DC and AC distribution systems and their comparison
- Technical issues of substations such as location, ratings and bus bar arrangements
- The causes of low power factor and methods to improve power factor
- The principles in Distribution automation

**UNIT – I****LOAD MODELING AND CHARACTERISTICS**

Introduction to Distribution Systems, Load Modelling and Characteristics. Coincidence Factor, Contribution Factor Loss Factor - Relationship between the Load Factor and Loss Factor. Classification of Loads (Residential, Commercial, Agricultural and Industrial) and Their Characteristics.

**UNIT – II****CLASSIFICATION OF DISTRIBUTION SYSTEMS**

Classification of Distribution Systems - Comparison of DC vs AC and Under-Ground vs Over - Head Distribution Systems- Requirements and Design Features of Distribution Systems. Design Considerations of Distribution Feeders: Radial and Loop Types of Primary Feeders, Voltage Levels, Feeder Loading, Basic Design Practice of the Secondary Distribution System. Voltage Drop Calculations (Numerical Problems) In A.C. Distributors for The Following Cases: Power Factors Referred to Receiving End Voltage and With Respect to Respective Load Voltages.

**UNIT – III****SUBSTATIONS**

Location of Substations: Rating of Distribution Substation, Service Area within Primary Feeders. Benefits Derived Through Optimal Location of Substations.

Classification of Substations: Air Insulated Substations - Indoor & Outdoor Substations: Substation Layout showing the Location of all the Substation Equipment.

Bus Bar Arrangements in the Sub-Stations: Simple Arrangements Like Single Bus Bar, Sectionalized Single Bus Bar, Main and Transfer Bus Bar Double Breaker – One and Half Breaker System With Relevant Diagrams.

**UNIT – IV****POWER FACTOR IMPROVEMENT**

Voltage Drop and Power-Loss Calculations: Derivation for Voltage Drop and Power Loss in Lines, Manual Methods of Solution for Radial Networks, Three Phase Balanced Primary Lines.

Causes of Low P.F -Methods of Improving P.F -Phase Advancing and Generation of Reactive KVAR Using Static Capacitors-Most Economical P.F. for Constant KW Load and Constant KVA Type Loads, Numerical Problems.

Capacitive Compensation for Power-Factor Control - Effect of Shunt Capacitors (Fixed and Switched), Power Factor Correction- Economic Justification - Procedure to Determine the Best Capacitor Location.

**UNIT – V****DISTRIBUTION AUTOMATION**

Distribution Automation (DA) – Project Planning – Definitions – Communication Sensors- Supervisory Control and Data Acquisition (SCADA) – Consumer Information Service (CIS) – Geographical Information System (GIS) – Automatic Meter Reading (AMR) – Automation Systems.

**Course Outcomes:** Student should be able to:

- Compute the various factors associated with power distribution
- Make voltage drop calculations in given distribution networks
- Learn principles of substation maintenance
- Compute power factor improvement for a given system and load
- Understand implementation of SCADA for distribution automation

**TEXT BOOKS:**

1. Electric Power Distribution Engineering, Turan Gonen, CRC Press, 3<sup>rd</sup> Edition, 2014.
2. Electric Power Distribution, A.S. Pabla, Tata Mc Graw Hill (India) Pvt. Ltd., 6<sup>th</sup> Edition, 2011.

**REFERENCE BOOKS:**

1. Electric Power Distribution Automation, Dr. M. K. Khedkar and Dr. G. M. Dhole, University Science Press, 2010.
2. Electrical Power Distribution Systems, V. Kamaraju, Jain Book Depot. 2012.
3. Electrical Power Systems for Industrial Plants, Kamalesh Das, JAICO Publishing House, 2008.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

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**15A04603 DIGITAL SIGNAL PROCESSING****Course Outcomes:**

At the end of the course, the student should be able to:

- Formulate engineering problems in terms of DSP tasks.
- Apply engineering problems solving strategies to DSP problems.
- Design and test DSP algorithms.
- Analyze digital and analog signals and systems.
- Encode information into signals.
- Design digital signal processing algorithms.
- Design and simulate digital filters.
- Analyze and compare different signal processing strategies.

**UNIT-I**

Review of discrete-time signals and systems – Time domain analysis of discrete-time signals & systems, Frequency domain analysis of discrete-time signals and systems.

**Discrete Fourier Transform:** Frequency-domain sampling and reconstruction of discrete-time signals, Discrete Fourier Transform (DFT), The DFT as a linear transformation, Relationship of the DFT to other transforms, Properties of DFT, Linear filtering methods based on DFT, Frequency analysis of signals using the DFT.

**UNIT-II**

Efficient computation of the DFT – Direct computation of DFT, Divide and conquer approach to computation of DFT, Radix-2, Radix-4, and Split radix FFT algorithms, Implementation of FFT algorithms, Applications of FFT algorithms – Efficient computation of the DFT of two real sequences, 2N point real sequences, Use of the FFT algorithm in linear filtering and correlation, A linear filtering approach to computation of the DFT- the Goertzel, and the Chirp-z transform algorithms, Quantization errors in the computation of DFT.

**UNIT-III**

Structures for the realization of discrete-time systems, Structures for FIR systems - Direct form, Cascade form, Frequency sampling, and Lattice structures, Structures for IIR systems – Direct form, Signal flow graphs & Transposed, Cascade form, Parallel form and Lattice structures, Conversion from Lattice structure to direct form, lattice – Ladder structure.

**UNIT-IV**

General considerations – Causality and its implications, Characteristics of practical Frequency Selective Filters, Design of Finite Impulse Response (FIR) filters – Symmetric and asymmetric FIR filters, Design of linear phase FIR filters using windows, Design of linear phase FIR filters by the frequency sampling method, Design of optimum equi-ripple linear phase FIR filters, Comparison of design methods for linear phase FIR filters, Design of Impulse Invariance Response (IIR) filters from analog filters – IIR filter design by approximation of derivatives, by Impulse invariance, and by bilinear transformation methods, Characteristics of commonly used analog filters, Design examples of both FIR and IIR filters, Frequency transformation in the analog and digital domains, Illustrative problems.

**UNIT-V**

Introduction, Decimation, and interpolation, Sampling rate conversion by a rational factor, Implementation of sampling rate conversion, Multistage implementation of sampling rate conversion, Sampling rate conversion of bandpass signals, Sampling rate conversion by arbitrary factor, Applications of multirate signal processing.

**TEXT BOOKS:**

1. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and applications," Pearson Education/PHI, 4<sup>th</sup> ed., 2007.
2. Sanjit K Mitra, "Digital signal processing, A computer base approach," Tata McGraw Hill, 3<sup>rd</sup> edition, 2009.

**REFERENCES:**

1. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2<sup>nd</sup> ed., Pearson Education, 2012.
2. B. P. Lathi, "Principles of Signal Processing and Linear Systems," Oxford Univ. Press, 2011.
3. Li Tan, Jean Jiang, "Digital Signal Processing, Fundamentals and Applications," Academic Press, Second Edition, 2013.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

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**15A02702 POWER SYSTEM OPERATION AND CONTROL****Course Objectives:** The objectives of the course are to make the students learn about:

- Optimum generation allocation
- Hydrothermal scheduling
- Modeling of turbines and generators
- Load frequency control in single area and two area systems
- Reactive power compensation in power systems
- Power system operation in competitive environment

**UNIT – I****ECONOMIC OPERATION**

Optimal Operation of Thermal Power Units, - Heat Rate Curve – Cost Curve – Incremental Fuel and Production Costs, Input-Output Characteristics, Optimum Generation Allocation with Line Losses Neglected. Optimum Generation Allocation Including the Effect of Transmission Line Losses – Loss Coefficients, General Transmission Line Loss Formula.

**UNIT-II****HYDROTHERMAL SCHEDULING**

Optimal Scheduling of Hydrothermal System: Hydroelectric Power Plant Models, Scheduling Problems-Short Term Hydrothermal Scheduling Problem. Modeling of Turbine: First Order Turbine Model, Block Diagram Representation of Steam Turbines and Approximate Linear Models. Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of Small Signal Transfer Function – Block Diagram.

**UNIT – III****LOAD FREQUENCY CONTROL**

Necessity of Keeping Frequency Constant. Definitions of Control Area – Single Area Control – Block Diagram Representation of an Isolated Power System – Steady State Analysis – Dynamic Response – Uncontrolled Case. Load Frequency Control of 2-Area System – Uncontrolled Case and Controlled Case, Tie-Line Bias Control. Proportional Plus Integral Control of Single Area and Its Block Diagram Representation, Steady State Response – Load Frequency Control and Economic Dispatch Control.

**UNIT – IV****REACTIVE POWER CONTROL**

Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation.

**UNIT – V****POWER SYSTEM OPERATION IN COMPETITIVE ENVIRONMENT**

Introduction – Restructuring models – Independent System Operator (ISO) – Power Exchange - Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion - Electricity Price Volatility Electricity Price Indexes – Challenges to Electricity Pricing – Construction of Forward Price Curves – Short-time Price Forecasting

**Course Outcomes:** After completion of the course, the student will able to:

- Develop the mathematical models of turbines and governors
- Address the Load Frequency Control problem
- Explain how shunt and series compensation helps in reactive power control
- Explain the issues concerned with power system operation in competitive environment

**TEXT BOOKS:**

1. Power System Analysis Operation and Control, Abhijit Chakrabarti and Sunita Halder, PHI Learning Pvt. Ltd., 3<sup>rd</sup> Edition, 2010.
2. Modern Power System Analysis, D.P.Kothari and I.J.Nagrath, Tata McGraw Hill Publishing Company Ltd., 3<sup>rd</sup> Edition, 2003, Ninth Reprint 2007.

**REFERENCE BOOKS:**

1. Power System Analysis and Design, J. Duncan Glover and M.S.Sharma, Thomson, 3<sup>rd</sup> Edition, 2008.
2. Electric Energy System Theory: An Introduction, Olle Ingemar Elgerd, Tata McGraw Hill, 2<sup>nd</sup> Edition, 1982.
3. Power System Stability and Control, P Kundur, Tata McGraw Hill, 1994, 5<sup>th</sup> Reprint, 2008.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A02703 UTILIZATION OF ELECTRICAL ENERGY****Course Objectives:** The objectives of the course are to make the students learn about:

- The laws of illumination and their application for various lighting schemes
- Principles and methods for electric heating and welding.
- Systems of electric traction, study of traction equipment, mechanics of train movement and associated calculations.

**UNIT-I****ILLUMINATION**

Definition –Laws of Illumination–Polar Curves – Calculation of MHCP and MSCP. Lamps: Incandescent Lamp, Sodium Vapour Lamp, Fluorescent Lamp, CFL and LED. Requirement of Good Lighting Scheme – Types, Design and Calculation of Illumination. Street Lighting and Factory Lighting – Numerical Problems – Energy Conservation methods.

**UNIT-II****ELECTRIC HEATING & WELDING**

Electrical Heating: Advantages. Methods of Electric Heating – Resistance, Arc, Induction and Dielectric Heating – Energy conservation methods.

Electric Welding: Types – Resistance, Electric Arc, Gas Welding. Ultrasonic, Welding Electrodes of Various Metals, Defects in Welding.

Electrolysis - Faraday's Laws, Applications of Electrolysis, Power Supply for Electrolysis.

**UNIT-III****ELECTRIC TRACTION – I**

Introduction – Systems of Electric Traction. Comparison Between A. C. and D. C. Traction – Special Features of Traction Motors - The Locomotive – Wheel arrangement and Riding Qualities – Transmission of Drive – Characteristics and Control of Locomotives and Motor Coaches for Track Electrification – DC Equipment – AC Equipment – Electric Braking with DC Motors and with AC Motors – Control Gear – Auxiliary Equipment – Track Equipment and Collector Gear – Conductor-Rail Equipment – Overhead Equipment – Calculation of Sags and Tensions – Collector Gear for Overhead Equipment.

**UNIT-IV****ELECTRIC TRACTION - II**

Mechanics of Train Movement. Speed-Time Curves of Different Services – Trapezoidal and Quadrilateral Speed-Time Curves – Numerical Problems. Calculations of Tractive Effort, Power, Specific Energy Consumption - Effect of Varying Acceleration and Braking Retardation, Adhesive Weight and Coefficient of Adhesion – Problems.

**UNIT-V****ECONOMIC ASPECTS OF UTILISING ELECTRICAL ENERGY**

Power Factor Improvement, Load Factor improvement, Off Peak Loads- Use of Exhaust Steam, Waste Heat recovery, Pit Head Generation, Diesel Plant, General Comparison of Private Plant and Public Supply- Initial Cost and Efficiency, Capitalization of Losses, Choice of Voltage.

**Course Outcomes:** Student should be able to:

- Develop a lighting scheme for a given practical case.
- Analyze the performance of Heating and Welding methods
- Make all numerical calculations associated with electric traction.
- Assess the economic aspects in utilisation of electrical energy

**TEXT BOOKS:**

1. Utilization of Electric Energy, E. Openshaw Taylor and V. V. L. Rao, Universities Press, 2009.
2. Art & Science of Utilization of electrical Energy, Partab, Dhanpat Rai & Co., 2004.

**REFERENCE BOOKS:**

1. Generation, distribution and utilization of electrical energy, C.L Wadhwa, Wiley Eastern Limited, 1993
2. Electrical Power, S. L. Uppal, Khanna publishers, 1988.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A02704 MODERN CONTROL THEORY  
(CBCC-II)**

**Course Objective :** The objectives of the course are to make the students learn about:

- Concepts of state vector, State transition matrix and solution of state equations.
- Importance of controllability and observability concepts.
- Pole placement, state estimation using observers
- Lyapunov criterion for stability analysis
- Types of nonlinearities, their effect on system performance

**UNIT – I****STATE VARIABLE DESCRIPTION AND SOLUTION OF STATE EQUATION**

Concept of State – Derivation of State Space models for Linear Continuous time Systems from Schematic Models, Differential equations, Transfer functions and block diagrams – Non uniqueness of state model – State diagrams for continuous time state models – Solution of state equations – State transition matrix. Complete response of continuous time systems.

**UNIT – II****CONTROLLABILITY, OBSERVABILITY,**

Tests for controllability and observability for continuous time systems – Time varying case, minimum energy control, time invariant case, Principle of Duality, Controllability and observability of state models in Jordan canonical form and other canonical forms. Effect of state feedback on controllability and observability.

**UNIT – III****STATE FEEDBACK CONTROLLERS AND OBSERVERS**

Design of State Feedback Controllers through Pole placement. Full-order observer and reduced-order observer. State estimation through Kalman Filters.

**UNIT – IV****ANALYSIS OF NONLINEAR SYSTEMS**

Introduction to nonlinear systems, Types of nonlinearities, Concept of describing functions, Derivation of describing functions for Dead zone, Saturation, backlash, relay with dead zone and Hysteresis - Jump Resonance. Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, Singular points, Phase-plane analysis of nonlinear control systems.

**UNIT- V****STABILITY ANALYSIS**

Stability in the sense of Lyapunov. Lyapunov's stability and Lyapunov's instability theorems. Direct method of Lyapunov for Linear and Nonlinear continuous time autonomous systems.

**TEXT BOOKS:**

1. Modern Control Engineering, Katsuhiko Ogata, Prentice Hall, 5<sup>th</sup> Edition, 2010.
2. Modern Control System Theory, M. Gopal, New Age International Publishers, Revised 2<sup>nd</sup> edition, 2005.

**REFERENCE BOOKS:**

1. Control Systems Engineering, I.J. Nagarath and M.Gopal, New Age International Publishers, 5<sup>th</sup> Edition, 2007, Reprint 2012.
2. Modern Control Engineering, D. Roy Choudhury, PHI Learning Private Limited, 9<sup>th</sup> Printing, January 2015.

**Course Outcomes:** At the end of studying the course, the student should be able to:

- Model a given dynamic system in state space and obtain the solution for the state equation
- Test whether a given system is controllable and/or observable
- Design a state feedback controller for pole placement
- Design an observer for state estimation
- Apply Lyapunov criterion and determine stability of a given system
- Analyze nonlinear systems



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A02705 SWITCHED MODE POWER CONVERTERS  
(CBCC-II)**

**Course Objectives:** The objectives of the course are to make the students learn about:

- The concepts of modern power electronic converters and their applications in electric power utility.
- Analyzing and control of various power converter circuits

**UNIT – I****NON-ISOLATED DC-DC CONVERTERS**

Basic Types of Switching Power Supplies – Volt-Sec balance – Non-Isolated Switched-Mode DC-to-DC Converters – Buck Converter – Boost Converter – Buck-Boost Converter – Cuk Converter – SEPIC and Zeta Converters – Comparison of Non-Isolated Switched mode DC-to-DC Converters.

**UNIT – II****ISOLATED DC-DC CONVERTERS**

Need of Transformer Isolations in high frequency Power conversion - Isolated Switched Mode DC-to-DC Converters – Single Switch Isolated DC-to-DC Converters – Forward, Flyback, Push-Pull, Flux Weakening Phenomena, Half and Full Bridge Converters – Multi Switch Isolated DC-to-DC Converters – Comparison of Isolated and Non-Isolated Switched Mode DC-to-DC Converters.

**UNIT-III****RESONANT CONVERTERS**

Classification of Resonant converters-Basic resonant circuits- Series resonant circuit-parallel resonant circuits- Resonant switches, Concept of Zero voltage switching, principle of operation, analysis of M-type and L-type Resonant Buck and boost Converters.

**UNIT-IV****DYNAMIC ANALYSIS OF DC-DC CONVERTERS**

Formulation of dynamic equations of buck and boost converters, State-Space Models, Averaged Models, linearization technique, small-signal model and converter transfer functions, Significance of Small Signal Models, Dynamical Characterization.

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**UNIT-V****CONTROLLER DESIGN**

Review of frequency-domain analysis of linear time-invariant systems, controller specifications, Proportional (P), Proportional plus Integral (PI), Proportional, Integral plus Derivative controller (PID), selection of controller parameters for Isolated and Non-Isolated DC -DC Converters.

**Course Outcomes:** Upon completion of this course,

- The student learns the fundamental concepts of DC - DC Converters
- Student can explain the operation of different topologies of DC to DC converters and their differences
- Student will be able to model various converters as per state space, time average etc.
- Student can analyse in frequency domain with different P, PI and PID converters

**TEXT BOOKS:**

1. Issa Batarseh, Fundamentals of Power Electronics, John Wiley Publications, 2009.
2. Robert Erickson and Dragon Maksimovic, Fundamentals of Power Electronics, Springer Publications., 2<sup>nd</sup> Edition, 2001.

**REFERENCE BOOKS:**

1. Switched Mode Power Supplies design and construction 2<sup>nd</sup> Edition, H W Whittington, B W Flynn and D E Macpherson, Universities Press, 2009.
2. Philip T.Krein Elements of Power Electronics - Oxford University Press, 1997.
3. L. Umanand Power Electronics, Tata Mc-Graw Hill, 2004.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech IV-I Sem. (EEE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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<b>15A02706 ENERGY AUDITING &amp; DEMAND SIDE MANAGEMENT</b>				
<b>(CBCC-II)</b>				

**Course Objectives:** The objectives of this course include

- **To learn about energy consumption and situation in India**
- To learn about Energy Auditing.
- To learn about Energy Measuring Instruments.
- To understand the Demand Side Management.

### **UNI -I**

#### **INTRODUCTION TO ENERGY AUDITING**

Energy Situation – World and India, Energy Consumption, Conservation, Codes, Standards and Legislation. Energy Audit- Definitions, Concept, Types of Audit, Energy Index, Cost Index, Pie Charts, Sankey Diagrams, Load Profiles, Energy Conservation Schemes. Measurements in Energy Audits, Presentation of Energy Audit Results.

### **UNIT -II**

#### **ENERGY EFFICIENT MOTORS AND POWER FACTOR IMPROVEMENT**

Energy Efficient Motors , Factors Affecting Efficiency, Loss Distribution , Constructional Details , Characteristics - Variable Speed , Variable Duty Cycle Systems, RMS Hp- Voltage Variation-Voltage Unbalance- Over Motoring- Motor Energy Audit.Power Factor – Methods of Improvement, Power factor With Non Linear Loads

### **UNIT –III**

#### **LIGHTING AND ENERGY INSTRUMENTS FOR AUDIT**

Good Lighting System Design and Practice, Lighting Control, Lighting Energy Audit - Energy Instruments- Watt Meter, Data Loggers, Thermocouples, Pyrometers, Lux Meters, Tong Testers, Application of PLC's

### **UNIT –IV**

#### **INTRODUCTION TO DEMAND SIDE MANAGEMENT**

Introduction to DSM, Concept of DSM, Benefits of DSM, Different Techniques of DSM – Time of Day Pricing, Multi-Utility Power Exchange Model, Time of Day Models for Planning. Load Management, Load Priority Technique, Peak Clipping, Peak Shifting, Valley Filling, Strategic Conservation, Energy Efficient Equipment. Management and Organization of Energy Conservation Awareness Programs.

**UNIT –V****ECONOMICS AND COST EFFECTIVENESS TESTS OF DSM PROGRAMS**

Basic payback calculations, Depreciation, Net present value calculations. Taxes and Tax Credit – Numerical Problems. Importance of evaluation, measurement and verification of demand side management programs. Cost effectiveness test for demand side management programs - Ratepayer Impact Measure Test, Total Resource Cost, Participant Cost Test, Program Administrator Cost Test

Numerical problems: Participant cost test, Total Resource Cost test and Ratepayer impact measure test.

**Course Outcomes:** After completion of the course the student should be able to:

- Conduct energy auditing and evaluate energy audit results
- Carry out motor energy audit
- Analyze demand side management concepts through case study

**TEXT BOOKS:**

1. **Industrial Energy Management Systems**, Arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York, 1994.
2. **Fundamentals of Energy Engineering** - Albert Thumann, Prentice Hall Inc, Englewood Cliffs, New Jersey, 1984.

**REFERENCES:**

1. Economic Analysis of Demand Side Programs and Projects - California Standard Practice Manual, June 2002 – Free download available online [http://www.calmac.org/events/spm\\_9\\_20\\_02.pdf](http://www.calmac.org/events/spm_9_20_02.pdf)
2. Energy management by W.R. Murphy & G. Mckay Butter worth, Heinemann publications, 2007.
3. Energy management by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998
4. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

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**15A02707 SMART GRID  
(CBCC-III)**

**Course Objectives:** The objectives of the course are to make the students learn about:

- Overview of the technologies required for the smart grid
- Switching techniques and different means for data communication
- Standards for information exchange and smart metering
- Methods used for information security on smart grid
- Smart metering, and protocols for smart metering
- Management systems for Transmission and distribution

**UNIT – I****THE SMART GRID**

Introduction, Ageing Assets and Lack of Circuit Capacity, Thermal Constraints, Operational Constraints, Security of Supply, National Initiatives, Early Smart Grid Initiatives, Active Distribution Networks, Virtual Power Plant, Other Initiatives and Demonstrations, Overview of The Technologies Required for The Smart Grid.

**UNIT – II****COMMUNICATION TECHNOLOGIES**

**Data Communications:** Introduction, Dedicated and Shared Communication Channels, Switching Techniques, Circuit Switching, Message Switching, Packet Switching, Communication Channels, Wired Communication, Optical Fibre, Radio Communication, Cellular Mobile Communication, Layered Architecture and Protocols, The ISO/OSI Model, TCP/IP

**Communication Technologies:** IEEE 802 Series, Mobile Communications, Multi Protocol Label Switching, Power line Communication, Standards for Information Exchange, Standards For Smart Metering, Modbus, DNP3, IEC61850

**UNIT – III****INFORMATION SECURITY FOR THE SMART GRID**

Introduction, Encryption and Decryption, Symmetric Key Encryption, Public Key Encryption, Authentication, Authentication Based on Shared Secret Key, Authentication Based on Key Distribution Center, Digital Signatures, Secret Key Signature, Public Key Signature, Message Digest, Cyber Security Standards, IEEE 1686: IEEE Standard for

Substation Intelligent Electronic Devices(IEDs) Cyber Security Capabilities, IEC 62351: Power Systems Management And Association Information Exchange – Data and Communication Security.

#### **UNIT – IV**

##### **SMART METERING AND DEMAND SIDE INTEGRATION**

Introduction, smart metering – evolution of electricity metering, key components of smart metering, smart meters: an overview of the hardware used – signal acquisition, signal conditioning, analogue to digital conversion, computation, input/output, communication.

Communication infrastructure and protocols for smart metering- Home area network, Neighbourhood Area Network, Data Concentrator, meter data management system, Protocols for communication. Demand Side Integration- Services Provided by DSI, Implementation of DSI, Hardware Support, Flexibility Delivered by Prosumers from the Demand Side, System Support from DSI.

#### **UNIT – V**

##### **TRANSMISSION AND DISTRIBUTION MANAGEMENT SYSTEMS**

Data Sources, Energy Management System, Wide Area Applications, Visualization Techniques, Data Sources and Associated External Systems, SCADA, Customer Information System, Modelling and Analysis Tools, Distribution System Modelling, Topology Analysis, Load Forecasting, Power Flow Analysis, Fault Calculations, State Estimation, Applications, System Monitoring, Operation, Management, Outage Management System, Energy Storage Technologies, Batteries, Flow Battery, Fuel Cell and Hydrogen Electrolyser, Flywheels, Superconducting Magnetic Energy Storage Systems, Supercapacitors.

**Course Outcomes:** The student should have learnt about:

- How to meet the standards for information exchange and for smart metering
- How to preserve data and Communication security by adopting encryption and decryption procedures.
- Monitoring, operating, and managing the transmission and distribution tasks under smart grid environment

#### **TEXT BOOKS:**

1. Smart Grid, Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Wiley Publications, 2012, Reprint 2015.
2. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press., 2012, Reprint 2016.

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**REFERENCES:**

1. The Smart Grid – Enabling Energy efficiency and demand response, Clark W. Gellings, P.E., CRC Press, Taylor & Francis group, First Indian Reprint. 2015.
2. Smart Grid – Applications, Communications, and Security Edited by Lars Torsten Berger, Krzysztof Iniewski, WILEY, 2012, Reprint 2015.
3. Practical Electrical Network Automation and Communication Systems, Cobus Strauss, ELSVIER, 2003.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

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**15A02708 FLEXIBLE AC TRANSMISSION SYSTEMS  
(CBCC-III)**

**Course Objectives:** The objectives of the course are to make the students learn about:

- The basic concepts, different types, and applications of FACTS controllers in power transmission.
- The basic concepts of static shunt and series converters
- The working principle, structure and control of UPFC.

**UNIT-I****CONCEPTS OF FLEXIBLE AC TRANSMISSION SYSTEMS**

Transmission line Interconnections, Power flow in parallel lines, Mesh systems, Stability considerations, Relative importance of controllable parameters, Basic types of FACTS controllers, Shunt controllers, Series controllers, Combined shunt and series controllers, Benefits of FACTS.

**UNIT-II****VOLTAGE AND CURRENT SOURCED CONVERTERS**

Concept of Voltage Sourced Converters, Single Phase Full Wave Bridge Converter, Three Phase Full Wave Bridge Converter, Transformer Connections for 12-Pulse Operation, 24 and 48-Pulse Operation, Three Level Voltage Sourced Converter, Pulse Width Modulation (PWM) Converter, Converter Rating, Concept of Current Sourced Converters, Thyristor based converters, Current Sourced Converter with Turn off Devices, Current Sourced –vs- Voltage Sourced Converters.

**UNIT-III****STATIC SHUNT COMPENSATORS**

Objectives of Shunt Compensation, Midpoint Voltage Regulation for Line Segmentation, End of Line Voltage Support to Prevent Voltage Instability, Improvement of Transient Stability, Power Oscillation Damping, Methods of Controllable VAR Generation, Variable Impedance Type Static VAR Generators, Switching Converter Type VAR Generators, Hybrid VAR Generators, SVC and STATCOM, Transient Stability Enhancement and Power Oscillation Damping, Comparison Between STATCOM and SVC, V-I, V-Q Characteristics, Response Time.



**UNIT-IV****STATIC SERIES COMPENSATORS**

Objectives of Series Compensation, Voltage Stability, Improvement of Transient Stability, Power Oscillation Damping, Subsynchronous Oscillation Damping, Variable Impedance Type Series Compensators, GTO Thyristor Controlled Type Series Capacitor (GCSC), Thyristor Switched Series Capacitor (TSSC), Thyristor-Controlled Series Capacitor(TCSC), Basic Operating Control Schemes for GCSC, TSSC, and TCSC, Switching Converter Type Series Compensators, The Static Synchronous Series Capacitor(SSSC), Transmitted Power Versus Transmission Angle Characteristic, Control Range and VA Rating, Capability to Provide Real Power Compensation.

**UNIT-V****POWER FLOW CONTROLLERS**

The Unified Power Flow Controller-Basic Operating Principles, Conventional Transmission Control Capabilities, Independent Real and Reactive Power Flow Control. Control Structure, Basic Control System for P and Q Control, Dynamic Performance, The Interline Power Flow Controller (IPFC), Basic Operating Principles and Characteristics, Generalized and Multifunctional FACTS Controllers.

**Course Outcomes:** After completing this course the student will be able to:

- Understand various control issues, for the purpose of identifying the scope and for selection of specific FACTS controllers.
- Apply the concepts in solving problems of simple power systems with FACTS controllers.
- Design simple FACTS controllers and converters for better transmission of electric power.

**TEXT BOOKS:**

1. Understanding FACTS – Concepts and technology of Flexible AC Transmission systems, Narain G. Hingorani, Laszlo Gyugyi, IEEE Press, WILEY, 1st Edition, 2000, Reprint 2015.
2. FACTS Controllers in Power Transmission and Distribution, Padiyar K.R., New Age International Publishers, 1<sup>st</sup> Edition, 2007.

**REFERENCE BOOKS:**

1. Flexible AC Transmission Systems: Modelling and Control, Xiao – Ping Zhang, Christian Rehtanz, Bikash Pal, Springer, 2012, First Indian Reprint, 2015.
2. FACTS – Modelling and Simulation in Power Networks, Enrigue Acha, Claudio R. Fuerte – Esquivel, Hugu Ambriz – perez, Cesar Angeles – Camacho, WILEY India Private Ltd., 2004, Reprint 2012.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

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**15A02709****POWER QUALITY  
(CBCC-III)****Course Objectives:** The objectives of the course are to make the students learn about:

- Power quality issues and standards.
- The sources of power quality disturbances and power transients that occur in power systems.
- The sources of harmonics, harmonic indices, Devices for controlling harmonic distortion.
- The principle of operation of DVR and UPQC.

**UNIT I****INTRODUCTION**

Definition of Power Quality- Power Quality Terminology – Classification of Power Quality Issues-Magnitude Versus Duration Plot - Power Quality Standards - Responsibilities of Suppliers and Users of Electric Power-CBEMA and ITI Curves.

**UNIT II****TRANSIENTS, SHORT DURATION AND LONG DURATION VARIATIONS**

Categories and Characteristics of Electromagnetic Phenomena in Power Systems- Impulsive and Oscillatory Transients- Interruption - Sag-Swell-Sustained Interruption - Under Voltage – Over Voltage–Outage. Sources of Different Power Quality Disturbances- Principles of Regulating the Voltage- Conventional Devices for Voltage Regulation.

**UNIT III****FUNDAMENTALS OF HARMONICS & APPLIED HARMONICS**

Harmonic Distortion, Voltage Versus Current Distortion, Harmonics Versus Transients, Power System Quality Under Non Sinusoidal Conditions, Harmonic Indices, Harmonic Sources from Commercial Loads, Harmonic Sources from Industrial Loads. Applied Harmonics: Effects Of Harmonics, Harmonic Distortion Evaluations, Principles of Controlling Harmonics, Devices for Controlling Harmonic Distortion.

**UNIT-IV****POWER QUALITY MONITORING**

Power Quality Benchmarking-Monitoring Considerations- Choosing Monitoring Locations- Permanent Power Quality Monitoring Equipment-Historical Perspective of Power Quality Measuring Instruments- Power Quality Measurement Equipment-Types

of Instruments- Assessment of Power Quality Measurement Data- Power Quality Monitoring Standards.

## **UNIT V**

### **POWER QUALITY ENHANCEMENT USING CUSTOM POWER DEVICES**

Introduction to Custom Power Devices-Network Reconfiguring Type: Solid State Current Limiter (SSCL)-Solid State Breaker (SSB) -Solid State Transfer Switch (SSTS) - Compensating Type: Dynamic Voltage Restorer (DVR)-Unified Power Quality Conditioner(UPQC)-Principle of Operation Only.

**Course Outcomes:** After completion of the course the student should be able to:

- Address power quality issues to ensure meeting of standards
- Apply the concepts of compensation for sags and swells using voltage regulating devices
- Assess harmonic distortion and its mitigation.
- Explain the power measurement data according to standards

### **TEXT BOOKS:**

1. Electrical Power Systems Quality, Roger C. Dugan, Mark F. McGranaghan, Surya Santoso, H.Wayne Beaty, Mc Graw Hill Education (India) Pvt. Ltd., 3<sup>rd</sup> Edition, 2012.
2. Power quality, C. Sankaran, CRC Press, 2001.

### **REFERENCE BOOKS:**

1. Understanding Power quality problems – Voltage Sags and Interruptions, Math H. J. Bollen IEEE Press Series on Power Engineering, WILEY, 2007.
2. Power quality – VAR Compensation in Power Systems, R. Sastry Vedam, Mulukutla S. Sarma, CRC Press, 2009, First Indian Reprint 2013.
3. Fundamentals of Electric Power Quality, Surya Santoso, Create Space, 2012.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**15A04608 DIGITAL SIGNAL PROCESSING LABORATORY****Course Outcomes:**

- Able to design real time DSP systems and real world applications.
- Able to implement DSP algorithms using both fixed and floating point processors.

**List of Experiments: (Minimum of 5 experiments are to be conducted from each part) Software Experiments (PART – A)**

1. Generation of random signal and plot the same as a waveform showing all the specifications.
2. Finding Power and (or) Energy of a given signal.
3. Convolution and Correlation (auto and cross correlation) of discrete sequences without using built in functions for convolution and correlation operations.
4. DTFT of a given signal
5. N – point FFT algorithm
6. Design of FIR filter using windowing technique and verify the frequency response of the filter.
7. Design of IIR filter using any of the available methods and verify the frequency response of the filter.
8. Design of analog filters.

**Using DSP Processor kits (Floating point) and Code Composer Studio (CCS) (PART – B)**

1. Generation of random signal and plot the same as a waveform showing all the specifications.
2. Finding Power and (or) Energy of a given signal.
3. Convolution and Correlation (auto and cross correlation) of discrete sequences without using built in functions for convolution and correlation operations.
4. DTFT of a given signal
5. N – point FFT algorithm
6. Design of FIR filter using windowing technique and verify the frequency response of the filter.
7. Design of IIR filter using any of the available methods and verify the frequency response of the filter.
8. Design of analog filters.

**Equipment/Software Required:**

1. Licensed MATLAB software with required tool boxes for 30 users.
2. DSP floating Processor Kits with Code Composer Studio (8 nos.)
3. Function generators
4. CROs
5. Regulated Power Supplies.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
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<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**15A02710 POWER SYSTEMS AND SIMULATION LABORATORY****Course Objectives:** The objectives of this course include:

- Experimental determination (in machines lab) of sequence impedance and subtransient reactances of synchronous machine
- Conducting experiments to analyze LG, LL, LLG, LLLG faults
- The equivalent circuit of three winding transformer by conducting a suitable experiment.
- Developing MATLAB program for formation of Y and Z buses.
- Developing MATLAB programs for gauss-seidel and fast decoupled load flow studies.
- Developing the SIMULINK model for single area load frequency control problem.

**List of Experiments:**

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine.
2. Fault Analysis – I  
LG Fault  
LL Fault
3. Fault Analysis – II  
LLG Fault  
LLL Fault
4. Determination of Subtransient reactances of salient pole synchronous machine.
5. Equivalent circuit of three winding transformer.
6.  $Y_{bus}$  formation using MATLAB
7.  $Z_{bus}$  formation using MATLAB
8. Gauss-Seidel load flow analysis using MATLAB
9. Fast decoupled load flow analysis using MATLAB
10. Develop a Simulink model for a single area load frequency control problem

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**Course Outcomes:**

At the end of the lab course, the student should be able to do the following:

- Experimental determination (in machines lab) of sequence impedance and subtransient reactances of synchronous machine
- Conducting experiments to analyze LG, LL, LLG, LLLG faults
- The equivalent circuit of three winding transformer by conducting a suitable experiment.
- Developing MATLAB program for formation of Y and Z buses.
- Developing MATLAB programs for gauss-seidel and fast decoupled load flow studies.
- Developing the SIMULINK model for single area load frequency control problem.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A02801 INSTRUMENTATION  
(MOOCS-II)**

**Course Objectives:** The objectives of the course are to make the students learn about:

- Common errors that occur in measurement systems, and their classification
- Characteristics of signals, their representation, and signal modulation techniques
- Methods of Data transmission, telemetry, and Data acquisition.
- Working principles of different signal analyzers and Digital meters.
- Several types of transducers and their use for measurement of non-electrical quantities.

**UNIT-I****CHARACTERISTICS OF SIGNALS AND THEIR REPRESENTATION**

Measuring Systems, Performance Characteristics, - Static Characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signals and Their Representation: Standard Test, Periodic, Aperiodic, Modulated Signal, Sampled Data, Pulse Modulation and Pulse Code Modulation.

**UNIT-II****DATA TRANSMISSION , TELEMETRY AND DAS**

Methods of Data Transmission – General Telemetry System. Frequency Modulation (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM. Analog and Digital Data Acquisition Systems – Components of Analog DAS – Types of Multiplexing Systems: Time Division and Frequency Division Multiplexing – Digital DAS – Block Diagram — Modern Digital DAS (Block Diagram)

**UNIT-III****SIGNAL ANALYZERS, DIGITAL METERS**

Wave Analysers- Frequency Selective Analyzers, Heterodyne, Application of Wave Analyzers- Harmonic Analyzers, Total Harmonic Distortion, Spectrum Analyzers, Basic Spectrum Analyzers, Spectral Displays, Vector Impedance Meter, Q Meter. Peak Reading and RMS Voltmeters, Digital Voltmeters - Successive Approximation, Ramp and Integrating Type-Digital Frequency Meter-Digital Multimeter-Digital Tachometer



**UNIT-IV****TRANSDUCERS**

Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle of Operation of Resistive, Inductive, Capacitive Transducers, LVDT, Strain Gauge and Its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Synchros, Piezoelectric Transducers, Photovoltaic, Photo Conductive Cells, Photo Diodes.

**UNIT-V****MEASUREMENT OF NON-ELECTRICAL QUANTITIES**

Measurement of strain, Gauge Sensitivity, Measurement of Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Flow, Liquid level.

**Course Outcomes:**

The student should be able to:

- Identify and explain the types of errors occurring in measurement systems
- Differentiate among the types of data transmission and modulation techniques
- Apply digital techniques to measure voltage, frequency and speed
- Choose suitable transducers for the measurement of non-electrical quantities

**TEXT BOOKS:**

1. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co., 2012.
2. Transducers and Instrumentation, D.V.S Murty, Prentice Hall of India, 2<sup>nd</sup> Edition, 2004.

**REFERENCE BOOKS:**

1. Modern Electronic Instrumentation and Measurement technique, A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India., 1990.
2. Electronic Instrumentation, H.S.Kalsi Tata MCGraw-Hill Edition, 2010.
3. Industrial Instrumentation – Principles and Design, T. R. Padmanabhan, Springer, 3<sup>rd</sup> re print, 2009.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A02802 POWER SYSTEM DYNAMICS AND CONTROL  
(MOOCS-II)**

**Course Objectives:** The objectives of the course are to make the students learn about:

- The kinds of power stability problems
- The basic concepts of modelling and analysis of dynamical systems.
- Modelling of power system components - generators, transmission lines, excitation and prime mover controllers.
- Stability of single machine and multi-machine systems is analyzed using digital simulation and small-signal analysis techniques.
- The impact of stability problems on power system planning and operation.

**Unit – I** Introduction to Power System Stability

Power System Operation and Control - Stability Problems faced by Power Systems - Impact on Power System Operation and Control - Analysis of Dynamical Systems - Concept of Equilibria, Small and Large Disturbance Stability - Example: Single Machine Infinite Bus System - Modal Analysis of Linear Systems - Analysis using Numerical Integration Techniques - Issues in Modelling: Slow and Fast Transients, Stiff Systems

**Unit – II** Modelling of a Synchronous Machine

Physical Characteristics - Rotor Position Dependent model - D-Q Transformation - Model with Standard Parameters - Steady State Analysis of Synchronous Machine - Short Circuit Transient Analysis of a Synchronous Machine - Synchronous Machine Connected to Infinite Bus.

**Unit – III** Modelling of power system components

Physical Characteristics and Models - Control system components - Excitation System Controllers - Prime Mover Control Systems - Transmission Line Physical Characteristics - Transmission Line Modeling - Load Models - induction machine model - Other Subsystems - HVDC, protection systems.

**Unit – IV** Stability Issues in Interconnected Power Systems

Single Machine Infinite Bus System - Multi-machine Systems - Stability of Relative Motion - Frequency Stability: Centre of Inertia Motion - Concept of Load Sharing: Governors - Single Machine Load Bus System: Voltage Stability - Torsional Oscillations

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**Unit – V Enhancing System Stability**

Planning Measures - Stabilizing Controllers (Power System Stabilizers) - Operational Measures- Preventive Control - Emergency Control - Power System Stability Analysis Tools: Small Signal Analysis Program - Transient Stability Program - Real-Time Simulators.

**Course Outcomes:** After completion of Course, the student should be able to

- Understand the power stability problems
- Understand the basic concepts of modelling of synchronous machine and power system components
- Analyse the stability issues in interconnected systems
- Understand the power system stability analysis tools and enhancement of power system stability

Reference Books:

1. K.R.Padiyar, Power System Dynamics, Stability & Control, 2nd Edition, B.S. Publications, Hyderabad, 2002.
2. P.Kundur, Power System Stability and Control, McGraw Hill Inc, New York, 1995.
3. P.Sauer & M.A.Pai, Power System Dynamics & Stability, Prentice Hall, 1997.
4. [Jan Machowski](#), [Janusz Bialek](#), [James Richard Bumby](#), Power system dynamics and control , John Wiley & Sons, 1997.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A02803 INDUSTRIAL AUTOMATION & CONTROL  
(MOOCS-II)**

**Course Objectives:** The objectives of the course are to make the students learn about

- Sensors and types of measurement systems
- Process control and sequence control of different controllers
- Operation of actuators
- Types of electric drives and their principles

**Unit – I** Introduction to sensors and measurement systems

Introduction to Industrial Automation and Control - Architecture of Industrial Automation Systems - Introduction to sensors and measurement systems - Temperature measurement - Pressure and Force measurements - Displacement and speed measurement - Flow measurement techniques - Measurement of level, humidity, pH etc - Signal Conditioning and Processing - Estimation of errors and Calibration.

**Unit – II** Introduction to Process Control

P-- I -- D Control - Controller Tuning - Implementation of PID Controllers - Special Control Structures : Feed forward and Ratio Control - Special Control Structures : Predictive Control, Control of Systems with Inverse Response - Special Control Structures : Cascade Control, Overriding Control, Selective Control, Split Range Control.

**Unit – III** Introduction to Sequence Control

PLCs and Relay Ladder Logic - Sequence Control: Scan Cycle, RLL Syntax - Sequence Control: Structured Design Approach - Sequence Control: Advanced RLL Programming - Sequence Control: The Hardware environment

**Unit – IV** Introduction to Actuators

Flow Control Valves - Hydraulic Actuator Systems: Principles, Components and Symbols - Hydraulic Actuator Systems: Pumps and Motors- Proportional and Servo Valves - Pneumatic Control Systems: System Components - Pneumatic Control Systems: Controllers and Integrated Control Systems - Networking of Sensors, Actuators and Controllers: The Fieldbus - The Field bus Communication Protocol

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**Unit – V Electric Drives**

Introduction, Energy Saving with Adjustable Speed Drives - Step motors: Principles, Construction and Drives - DC Motor Drives: Introduction, DC--DC Converters, Adjustable Speed Drives - Induction Motor Drives: Introduction, Characteristics, Adjustable Speed Drives - Synchronous Motor Drives: Motor Principles, Adjustable Speed and Servo Drives.

**Course Outcomes:** After completion of Course, the student should be able to

- Understand the measurement of different quantities
- Apply principles of electric drives for different applications like speed control
- Understand the principles of process control and sequence control in relay ladder logic.
- Understand the operation of controller in integrated control systems

Reference Books:

1. S. Mukhopadhyay, S. Sen & A. K. Deb, Industrial instrumentation, control and automation, Jaico Publishing House, 2012
2. Madhuchhanda Mitra and Samarjit Sen Gupta, Programmable Logic Controllers And Industrial Automation An ntroduction, 2008
3. David W. Pessen, Industrial Automation: Circuit Design and Components
4. Wiley India Publication, 2011
5. Rajput R.K, Robotics and Industrial Automation, S. Chand publications, 2008

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A02804 HVDC TRANSMISSION  
(MOOCS-III)**

**Course Objectives:** The objectives of the course are to make the students learn about:

- Technical and economic aspects of HVAC and HVDC transmission and their comparison.
- Static power converters
- Control of HVDC converter systems
- Origin, effects, classification and elimination of harmonics
- The occurrence of faults, and transients in HVDC system and their protection.

**UNIT-I****INTRODUCTION TO HVDC TRANSMISSION**

HVDC Transmission: Technical And Economical Comparison of HVAC and HVDC Transmission, Types of DC Links, Power Handling Capabilities of HVDC Lines, static Conversion Principles, Static Converter Configuration.

**UNIT-II****STATIC POWER CONVERTER ANALYSIS**

Static Power Converters: 3-Pulse, 6-Pulse & 12-Pulse Converters, Converter Station and Terminal Equipment, Commutation Process, Rectifier and Inverter Operation, Equivalent Circuit for Rectifier, Inverter and HVDC Link- Special Features of Converters.

**UNIT-III****CONTROL OF HVDC CONVERTER SYSTEMS**

Control of HVDC Converter Systems: Principle of DC Link Control – Constant Current, Constant Extinction Angle and Constant Ignition Angle Control and Voltage Dependent Current Control. Individual Phase Control and Equidistant Firing Angle Control

**UNIT-IV****HARMONICS AND FILTERS**

Origin of Harmonics in HVDC Systems, Classification of Harmonics, Elimination of Harmonics, Suppression Methods, Harmonic Instability Problems, Design of HVDC AC & DC Filters.

**UNIT-V****TRANSIENTS, FAULTS AND PROTECTION OF HVDC SYSTEMS**

Origin of over Voltages in HVDC Systems, Over Voltages due to DC and AC Side Line Faults - Converter Faults, Over Current Protection- Valve Group and DC Line Protection. Over Voltage Protection of Converters, Surge Arresters etc.

**Course Outcomes:** After Completion of Course, the student should be able to:

- Compare HVDC and HVAC transmission systems
- Understand the operation of various converters used in HVDC transmission systems
- Devise means to suppress / eliminate harmonics.
- Design HVDC and AC Filters

**TEXT BOOKS:**

1. HVDC Power Transmission Systems, K.R.Padiyar, 3<sup>rd</sup> Edition, New Age International publishers, 2015.
2. HVDC Transmission, S.Kamakshaiah, V.Kamaraju, Mc Graw Hill Education (India) Pvt. Ltd., 2011.

**REFERENCES:**

1. Direct Current Transmission, Vol. 1, E. W. Kimbark, Wiley, 1971
2. High Voltage Direct Current Transmission, Jos Arrillaga, IEE Power and Energy series 29, 2<sup>nd</sup> Edition, 1998
3. EHV-AC, HVDC Transmission & Distribution Engineering, S Rao, Khanna Publishers, 4<sup>th</sup> Edition, 2008.

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<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A04702 EMBEDDED SYSTEMS  
(MOOCS-III)**
**Course Outcomes:****After completion the students will be able to**

- Design of embedded systems leading to 32-bit application development.
- Understand hardware-interfacing concepts to connect digital as well as analog sensors while ensuring low power considerations.
- Review and implement the protocols used by microcontroller to communicate with external sensors and actuators in real world.
- Understand Embedded Networking and IoT concepts based upon connected MCUs

**UNIT-I****Introduction to Embedded Systems**

Embedded system introduction, host and target concept, embedded applications, features and architecture considerations for embedded systems- ROM, RAM, timers; data and address bus concept, Embedded Processor and their types, Memory types, overview of design process of embedded systems, programming languages and tools for embedded design

**UNIT-II****Embedded processor architecture**

CISC Vs RISC design philosophy, Von-Neumann Vs Harvard architecture. Introduction to ARM architecture and Cortex – M series, Introduction to the TM4C family viz. TM4C123x & TM4C129x and its targeted applications. TM4C block diagram, address space, on-chip peripherals (analog and digital) Register sets, Addressing modes and instruction set basics.

**UNIT- III****Overview of Microcontroller and Embedded Systems**

Embedded hardware and various building blocks, Processor Selection for an Embedded System , Interfacing Processor, Memories and I/O Devices, I/O Devices and I/O interfacing concepts, Timer and Counting Devices, Serial Communication and Advanced I/O, Buses between the Networked Multiple Devices.



Embedded System Design and Co-design Issues in System Development Process, Design Cycle in the Development Phase for an Embedded System, Uses of Target System or its Emulator and In-Circuit Emulator (ICE), Use of Software Tools for Development of an Embedded System

Design metrics of embedded systems - low power, high performance, engineering cost, time-to-market.

## UNIT-IV

### **Microcontroller fundamentals for basic programming**

I/O pin multiplexing, pull up/down registers, GPIO control, Memory Mapped Peripherals, programming System registers, Watchdog Timer, need of low power for embedded systems, System Clocks and control, Hibernation Module on TM4C, Active vs Standby current consumption. Introduction to Interrupts, Interrupt vector table, interrupt programming. Basic Timer, Real Time Clock (RTC), Motion Control Peripherals: PWM Module & Quadrature Encoder Interface (QEI).

## Unit-V

### **Embedded communications protocols and Internet of things**

Synchronous/Asynchronous interfaces (like UART, SPI, I2C, USB), serial communication basics, baud rate concepts, Interfacing digital and analog external device, Implementing and programming UART, SPI and I2C, SPI interface using TM4C. Case Study: Tiva based embedded system application using the interface protocols for communication with external devices "Sensor Hub BoosterPack"

Embedded Networking fundamentals, IoT overview and architecture, Overview of wireless sensor networks and design examples. Adding Wi-Fi capability to the Microcontroller, Embedded Wi-Fi, User APIs for Wireless and Networking applications Building IoT applications using CC3100 user API.

Case Study: Tiva based Embedded Networking Application: "Smart Plug with Remote Disconnect and Wi-Fi Connectivity"

### **Text Books:**

1. Embedded Systems: Real-Time Interfacing to ARM Cortex-M Microcontrollers, 2014, Create space publications ISBN: 978-1463590154.
2. Embedded Systems: Introduction to ARM Cortex - M Microcontrollers, 5th edition  
Jonathan W Valvano, Createspace publications ISBN-13: 978-1477508992
3. Embedded Systems 2E Raj Kamal, Tata McGraw-Hill Education, 2011 ISBN-0070667640, 9780070667648

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**References:**

1. [http://processors.wiki.ti.com/index.php/Hands-On\\_Training\\_for\\_TI\\_Embedded\\_Processors](http://processors.wiki.ti.com/index.php/Hands-On_Training_for_TI_Embedded_Processors)
2. [http://processors.wiki.ti.com/index.php/MCU\\_Day\\_Internet\\_of\\_Things\\_2013\\_Workshop](http://processors.wiki.ti.com/index.php/MCU_Day_Internet_of_Things_2013_Workshop)
3. [http://www.ti.com/ww/en/simplelink\\_embedded\\_wi-fi/home.html](http://www.ti.com/ww/en/simplelink_embedded_wi-fi/home.html)
4. CC3100/CC3200 SimpleLink™ Wi-Fi® Internet-on-a-Chip User Guide Texas Instruments Literature Number: SWRU368A April 2014–Revised August 2015.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (EEE)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A02805 ENERGY RESOURCES & TECHNOLOGY  
(MOOCS-III)**

Course Objectives: The objectives of the course are to make the students learn about:

- Production of quality of energy
- Types of generation plants and their principle of operation
- Methods of energy storage
- Economics of generation

**Unit – I: Fundamentals principles of energy**

Fundamentals of energy- Quality of energy- Complete Cycle Analysis of Fossil Fuels - Other Fossil Fuels - Energy Economics : Input-Output Analysis.

**Unit – II: Thermal, Hydro and Nuclear power sources**

Thermal Power Plants - Hydroelectric Power plants - Nuclear Power Generation- Nuclear Fusion Reactors - Environmental Effects of Conventional Power

**Unit – III: Solar, wind and photo voltaic power sources**

Solar Thermal Energy Conversion - Solar Concentrating Collectors - Photovoltaic Power Generation- Wind Energy - Wind Electrical Conversion

**Unit – IV: Other sources of energy**

Tidal Energy - Ocean Thermal Energy Conversion - Solar Pond and Wave Power - Geothermal Energy - Solar Distillation and Biomass Energy

**Unit – V: Energy storage and Economy**

Energy Storage - Energy in Transportation - Magneto hydrodynamic Power Generation - Hydrogen Economy.

Course Outcomes: After completion of Course, the student should be able to:

- Understand different types of sources of energy
- Analyse the generation principles and operation of variety of sources of energy
- Understand energy storage and economy

**Reference Books:**

1. Renewable energy Resources – Jhon Twidell and tony Weir, Second edition, Taylor and Francis Group, 2006
2. Non- conventional energy sources by G. D. Rai, Khanna Publishers, 2000
3. Electrical power generation, Transmission and distribution by S. N. Singh, PHI, 2003
4. Wind electrical systems by S. N. Bhadra, D. Kastha & S. Banerjee – Oxford University Press, 2013

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
*(Established by Govt. of A.P., Act. No. 30 of 2008)*  
**ANANTHAPURAMU – 515 002 (A.P.) INDIA.**

**Course Structure for B.Tech-R15 Regulations**

**Mechanical Engineering**

**B.Tech I – I Semester (ME)**

S.No	Course code	Subject	L	T	P	C
1.	15A52101	Functional English	3	1	-	3
2.	15A54101	Mathematics – I	3	1	-	3
3.	15A05101	Computer Programming	3	1	-	3
4.	15A51101	Engineering Chemistry	3	1	-	3
5.	15A01101	Environmental Studies	3	1	-	3
6.	15A52102	English Language Communication Skills Lab	-	-	4	2
7.	15A51102	Engineering Chemistry Lab	-	-	4	2
8.	15A05102	Computer Programming Lab	-	-	4	2
Total			15	5	12	21

**I-II Semester**

S.No	Course code	Subject	L	T	P	Drg	C
1.	15A52201	English for Professional Communication	3	1	-	-	3
2.	15A54201	Mathematics – II	3	1	-	-	3
3.	15A03201	Material Science and Engineering	3	1	-	-	3
4.	15A56101	Engineering Physics	3	1	-	-	3
5.	15A03101	Engineering Drawing	-	-	-	6	3
6.	15A03202	Material Science and Engineering Lab	-	-	4	-	2
7.	15A56102	Engineering Physics Lab	-	-	4	-	2
8.	15A99201	Engineering & IT Workshop	-	-	4	-	2
Total			12	4	12	6	21

\* L - Lecture hours

\*T - Tutorial hours

\*P - Practical hours

\*Drg - Drawing

\*C - Credits

**II B. Tech – I Sem**

S.No.	Course Code	Subject	L	T	P	C
1	15A54301	Mathematics - III	3	1	-	3
2	15A52301	Managerial Economics & Financial Analysis	3	1	-	3
3	15A01308	Mechanics of Solids	3	1	-	3
4	15A03301	Engineering Drawing for Mechanical Engineers	3	1	-	3
5	15A03302	Engineering Mechanics	3	1	-	3
6	15A03303	Thermodynamics	3	1	-	3
7	15A01309	Mechanics of Solids Lab	-	-	4	2
8	15A03304	Computer Aided Drafting Lab	-	-	4	2
Total			18	06	08	22

**II B. Tech – II Sem**

S.No.	Course Code	Subject	L	T	P	C
1	15A54401	Probability and Statistics	3	1	-	3
2	15A99301	Basic Electrical and Electronics Engineering	3	1	-	3
3	15A03401	Machine Drawing	3	1	-	3
4	15A03402	Kinematics of Machines	3	1	-	3
5	15A03403	Thermal Engineering – 1	3	1	-	3
6	15A03404	Manufacturing Technology	3	1	-	3
7	15A03405	Thermal Engineering Laboratory	-	-	4	2
8	15A03406	Manufacturing Technology Laboratory	-	-	4	2
9	15A03407	Comprehensive Online Examination-I	-	-	-	1
Total			18	06	08	23

**B.Tech III-I Semester (ME)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A01510	Fluid Mechanics and Hydraulic Machines	3	1	-	3
2.	15A03501	Thermal Engineering - II	3	1	-	3
3.	15A03502	Dynamics of Machinery	3	1	-	3
4.	15A03503	Machine Tools	3	1	-	3
5.	15A03504	Design of Machine Members - I	3	1	-	3
6.	15A03505 15A03506 15A03507	<b>MOOCS -I</b> a. Entrepreneurship b. Nano Technology c. Micro Electro Mechanical Systems	3	1	-	3
7.	15A01511	Fluid Mechanics and Hydraulic Machines Laboratory	-	-	4	2
8.	15A03508	Machine Tools Laboratory	-	-	4	2
9.	15A99501	Audit course – Social Values & Ethics	2	0	2	0
<b>Total</b>			<b>20</b>	<b>6</b>	<b>10</b>	<b>22</b>

**B.Tech III-II Semester (ME)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A03601	Operations Research	3	1	-	3
2.	15A03602	Design of Machine Members – II	3	1	-	3
3.	15A03603	Heat Transfer	3	1	-	3
4.	15A03604	Finite Element Method	3	1	-	3
5.	15A03605	Metal forming Process	3	1	-	3
6.	15A03606 15A03607 15A03608 15A01608	<b>CBCC-I</b> a. Non Conventional Source of Energy b. Total Quality Management c. Mechatronics d. Intellectual Property Rights	3	1	-	3
7.	15A03609	Heat Transfer Laboratory	-	-	4	2
8.	15A03610	Computer Aided Engineering Laboratory	-	-	4	2
9.	15A52602	Advanced English Language Communication Skills (AELCS) Laboratory (Audit Course)			2	-
10.	15A03611	Comprehensive Online Examination - II	-	-	-	1
<b>Total</b>			<b>18</b>	<b>6</b>	<b>11</b>	<b>23</b>

**B.Tech IV-I Semester (ME)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A52601	Management Science	3	1	-	3
2.	15A03701	Automobile Engineering	3	1	-	3
3.	15A03702	CAD/CAM	3	1	-	3
4.	15A03703	Metrology and Measurements	3	1	-	3
5.	15A03704 15A03705 15A03706	<b>CBCC-II</b> a. Refrigeration and Air – Conditioning b. Tool Design c. Modern Manufacturing Methods	3	1	-	3
6.	15A03707 15A03708 15A03709	<b>CBCC-III</b> a. Computational Fluid Dynamics b. Automation and Robotics c. Production & Operations Management	3	1	-	3
7.	15A03710	CAD/ CAM Laboratory	-	-	4	2
8.	15A03711	Metrology and Measurements Laboratory	-	-	4	2
<b>Total</b>			<b>18</b>	<b>6</b>	<b>8</b>	<b>22</b>

**B.Tech IV-II Semester (ME)**

S. No.	Course Code	Subject	L	T	P	C
1.	15A03801 15A03802 15A03803	<b>MOOCS-II</b> a. Industrial Engineering b. Product Design c. Composite Materials	3	1	0	3
2.	15A03804 15A03805 15A03806	<b>MOOCS -III</b> a. Power Plant Engineering b. Gas Turbines and Jet Propulsion c. Energy Management	3	1	0	3
3.	15A03807	Comprehensive Viva Voce	0	0	4	2
4.	15A03808	Technical Seminar	0	0	4	2
5.	15A03809	Project work	0	0	24	12
<b>Total</b>			<b>6</b>	<b>2</b>	<b>32</b>	<b>22</b>



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**Minor Discipline in ME**

<b>S. No.</b>	<b>Course Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1	15A03303	Thermodynamics	3	1	-	3
2	15A03403	Thermal Engineering-I	3	1	-	3
3	15A03501	Thermal Engineering-II	3	1	-	3
4	15A03603	Heat Transfer	3	1	-	3
5	15A03101	Minor Discipline Project	-	-	-	8
		<b>Total</b>	<b>12</b>	<b>4</b>	<b>-</b>	<b>20</b>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (ME)**

L	T	P	C
3	1	0	3

**(15A52101) FUNCTIONAL ENGLISH****(Common to All Branches)****Preamble:**

English is an international language as well as a living and vibrant one. People have found that knowledge of English is a passport for better career, better pay, and advanced knowledge and for communication with the entire world. As it is a language of opportunities in this global age, English is bound to expand its domain of use everywhere. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**Objectives:**

- To enable the students to communicate in English for academic and social purpose.
- To enable the students to acquire structure and written expressions required for their profession.
- To develop the listening skills of the students.
- To inculcate the habit of reading and critical thinking skills.
- To enhance the study skills of the students with emphasis on LSRW skills.

**UNIT –I**

**Topics:** Paragraph writing, writing letters, role play, reading graphs, prepositions, designing posters, tenses, making recommendations.

**Text:** ENVIRONMENTAL CONSCIOUSNESS' from *MINDSCAPES*  
Climate Change - Green Cover – Pollution

**UNIT –II**

**Topics:** Compound nouns, imperatives, writing instructions, interpreting charts and pictures, note making, role play, prefixes, subject-verb agreement.

**Text:** EMERGING TECHNOLOGIES from *MINDSCAPES*  
Solar Thermal Power - Cloud Computing - Nanotechnology

**UNIT –III**

**Topics:** Making conversations, homonyms and homophones, SMS and use of emotions, past participle for irregular verbs, group discussion, E - mail communication, antonyms, Preparing projects

**Text:** GLOBAL ISSUES from *MINDSCAPES*  
Child Labour - Food Crisis - Genetic Modification - E-Waste - Assistive Technology

**UNIT –IV**

**Topics:** Group discussion, affixes, double consonants, debates, writing a book / film review, predicting and problem-solving-future tense, adverbs

**Text:** SPACE TREK from *MINDSCAPES*  
Hubble Telescope - Chandrayan-2 - Anusat - Living Quarters - Space Tourism

**UNIT –V**

**Topics:** Compare and contrast, effective writing, group discussion, writing reports, writing advertisements, tweeting and blogging, types of interviews, framing questions.

**Text:** MEDIA MATTERS from *MINDSCAPES*  
History of Media - Language and Media - Milestone in Media - Manipulation by Media - Entertainment Media - Interviews

**Text Books:**

1. MINDSCAPES: English for Technologists and Engineers, Orient Blackswan, 2014.

**References:**

1. A Practical Course in Effective English Speaking Skills by J.K.Gangal, PHI Publishers, New Delhi.2012
2. Technical Communication, Meenakshi Raman, Oxford University Press,2011.
3. Spoken English, R.K. Bansal & JB Harrison, Orient Longman,2013, 4<sup>Th</sup> edition.
4. Murphy's English Grammar with CD, Murphy, Cambridge University Press,3<sup>Rd</sup> edition.
5. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO,2008.

**Outcomes:**

- Have improved communication in listening, speaking, reading and writing skills in general.
- Have developed their oral communication and fluency in group discussions and interviews.
- Have improved awareness of English in science and technology context.
- Have achieved familiarity with a variety of technical reports.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A54101) MATHEMATICS – I****(Common to All Branches)****Objectives:**

- To train the students thoroughly in Mathematical concepts of ordinary differential equations and their applications.
- To prepare students for lifelong learning and successful careers using mathematical concepts of differential and Integral calculus, ordinary differential equations and vector calculus.
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate and modeling the problems, to think creatively and to synthesize information.

**UNIT – I**

Exact, linear and Bernoulli equations, Applications to first order equations; Orthogonal trajectories, Simple electric circuits.

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax} V(x)$ ,  $xV(x)$ .

**UNIT – II**

Method of variation of parameters, linear equations with variable coefficients: Euler-Cauchy Equations, Legendre's linear equation. Applications of linear differential equations- Mechanical and Electrical oscillatory circuits and Deflection of Beams.

**UNIT – III**

Taylor's and Maclaurin's Series - Functions of several variables – Jacobian – Maxima and Minima of functions of two variables, Lagrange's method of undetermined Multipliers with three variables only. Radius of curvature.

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**UNIT – IV**

Multiple integral – Double and triple integrals – Change of Variables – Change of order of integration. Applications to areas and volumes in Cartesian and polar coordinates using double and triple integral.

**UNIT – V**

Vector Calculus: Gradient – Divergence – Curl and their properties; Vector integration – Line integral - Potential function – Area – Surface and volume integrals. Vector integral theorems: Green's theorem – Stoke's and Gauss's Divergence Theorem (Without proof). Application of Green's, Stoke's and Gauss's Theorems.

**Text Books:**

1. Engineering Mathematics-I, E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher
2. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.

**References:**

1. Engineering Mathematics Volume-I, by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publication.
2. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Alan Jeffrey, Elsevier.

**Outcomes:**

- The students become familiar with the application of differential and integral calculus, ordinary differential equations and vector calculus to engineering problems.
- The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications.

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

**B. Tech I-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

### (15A05101) COMPUTER PROGRAMMING

(Common to All Branches)

#### Objectives:

- Understand problem solving techniques
- Understand representation of a solution to a problem
- Understand the syntax and semantics of C programming language
- Understand the significance of Control structures
- Learn the features of C language

#### UNIT - I

Overview of Computers and Programming - Electronic Computers Then and Now - Computer Hardware - Computer Software - Algorithm - Flowcharts - Software Development Method - Applying the Software Development Method.

Types, Operators and Expressions: Variable Names - Data Types and Sizes - Constants - Declarations - Arithmetic Operators - Relational and Logical Operators - Type Conversions - Increment and Decrement Operators - Bitwise Operators - Assignment Operators and Expressions - Conditional Expressions - Precedence and Order of Evaluation.

#### UNIT - II

Selections Statements – Iteration Statements – Jump Statements- Expression Statements - Block Statements.

Single Dimensional Arrays – Generating a Pointer to an Array – Passing Single Dimension Arrays to Functions – Strings – Two Dimensional Arrays – Indexing Pointers – Array Initialization – Variable Length Arrays

#### UNIT - III

Pointer Variables – Pointer Operators - Pointer Expressions – Pointers And Arrays – Multiple Indirection – Initializing Pointers – Pointers to Functions – C’s Dynamic Allocation Functions – Problems with Pointers.

Understanding the scope of Functions – Scope Rules – Type Qualifiers – Storage Class Specifiers- Functions Arguments –The Return Statement.

## **UNIT - IV**

Command line arguments – Recursion – Function Prototypes – Declaring Variable Length Parameter Lists

Structures – Arrays of Structures – Passing Structures to Functions – Structure Pointers – Arrays and Structures within Structures – Unions – Bit Fields – Enumerations – typedef

## **UNIT - V**

Reading and Writing Characters – Reading and Writing Strings – Formatted Console I/O – Printf - Scanf – Standard C Vs Unix File I/O – Streams and Files – File System Basics – Fread and Fwrite – Fseek and Random Access I/O – Fprintf ( ) and Fscanf( ) – The Standard Streams – The Preprocessor Directives #define and #include.

### **Text Books:**

1. “The Complete Reference C”- Fourth Edition- Herbert Schildt- McGrawHill Education.
2. “The C Programming Language” Second Edition- Brian W. Kernighan- Dennis M. Ritchie- Prentice Hall-India. (UNIT- I)

### **References:**

1. Programming in C, Second Edition – Pradip Dey, Manas Ghosh, Oxford University Press.
2. “C From Theory to Practice”- George S. Tselikis- Nikolaos D. Tselikas- CRC Press.
3. “Programming with C”- R S Bichkar- University Press.
4. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education. (UNIT-I)
5. Computer Fundamentals and C Programming- Second Edition- P.Chenna Reddy- Available at Potthi.com (<http://pothi.com/pothi/book/dr-p-chenna-reddy-computer-fundamentals-and-c-programming>).

### **Outcomes:**



- Apply problem solving techniques in designing the solutions for a wide-range of problems
- Choose appropriate control structure depending on the problem to be solved
- Modularize the problem and also solution

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A51101) ENGINEERING CHEMISTRY****(Common to ECE/EIE/ME/IT)****Objectives:**

- The Engineering Chemistry course for undergraduate students is framed to strengthen the fundamentals of chemistry and then build an interface of theoretical concepts with their industrial/engineering applications.
- The course main aim is to impart in-depth knowledge of the subject and highlight the role of chemistry in the field of engineering.
- The lucid explanation of the topics will help students understand the fundamental concepts and apply them to design engineering materials and solve problems related to them. An attempt has been made to logically correlate the topic with its application.
- The extension of fundamentals of electrochemistry to energy storage devices such as commercial batteries and fuel cells is one such example.
- After the completion of the course, the student would understand the concepts of chemistry and apply to various materials for engineering applications.

**UNIT – I WATER QUALITY AND TREATMENT**

Impurities in water, Hardness of water and its Units, Disadvantages of hard water, Estimation of hardness by EDTA method, Numerical problems on hardness, Estimation of dissolved oxygen, Alkalinity, acidity and chlorides in water, Water treatment for domestic purpose (Chlorination, Bleaching powder, ozonisation)

Industrial Use of water:

For steam generation, troubles of Boilers: Scale & Sludge, Priming and Foaming, Caustic Embrittlement and Boiler Corrosion.

Treatment of Boiler Feed water:

Internal Treatment: Colloidal, Phosphate, Carbonate, Calgon and sodium aluminate treatment.

External Treatment: Ion-Exchange and Permutit processes.

**UNIT – II                      POLYMERS**

i) Introduction: Basic concepts of polymerisation, Types of polymerisation (Chain Growth (Addition), Step growth (Condensation)), Mechanism: cationic, anionic, free radical and coordination covalent.

Plastomers: Thermosetting and Thermoplastics, Preparation, properties and Engineering applications of PVC, Teflon, Bakelite and nylons.

Elastomers

Natural Rubber; Processing of natural rubbers, Compounding of Rubber

Synthetic Rubber: Preparation, properties and engineering applications of Buna-S, Buna-N, Polyurethane, Polysulfide (Thiokol) rubbers

ii) Conducting polymers: Mechanism, synthesis and applications of polyacetylene, polyaniline.

iii) Inorganic Polymers: Basic Introduction, Silicones, Polyphosphazenes ( $-(R)_2P=N-$ ) applications

**UNIT – III                      ELECTROCHEMISTRY**

i) Galvanic cells, Nernst Equation, Numerical calculations, Batteries: Rechargeable batteries (Lead acid, Ni-Cd, Lithium Ion Batteries), Fuel cells: (Hydrogen-Oxygen and Methanol-Oxygen, Solid oxide)

ii) Corrosion: Introduction, type of corrosion (Concentration cell corrosion, Galvanic corrosion), Chemical (Dry) and Electrochemical (Wet) Theory of corrosion. Galvanic series, factors affecting the corrosion (Metal and environment). Prevention: Cathodic protection (Sacrificial anode and impressed current), Inhibitors (Anodic and cathodic), electroplating (Copper, nickel and chromium) and electroless plating (Copper and nickel)

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**UNIT – IV                      FUELS AND COMBUSTION**

Classifications of Fuels – Characteristics of Fuels- Calorific Value – Units, Numerical Problems.

Solid Fuels: Coal-Classification and Analysis (proximate and ultimate), Coke :Characteristics of metallurgical coke, Manufacture of Metallurgical Coke by Otto Hoffmann's by product oven processes.

Liquid Fuels:

Petroleum: Refining of Petroleum, Gasoline- Octane Number, Diesel -Cetane Number, Synthetic Petrol: Bergius Processes, Fischer Troph's synthesis

Power Alcohol: Manufacture, Advantages and Disadvantages of Power Alcohol

Gaseous Fuels: Natural gas, Producer gas, Water gas, Coal gas and Biogas. Determination calorific value of Gases fuels by Junker's calorimeter.

Combustion: Basic principles and numerical problems, Flue Gas analysis by Orsat's apparatus.

**UNIT – V                      CHEMISTRY OF ENGINEERING MATERIALS**

i) Cement: Composition, Classification, preparation (Dry and Wet processes), Setting and Hardening (Hydration and Hydrolysis)

ii) Refractories: Introduction, Classification , properties and applications

iii) Lubricants: Introduction, classification (Solid, liquid, semi solid, emulsion and synthetic),Theory of lubrication (Thin film, Thick film & Extreme pressure) , properties of lubricants and applications.

iv) Carbon clusters: Fullerenes and Carbon Nano Tubes (CNT)

**Text Books:**

1. Engineering Chemistry, First Edition, Jayaveera KN, Subba Reddy GVand Ramachandraiah C, McGraw Hill Higher Education, New Delhi, 2013.

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2. A Text Book of Engineering Chemistry, 15<sup>th</sup> Edition, Jain and Jain, Dhanapathi Rai Publications, New Delhi, 2013.

**References:**

1. A Text book of Engineering Chemistry, 12<sup>th</sup> Edition, SS Dhara, Uma, S. Chand Publications, New Delhi, 2010.
2. Engineering Chemistry, First edition, K.B. Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited, 2010.
3. Engineering Chemistry, First edition, Seshamaheswaramma K and Mridula Chugh, Pearson Education, 2013.

**Outcomes:** The student is expected to:

- Differentiate between hard and soft water. Understand the disadvantages of using hard water domestically and industrially. Select and apply suitable treatments domestically and industrially.
- Understand the electrochemical sources of energy
- Understand industrially based polymers, various engineering materials.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ME)**

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3	1	0	3

**(15A01101) ENVIRONMENTAL STUDIES****(Common to ECE/EIE/ME/IT)****Objectives:**

To make the students to get awareness on environment, to understand the importance of protecting natural resources, ecosystems for future generations and pollution causes due to the day to day activities of human life to save earth from the inventions by the engineers.

**UNIT – I****MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES: –**

Definition, Scope and Importance – Need for Public Awareness.

**NATURAL RESOURCES :** Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

**UNIT – II**

**ECOSYSTEMS:** Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:

- a. Forest ecosystem.
- b. Grassland ecosystem
- c. Desert ecosystem
- d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**BIODIVERSITY AND ITS CONSERVATION :** Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### UNIT – III

**ENVIRONMENTAL POLLUTION:** Definition, Cause, effects and control measures of :

- a. Air Pollution.
- b. Water pollution
- c. Soil pollution
- d. Marine pollution
- e. Noise pollution
- f. Thermal pollution
- g. Nuclear hazards

**SOLID WASTE MANAGEMENT:** Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

### UNIT – IV

**SOCIAL ISSUES AND THE ENVIRONMENT:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness.

### UNIT – V

**HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**FIELD WORK:** Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site- Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

**Text Books:**

1. Text Book of Environmental Studies for Undergraduate Courses, Erach Bharucha, Universities Press Pvt Ltd, Hyderabad. 2<sup>nd</sup> Edition 2013.
2. Environmental Studies by Kaushik, New Age Publishers.

**References:**

1. Environmental Studies by Rajagopalan, Oxford Publishers.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.

**Outcomes:**

- Students will get the sufficient information that will clarify modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
- Students will realize the need to change their approach so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
- Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
- By studying environmental sciences, students are exposed to the environment that enables one to find out solution of various environmental problems encountered on and often.
- At the end of the course, it is expected that students will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. This will enable every human being to live in a more sustainable manner.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-I Sem. (ME)**

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<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(15A52102) ENGLISH LANGUAGE COMMUNICATION SKILLS (ELCS) LAB****(Common to All Branches)**

The Language Lab focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations and contexts.

**Objectives:**

- To enable students to learn better pronunciation through stress on word accent, intonation, and rhythm.
- To help the second language learners to acquire fluency in spoken English and neutralize mother tongue influence
- To train students to use language appropriately for interviews, group discussion and public speaking

**UNIT - 1**

1. Phonetics -importance
2. Introduction to Sounds of Speech
3. Vowels and consonants sounds
4. Phonetic Transcription

**UNIT - II**

5. Word Stress
6. Syllabification
7. Rules of word stress
8. Intonation

**UNIT - III**

9. Situational Dialogues
10. Role Plays
11. JAM
12. Describing people/objects/places

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**UNIT - IV**

13. Debates
14. Group Discussions
15. Interview skills

**UNIT - V**

16. Video speech writing
17. Book reviews -oral and written

**Minimum Requirements for ELCS Lab:**

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab: The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
  2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.
- System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

**Suggested Software:**

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – part II
3. K-Van Advanced Communication Skills
4. Walden InfoTech Software.

**References:**

1. A Textbook of English Phonetics for Indian Students 2<sup>nd</sup> Ed T. Balasubramanian. (Macmillan),2012.
2. A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt.Ltd
3. Speaking English Effectively, 2<sup>nd</sup> Edition Krishna Mohan & NP Singh, 2011. (Mcmillan).
4. A Hand book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books,2011
5. Spring Board Succes, Sharada Kouhik, Bindu Bajwa, Orient Blackswan, Hyderabad, 2010.

**Outcomes:**

- Become active participants in the learning process and acquire proficiency in spoken English.
- Speak with clarity and confidence thereby enhance employability skills.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-I Sem. (ME)**

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**(15A51102) ENGINEERING CHEMISTRY LAB****(Common to ECE/EIE/ME/IT)****Objectives:**

- Will learn practical understanding of the redox reaction
- Will learn the preparation and properties of synthetic polymers and other material that would provide sufficient impetus to engineer these to suit diverse applications
- Will also learn the hygiene aspects of water would be in a position to design methods to produce potable water using modern technology.

**List of Experiments:**

1. Determination of total hardness of water by EDTA method.
2. Determination of Copper by EDTA method.
3. Estimation of Dissolved Oxygen by Winkler's method
4. Estimation of iron (II) using diphenylamine indicator (Dichrometry – Internal indicator method).
5. Determination of Alkalinity of Water
6. Determination of acidity of Water
7. Preparation of Phenol-Formaldehyde (Bakelite)
8. Determination of Viscosity of oils using Redwood Viscometer I
9. Determination of Viscosity of oils using Redwood Viscometer II
10. Determination of calorific value of gaseous fuels by Junker's Calorimeter
11. Conductometric estimation of strong acid using standard sodium hydroxide solution

12. Determination of Corrosion rate and inhibition efficiency of an inhibitor for mild steel in hydrochloric acid medium.
13. Potentio metric determination of iron using standard potassium dichromate
14. Colorometric estimation of manganese.
15. pH meter calibration and measurement of pH of water and various other samples.

(Any 10 experiments from the above list)

**References:**

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – Mendham J et al, Pearson Education, 2012.
2. Chemistry Practical– Lab Manual, First edition, Chandra Sekhar KB, Subba Reddy GV and Jayaveera KN, SM Enterprises, Hyderabad, 2014.

**Outcomes:**

- Would be confident in handling energy storage systems and would be able combat chemical corrosion
- Would have acquired the practical skill to handle the analytical methods with confidence.
- Would feel comfortable to think of design materials with the requisite properties
- Would be in a position to technically address the water related problems.

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**B. Tech I-I Sem. (ME)**

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**(15A05102) COMPUTER PROGRAMMING LAB****(Common to All branches)****Objectives:**

- Learn C Programming language
- To make the student solve problems, implement algorithms using C language.

**List of Experiments/Tasks**

1. Practice DOS and LINUX Commands necessary for design of C Programs.
2. Study of the Editors, Integrated development environments, and Compilers in chosen platform.
3. Write, Edit, Debug, Compile and Execute Sample C programs to understand the programming environment.
4. Practice programs: Finding the sum of three numbers, exchange of two numbers, maximum of two numbers, To read and print variable values of all data types of C language, to find the size of all data types, to understand the priority and associativity of operators using expressions, to use different library functions of C language.
5. Write a program to find the roots of a Quadratic equation.
6. Write a program to compute the factorial of a given number.
7. Write a program to check whether the number is prime or not.
8. Write a program to find the series of prime numbers in the given range.
9. Write a program to generate Fibonacci numbers in the given range.
10. Write a program to find the maximum of a set of numbers.
11. Write a program to reverse the digits of a number.
12. Write a program to find the sum of the digits of a number.
13. Write a program to find the sum of positive and negative numbers in a given set of numbers.
14. Write a program to check for number palindrome.
15. Write a program to evaluate the sum of the following series up to 'n' terms  

$$e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$$
16. Write a program to generate Pascal Triangle.
17. Write a program to read two matrices and print their sum and product in the matrix form.
18. Write a program to read matrix and perform the following operations.
  - i. Find the sum of Diagonal Elements of a matrix.
  - ii. Print Transpose of a matrix.

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- iii. Print sum of even and odd numbers in a given matrix.
19. Write a program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters.
  20. Write a program to insert a substring in to a given string and delete few characters from the string. Don't use library functions related to strings.
  21. Write a program to perform the operations addition, subtraction, multiplication of complex numbers.
  22. Write a program to split a 'file' in to two files, say file1 and file2. Read lines into the 'file' from standard input. File1 should consist of odd numbered lines and file2 should consist of even numbered lines.
  23. Write a program to merge two files.
  24. Write a program to implement numerical methods Lagrange's interpolation, Trapezoidal rule.
  25. Write a program to read a set of strings and sort them in alphabetical order.
  26. Write a program to read two strings and perform the following operations without using built-in string Library functions and by using your own implementations of functions.
    - i. String length determination
    - ii. Compare Two Strings
    - iii. Concatenate them, if they are not equal
    - iv. String reversing
  27. Write programs using recursion for finding Factorial of a number, GCD, LCM, and solving Towers of Hanoi problem.
  28. Write a program to exchange two numbers using pointers.
  29. Write a program to read student records into a file. Record consists of rollno, name and marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per JNTUA rules. Write the first class, second class, third class and failed students lists separately to another file.
  30. A file consists of information about employee salary with fields employeeid, name, Basic, HRA, DA, IT, other-deductions, Gross and Net salary. Initially only employeeid, name, and basic have valid values. HRA is taken as 10% of the basic, DA is taken as 80% of basic, IT is 20% of the basic, other deductions is user specified. Compute the Gross and Net salary of the employee and update the file.
  31. Write a program to perform Base (decimal, octal, hexadecimal, etc) conversion.
  32. Write a program to find the square root of a number without using built-in library function.
  33. Write a program to convert from string to number.
  34. Write a program to implement pseudo random generator.
  35. Write a program to generate multiplication tables from 11 to 20.
  36. Write a program to express a four digit number in words. For example 1546 should be written as one thousand five hundred and forty six.

37. Write a program to generate a telephone bill. The contents of it and the rate calculation etc should be as per BSNL rules. Student is expected to gather the required information through the BSNL website.
38. Write a program to find the execution time of a program.
39. Design a file format to store a person's name, address, and other information. Write a program to read this file and produce a set of mailing labels

**Note:**

1. Instructors are advised to conduct the lab in LINUX/UNIX environment also
2. The above list consists of only sample programs. Instructors may choose other programs to illustrate certain concepts, wherever is necessary. Programs should be there on all the concepts studied in Theory. Instructors are advised to change atleast 25% of the programs every year until the next syllabus revision.

**References:**

1. “How to Solve it by Computer”, R.G. Dromey, Pearson.
2. “The C Programming Language”, Brian W. Kernighan, Dennis M. Ritchie, Pearson.
3. “Let us C”, Yeswant Kanetkar, BPB publications
4. “Pointers in C”, Yeswant Kanetkar, BPB publications.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education.

**Outcomes:**

- Apply problem solving techniques to find solutions to problems
- Able to use C language features effectively and implement solutions using C language.
- Improve logical skills.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-II Sem. (ME)**

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**(15A52201) ENGLISH FOR PROFESSIONAL  
COMMUNICATION**
**1. INTRODUCTION:**

English is a global language and has international appeal and application. It is widely used in a variety of contexts and for varied purposes. The students would find it useful both for social and professional development. There is every need to help the students acquire skills useful to them in their career as well as workplace. They need to write a variety of documents and letters now extending into professional domain that cuts across business and research also. The syllabus has been designed to enhance communication skills of the students of engineering and pharmacy. The prescribed book serves the purpose of preparing them for everyday communication and to face the global competitions in future.

The text prescribed for detailed study focuses on LSRW skills and vocabulary development. The teachers should encourage the students to use the target language. The classes should be interactive and learner-centered. They should be encouraged to participate in the classroom activities keenly.

In addition to the exercises from the text done in the class, the teacher can bring variety by using authentic materials such as newspaper articles, advertisements, promotional material etc.

**2. OBJECTIVES:**

1. To develop confidence in the students to use English in everyday situations.
2. To enable the students to read different discourses so that they appreciate English for science and technologies.
3. To improve familiarity with a variety of technical writings.
4. To enable the students to acquire structure and written expressions required for their profession.
5. To develop the listening skills of the students.

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### 3. SYLLABUS:

#### UNIT –I

**Topics:** Group discussion, cause and effect, events and perspectives, debate, if conditional, essay writing.

**Text: LESSONS FROM THE PAST** from *MINDSCAPES*

Importance of History - Differing Perspectives - Modern Corporatism - Lessons From The Past

#### UNIT-II

**Topics:** Idioms, essay writing, power point presentation, modals, listening and rewriting, preparing summary, debate, group discussion, role play, writing a book review, conversation

**Text: ‘ENERGY’** from *MINDSCAPES*

Renewable and Non-Renewable Sources - Alternative Sources - Conservation -Nuclear Energy

#### UNIT-III

**Topics:** Vocabulary, impromptu speech, creative writing, direct and indirect speech, fixed expressions, developing creative writing skills, accents, presentation skills, making posters, report writing

**Text: ‘ENGINEERING ETHICS’** from *MINDSCAPES*

Challenger Disaster - Biotechnology - Genetic Engineering - Protection From Natural Calamities

#### UNIT-IV

**Topics:** Vocabulary, Conversation, Collocation, Group discussion, Note-making, Clauses, Interpreting charts and tables, Report writing.

**Text: ‘TRAVEL AND TOURISM’** from *MINDSCAPES*

Advantages and Disadvantages of Travel - Tourism - Atithi Devo Bhava - Tourism in India

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**UNIT-V**

**Topics:** Vocabulary, phrasal verbs, writing a profile, connectives, discourse markers, problem-solving, telephone skills, application letters, curriculum vitae, interviews (telephone and personal)

**Text:** ‘**GETTING JOB-READY**’ from ***MINDSCAPES***

SWOT Analysis - Companies And Ways Of Powering Growth - Preparing For Interviews

**Prescribed Text**

***MINDSCAPES:*** English for Technologists and Engineers, Orient Blackswan, 2014.

**REFERENCES:**

1. **Effective Tech Communication**, [Rizvi](#), Tata McGraw-Hill Education, 2007.
2. **Technical Communication**, Meenakshi Raman, Oxford University Press.
3. **English Conversations Prcatice**, Grant Taylor, Tata Mc GrawHill publications, 2013.
4. **Practical English Grammar**. Thomson and Martinet, OUP, 2010.

**Expected Outcomes:**

At the end of the course, students would be expected to:

1. Have acquired ability to participate effectively in group discussions.
2. Have developed ability in writing in various contexts.
3. Have acquired a proper level of competence for employability.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-II Sem. (ME)**

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**(15A54201) MATHEMATICS – II****(Common to All Branches)**

**Objectives:** Our emphasis will be more on conceptual understanding and application of Fourier series, Fourier, Z and Laplace transforms and solution of partial differential equations.

**UNIT – I**

Laplace transform of standard functions – Inverse transform – First shifting Theorem, Transforms of derivatives and integrals – Unit step function – Second shifting theorem – Dirac's delta function – Convolution theorem – Laplace transform of Periodic function.

Differentiation and integration of transform – Application of Laplace transforms to ordinary differential equations of first and second order.

**UNIT – II**

Fourier Series: Determination of Fourier coefficients – Fourier series – Even and odd functions – Fourier series in an arbitrary interval – Even and odd periodic continuation – Half-range Fourier sine and cosine expansions- Parseval's formula- Complex form of Fourier series.

**UNIT – III**

Fourier integral theorem (only statement) – Fourier sine and cosine integrals. Fourier transform – Fourier sine and cosine transforms – Properties – Inverse transforms – Finite Fourier transforms.

**UNIT – IV**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Method of separation of variables – Solutions of one dimensional wave equation, heat equation and two-dimensional Laplace's equation under initial and boundary conditions.

### **UNIT – V**

z-transform – Inverse z-transform – Properties – Damping rule – Shifting rule – Initial and final value theorems. Convolution theorem – Solution of difference equations by z-transforms.

### **TEXT BOOKS:**

1. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.

### **REFERENCES:**

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad S. Chand publication.
2. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
3. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

**Outcomes:**The student gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and partial differential equations.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-II Sem. (ME)**

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**(15A03201) MATERIAL SCIENCE AND ENGINEERING****Course Objective:**

*To gain and understanding of the relationship between the structure, properties, processing, testing, heat treatment and applications of metallic , non metallic, ceramic and composite materials so as to identify and select suitable materials for various engineering applications.*

**UNIT I**

**STRUCTURE OF METALS:** Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size.

**CONSTITUTION OF ALLOYS:** Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

**Learning outcome & Suggested Student Activities:**

*Students will get knowledge on bonds of solids and knowing the crystallization of metals. By knowing the grain size and shape through the crystallization, he may understand the effect of grain boundaries on the properties of metals and finally he determines the grain size that is very essential for analyzing the microstructures of metals.*

*Students are advised to refer the following websites [www.physics.rutgers.edu/meis/pubs/BB\\_thesis.pdf](http://www.physics.rutgers.edu/meis/pubs/BB_thesis.pdf) [www.ce.berkeley.edu/~paulmont/CE60New/alloys-steel.pdf](http://www.ce.berkeley.edu/~paulmont/CE60New/alloys-steel.pdf) for better understanding of this topic.*

**UNIT II**

**EQUILIBRIUM OF DIAGRAMS:** Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni, Al-Cu, and Fe-Fe<sub>3</sub>C

**Learning outcome & Suggested Student Activities:**

*Students will be able to construct the equilibrium diagrams by experimental methods and knowing all types of equilibrium diagrams isomorphs alloy systems , electric systems, peritectic systems solid-state transformations etc. while studying all these diagrams he may able to know about lever*

*rule and phase rule.*

*Students are advised to visit the following URLs website [www.freelance-teacher.com/videos.htm](http://www.freelance-teacher.com/videos.htm)*

*[www.susqu.edu/brake/aux/downloads/papers/foamcomp.pdf](http://www.susqu.edu/brake/aux/downloads/papers/foamcomp.pdf) for better understanding of this topic.*

### **UNIT III**

**CAST IRONS AND STEELS:** Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

**NON-FERROUS METALS AND ALLOYS:** Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.

#### ***Learning Outcome & Suggested Student Activities:***

*Students will be able to learn the structure and properties of all cast irons, steels and Non-ferrous metal alloys of copper, Al and Titanium. Students are advised to visit any Machine shop in the industries like SAIL, Visakhapatnam steel plant etc., Students are advised to visit the following website. [www.buzzle.com](http://www.buzzle.com), [www.mhprofessional.com](http://www.mhprofessional.com) [www.eng.sut.ac](http://www.eng.sut.ac) for better understanding of this topic.*

### **UNIT IV**

**HEAT TREATMENT OF ALLOYS:** Effect of alloying elements on Iron – Iron carbon system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys. Heat treatment of plastics

#### ***Learning outcome & Suggested Student Activities:***

*Students will be able to learn the methods of different heat treatments i.e. annealing, normalizing and hardening. He also learns the different of alloying elements on Iron-Iron carbon system, the importance of TTT diagrams, Harden ability that are very essential for melting science. Finally, he learn about the heat treatment of cryogenic environment as an advance topic.*

*Students are advised to go through the URLs <http://www.nptel.iitm.ac.in/> and [iisc.ernet.in](http://iisc.ernet.in) for video lectures, <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv180-Page1.htm>*

### **UNIT V**

**CERAMIC MATERIALS:** Crystalline ceramics, glasses, cermets.

**COMPOSITE MATERIALS:** Classification of composites, various methods of component manufacture of composites, particle – reinforced

materials, fiber reinforced materials, polymer composites, metal ceramic mixtures, metal – matrix composites and Carbon – Carbon composites.

**Learning Outcome & Suggested Student Activities:**

This unit helps the students to understand the importance of advanced composite materials in application to sophisticated machine and structure of components, These composite materials helps to develop the components with required properties which we cannot attain using the metals & metal alloys.

Examples of products maybe of composite materials are air cooler bodies, fiber reinforced hose pipes, boat bodies some automobile body frames etc. Students may refer the following website for better understanding [www.susqu.edu/brake/aux/downloads/papers/foamcomp.pdf](http://www.susqu.edu/brake/aux/downloads/papers/foamcomp.pdf); [www.asment.com](http://www.asment.com) [www.princeton.edu/~achaney/tmve/wiki100k/doc/metal\\_matrix\\_composite.html](http://www.princeton.edu/~achaney/tmve/wiki100k/doc/metal_matrix_composite.html)

**Text Books:**

1. *Introduction to Physical Metallurgy*, Sidney H. Avner, US, 2<sup>nd</sup> Edition, 2007 Tata McGraw-Hill,
2. *Essential of Materials Science and Engineering*, Donald R. Askeland, USA, 3<sup>rd</sup> Edition, Cengage Publisher, 2013.

**Reference Books:**

1. *Material Science and Metallurgy*, U.C. Jindal, pearson educations, 2011,
2. *Elements of Materials Science and Engineering*, Lawrance H. Van Vlack, pearson educations, 6<sup>th</sup> Edition, 2002.
3. *Material Science and Metallurgy*, kodgire V.D, 12<sup>th</sup> Edition, Everest Publishing House, 2002.
4. *Engineering Mechanics of Composite Materials-* Isaac and M Daniel, Oxford University Press, 1994, 2<sup>nd</sup> Edition 2013.
5. *Mechanics of Composite Materials*, R. M. Jones, McGraw Hill Company, New York, 1975.
6. *Science of Engineering Materials*, Agarwal, TMH.
7. *Materials Science and Engineering*, William D. Callister, 8<sup>th</sup> Edition, 2010.
8. *Elements of Material science*, V. Rahghavan, PHI, 5<sup>th</sup> Editon.
9. *Engineering Materials and Their Applications* – R. A Flinn and P K Trojan, Jaico Books.
10. *Engineering materials and metallurgy*, R.K.Rajput, S.Chand, 1<sup>st</sup> Editon, 2008.

**Web References:**

[www.asminternational.org](http://www.asminternational.org)  
[www.henry.wells.edu](http://www.henry.wells.edu)  
[www.ce.berkeley.edu](http://www.ce.berkeley.edu)  
[www.sjsu.edu](http://www.sjsu.edu)



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech I-II Sem. (ME)**

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**(15A56101) ENGINEERING PHYSICS****Objectives:**

- To evoke interest on applications of superposition effects like interference and diffraction, the mechanisms of emission of light, achieving amplification of electromagnetic radiation through stimulated emission, study of propagation of light through transparent dielectric waveguides along with engineering applications.
- To enlighten the periodic arrangement of atoms in crystals, direction of Bragg planes, crystal structure determination by X-rays and non-destructive evaluation using ultrasonic techniques.
- To get an insight into the microscopic meaning of conductivity , classical and quantum free electron model, the effect of periodic potential on electron motion, evolution of band theory to distinguish materials and to understand electron transport mechanism in solids.
- To open new avenues of knowledge and understanding semiconductor based electronic devices , basic concepts and applications of semiconductors and magnetic materials have been introduced which find potential in the emerging micro device applications.
- To give an impetus on the subtle mechanism of superconductors in terms of conduction of electron pairs using BCS theory, different properties exhibited by them and their fascinating applications. Considering the significance of microminiaturization of electronic devices and significance of low dimensional materials, the basic concepts of nanomaterials, their synthesis, properties and applications in emerging technologies are elicited.

**UNIT - I****PHYSICAL OPTICS, LASERS AND FIBRE OPTICS**

*Physical Optics:* Interference (Review) – Interference in thin film by reflection –Newton's rings –Diffraction (Review) - Fraunhofer diffraction due to single slit, double slit and diffraction grating.

*Lasers:* Characteristics of laser – Spontaneous and stimulated emission of radiation – Einstein's coefficients — Population inversion – Excitation mechanism and optical resonator – Nd:YAG laser - He-Ne laser – Semiconductor Diode laser - Applications of lasers

*Fiber optics:* Introduction - construction and working principle of optical fiber – Numerical aperture and acceptance angle – Types of optical fibers – Attenuation and losses in Optical fibers –Block diagram of Optical fiber communication system – Applications of optical fibers

## **UNIT – II**

### **CRYSTALLOGRAPHY AND ULTRASONICS**

*Crystallography:* Introduction – Space lattice –Unit cell – Lattice parameters –Bravais lattice – Crystal systems – Packing fractions of SC, BCC and FCC - Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – X-ray diffraction - Bragg's law – Powder method.

*Ultrasonics:* Introduction – Production of ultrasonics by piezoelectric method – Properties and detection – Applications in non-destructive testing.

## **UNIT – III**

### **QUANTUM MECHANICS AND ELECTRON THEORY**

*Quantum Mechanics:* Matter waves – de'Broglie hypothesis and properties - Schrodinger's time dependent and independent wave equations – Physical significance of wave function - Particle in one dimensional infinite potential well.

*Electron theory:* Classical free electron theory – Equation for electrical conductivity - Quantum free electron theory – Fermi-Dirac distribution – Source of electrical resistance – Kronig-Penny model (qualitative treatment) – Origin of bands in solids – Classification of solids into conductors, semiconductors and insulators.

## **UNIT – IV**

### **SEMICONDUCTORS AND MAGNETIC MATERIALS**

*Semiconductors:* Intrinsic and extrinsic semiconductors (Qualitative treatment) – Drift & diffusion currents and Einstein's equation – Hall effect - Direct and indirect band gap semiconductors – Formation of p-n junction.

*Magnetic materials:* Introduction and basic definitions – Origin of magnetic moments – Bohr magneton – Classification of magnetic materials into dia, para, ferro, antiferro and ferri magnetic materials (Qualitative treatment) – Hysteresis - Soft and hard magnetic materials, applications of magnetic materials.

## **UNIT – V**

### **SUPERCONDUCTIVITY AND PHYSICS OF NANOMATERIALS**

*Superconductivity:* Introduction - Effect of magnetic field - Meissner effect – Type I and Type II superconductors – Flux quantization – Penetration depth - BCS theory (qualitative treatment) — Josephson effects –Applications of superconductors.

*Physics of Nanomaterials:* Introduction - Significance of nanoscale and types of nanomaterials – Physical properties: optical, thermal, mechanical and magnetic properties – Synthesis of nanomaterials by Top down and bottom up approaches: ball mill, chemical vapour deposition, and sol gel –Applications of nanomaterials.

**Text Books:**

1. Engineering Physics – K.Thyagarajan, 5<sup>th</sup> Edition, MacGraw Hill Publishers, NewDelhi, 2014.
2. Physics for Engineers - N.K Verma, 1<sup>st</sup> Edition, PHI Learning Private Limited, New Delhi, 2014.

**References:**

1. Engineering Physics – Dr. M.N. Avadhanulu & Dr. P.G. Kshirsagar, 10<sup>th</sup> Edition, S.Chand and Company, New Delhi, 2014.
2. Engineering Physics – D K Pandey, S. Chaturvedi, 2<sup>nd</sup> Edition, Cengage Learning, New Delhi, 2013.
3. Engineering Physics – D.K Bhattacharya, Poonam Tandon, 1<sup>nd</sup> Edition, Oxford University Press, New Delhi, 2015.

**Outcomes:**

- The different realms of physics and their applications in both scientific and technological systems are achieved through the study of physical optics, lasers and fibre optics.
- The important properties of crystals like the presence of long-range order and periodicity, structure determination using X-ray diffraction are focused along with defects in crystals and ultrasonic non-destructive techniques.
- The discrepancies between the classical estimates and laboratory observations of physical properties exhibited by materials would be lifted through the understanding of quantum picture of subatomic world.
- The electronic and magnetic properties of materials were successfully explained by free electron theory and the bases for the band theory are focused.
- The properties and device applications of semiconducting and magnetic materials are illustrated.

The importance of superconducting materials and nanomaterials along with their engineering applications are well elucidated.

B. Tech I-II Sem. (ME)

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**(15A03101) ENGINEERING DRAWING****Objectives:**

- To gain and understanding of the basics of geometrical constructions of various planes and solids, understanding system of graphical representation of various objects and various views to draft and read the products to be designed and eventually for manufacturing applications.
- To learn about various projections, to understand complete dimensions and details of object.
- Ultimately student must get imaginary skill to put an idea of object, circuit, assembly of parts in black & white, to design a product and to understand the composition, which can be understood universally.

**UNIT I**

**Introduction to Engineering Drawing:** Principles of Engineering Graphics and their Significance- Conventions in Drawing-Lettering – BIS Conventions. Curves used in Engineering Practice. a) Conic Sections including the Rectangular Hyperbola- General method only, b) Cycloid, Epicycloid and Hypocycloid

**UNIT II**

**Scales:** Plain, Diagonal and Vernier;

**Projection of Points:** Principles of orthographic projection – Convention – First angle projections, projections of points.

**UNIT III**

**Projections of Lines:** lines inclined to one or both planes, Problems on projections, Finding True lengths.

**Projections of Planes:** Projections of regular plane surfaces- plane surfaces inclined to both planes.

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**UNIT IV**

**Projections of Solids:** Projections of Regular Solids with axis inclined to both planes.

**Developments of Solids:** Development of Surfaces of Right Regular Solids-Prism, Cylinder, Pyramid, Cone.

**UNIT V**

**Isometric and Orthographic Projections:** Principles of isometric projection- Isometric Scale- Isometric Views- Conventions- Isometric Views of lines, Planes, Simple solids (cube, cylinder and cone). Isometric projections of spherical parts. Conversion of isometric Views to Orthographic Views.

**Text Books:**

1. *Engineering Drawing*, N.D. Bhatt, Charotar Publishers
2. *Engineering Drawing*, K.L. Narayana & P. Kannaih, Scitech Publishers, Chennai

**References:**

1. *Engineering Drawing*, Johle, Tata McGraw-Hill Publishers
2. *Engineering Drawing*, Shah and Rana, 2/e, Pearson Education
3. *Engineering Drawing and Graphics*, Venugopal/ New age Publishers
4. *Engineering Graphics*, K.C. John, PHI, 2013
5. *Engineering Drawing*, B.V.R. Gupta, J.K. Publishers

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**Outcomes:**

- Drawing 2D and 3D diagrams of various objects.
- Learning conventions of Drawing, which is an Universal Language of Engineers.
- Drafting projections of points, planes and solids.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech I-II Sem. (ME)**

L	T	P	C
0	0	4	2

**(15A03202) MATERIAL SCIENCE and ENGINEERING LAB**

1. Mounting and preparation of Specimen.
2. Preparation and study of the Micro Structure of Ferrous metal
3. Preparation and study of the Microstructure of Non - Ferrous metals (Cu, Al..... etc)
4. Preparation and study of the Microstructure of Mild Steel, Low carbon Steels, High carbon steels
5. Study of the Micro Structures of Cast Irons.
6. Study of the Micro Structures of Non-Ferrous alloys.
7. Study of the Micro structures of Heat treated steels.
8. Hardeneability of steels by Jominy End Quench Test.
9. To find out the hardness of various treated and untreated steels.
10. Fracture testing of materials.
11. Fatigue testing of materials.
12. Creep Testing of materials.



B. Tech I-II Sem. (ME)

L	T	P	C
0	0	4	2

**(15A56102) ENGINEERING PHYSICS LABORATORY****Objectives:**

- Will recognize the important of optical phenomenon like Interference and diffraction.
- Will understand the role of optical fiber parameters and signal losses in communication.
- Will recognize the importance of energy gap in the study of conductivity and hall effect in a semiconductor
- Will understand the applications of B H curve.
- Will acquire a practical knowledge of studying the crystal structure in terms of lattice constant.
- Will recognize the application of laser in finding the particle size and its role in diffraction studies.
- Will learn to synthesis of the nanomaterials and recognize its importance by knowing its nano particle size and its impact on its properties.

**Any 10 of the following experiments has to be performed during the I year I semester**

1. Determination of radius of curvature of a Plano-convex lens by forming Newton's rings.
2. Determination of wavelength of given source using diffraction grating in normal incidence method.
3. Determination of Numerical aperture, acceptance angle of an optical fiber.
4. Energy gap of a Semiconductor diode.
5. Hall effect – Determination of mobility of charge carriers.
6. B-H curve – Determination of hysteresis loss for a given magnetic material.
7. Determination of Crystallite size using X-ray pattern (powder) using debye-scheerer method.
8. Determination of particle size by using laser source.
9. Determination of dispersive power of a prism.
10. Determination of thickness of the thin wire using wedge Method.

- 
11. Laser : Diffraction due to single slit
  12. Laser : Diffraction due to double slit
  13. Laser: Determination of wavelength using diffraction grating
  14. Magnetic field along the axis of a current carrying coil – Stewart and  
Gee's method.
  15. Synthesis of nanomaterial by any suitable method.

**References:**

1. Engineering Physics Practicals – NU Age Publishing House, Hyderabad.
2. Engineering Practical physics – Cengage Learning, Delhi.

**Outcomes:**

- Would recognize the important of optical phenomenon like Interference and diffraction.
- Would have acquired the practical application knowledge of optical fiber, semiconductor, dielectric and magnetic materials, crystal structure and lasers by the study of their relative parameters.

Would recognize the significant importance of nanomaterials in various engineering fields.

B. Tech I-II Sem. (ME)

L	T	P	C
0	0	4	2

**(15A99201) ENGINEERING & I.T. WORKSHOP****ENGINEERING WORKSHOP****Course Objective:**

*The budding Engineer may turn out to be a technologist, scientist, entrepreneur, practitioner, consultant etc. There is a need to equip the engineer with the knowledge of common and newer engineering materials as well as shop practices to fabricate, manufacture or work with materials. Essentially he should know the labour involved, machinery or equipment necessary, time required to fabricate and also should be able to estimate the cost of the product or job work. Hence engineering work shop practice is included to introduce some common shop practices and on hand experience to appreciate the use of skill, tools, equipment and general practices to all the engineering students.*

**1. TRADES FOR EXERCISES:**

- Carpentry shop– Two joints (exercises) involving tenon and mortising, groove and tongue: Making middle lap T joint, cross lap joint, mortise and tenon T joint, Bridle T joint from out of 300 x 40 x 25 mm soft wood stock
- Fitting shop– Two joints (exercises) from: square joint, V joint, half round joint or dove tail joint out of 100 x 50 x 5 mm M.S. stock
- Sheet metal shop– Two jobs (exercises) from: Tray, cylinder, hopper or funnel from out of 22 or 20 guage G.I. sheet
- House-wiring– Two jobs (exercises) from: wiring for ceiling rose and two lamps (bulbs) with independent switch controls with or without looping, wiring for stair case lamp, wiring for a water pump with single phase starter.
- Foundry– Preparation of two moulds (exercises): for a single pattern and a double pattern.

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- f. Welding – Preparation of two welds (exercises): single V butt joint, lap joint, double V butt joint or T fillet joint.

## **2. TRADES FOR DEMONSTRATION:**

- a. Plumbing
- b. Machine Shop
- c. Metal Cutting

Apart from the above the shop rooms should display charts, layouts, figures, circuits, hand tools, hand machines, models of jobs, materials with names such as different woods, wood faults, Plastics, steels, meters, gauges, equipment, CD or DVD displays, First aid, shop safety etc. (though they may not be used for the exercises but they give valuable information to the student). In the class work or in the examination knowledge of all shop practices may be stressed upon rather than skill acquired in making the job.

### **References:**

1. *Engineering Work shop practice for JNTU*, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009
2. *Work shop Manual* / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.
3. *Engineering Practices Lab Manual*, Jeyapoovan, SaravanaPandian, 4/e Vikas
4. *Dictionary of Mechanical Engineering*, GHF Nayler, Jaico Publishing House.

## **I.T. WORKSHOP**

### **Course Objective:**

- To provide Technical training to the students on Productivity tools like Word processors, Spreadsheets, Presentations
- To make the students know about the internal parts of a computer, assembling a computer from the parts, preparing a computer for use by installing the operating system
- To learn about Networking of computers and use Internet facility for Browsing and Searching.

### **Learning Outcome:**

- Disassemble and Assemble a Personal Computer and prepare the computer ready to use.
- Prepare the Documents using Word processors
- Prepare Slide presentations using the presentation tool
- Interconnect two or more computers for information sharing
- Access the Internet and Browse it to obtain the required information
- Install single or dual operating systems on computer

### **Preparing your Computer ( 5 weeks)**

**Task 1: Learn about Computer:** Identify the internal parts of a computer, and its peripherals. Represent the same in the form of diagrams including Block diagram of a computer. Write specifications for each part of a computer including peripherals and specification of Desktop computer. Submit it in the form of a report.

**Task 2: Assembling a Computer:** Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

**Task 3: Install Operating system:** Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

**Task 4: Operating system features:** Students should record the various features that are supported by the operating system(s) installed. They have to submit a report on it. Students should be able to access CD/DVD drives, write CD/DVDs, access pen drives, print files, etc. Students should install new application software and record the installation process.

### **Networking and Internet (4 weeks)**

**Task 5: Networking:** Students should connect two computers directly

using a cable or wireless connectivity and share information. Students should connect two or more computers using switch/hub and share information. Crimping activity, logical configuration etc should be done by the student. The entire process has to be documented.

**Task 6: Browsing Internet:** Student should access the Internet for Browsing. Students should search the Internet for required information. Students should be able to create e-mail account and send email. They should get acquaintance with applications like Facebook, skype etc.

If Intranet mailing facility is available in the organization, then students should share the information using it. If the operating system supports sending messages to multiple users (LINUX supports it) in the same network, then it should be done by the student. Students are expected to submit the information about different browsers available, their features, and search process using different natural languages, and creating e-mail account.

**Task 7: Antivirus:** Students should download freely available Antivirus software, install it and use it to check for threats to the computer being used. Students should submit information about the features of the antivirus used, installation process, about virus definitions, virus engine etc.

### **Productivity tools (6 weeks)**

**Task 8: Word Processor:** Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the color, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the

features studied. Students should submit a user manual of the word processor considered.

**Task 9: Spreadsheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

**Task 10: Presentations :** creating, opening, saving and running the presentations, Selecting the style for slides, formatting the slides with different fonts, colors, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

### **Optional Tasks:**

**Task 11: Laboratory Equipment:** Students may submit a report on specifications of various equipment that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop computer
- Server computer
- Switch (computer science related)
- Microprocessor kit
- Micro controller kit
- Lathe machine
- Generators
- Construction material

- Air conditioner
- UPS and Inverter
- RO system
- Electrical Rectifier
- CRO
- Function Generator
- Microwave benches

**Task 12: Software:** Students may submit a report on specifications of various software that may be used by them for the laboratories in their curriculum starting from I B.Tech to IV. B.Tech. The software may be proprietary software or Free and Open source software. It can vary from department to department. Students can refer to their syllabus books, consult staff members of the concerned department or refer websites. The following is a sample list. Instructors may make modifications to the list to suit the department concerned.

- Desktop operating system
- Server operating system
- Antivirus software
- MATLAB
- CAD/CAM software
- AUTOCAD

### References:

1. Introduction to Computers, Peter Norton, Mc Graw Hill
2. MOS study guide for word, Excel, Powerpoint & Outlook Exams”, Joan Lambert, Joyce Cox, PHI.
3. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
4. Networking your computers and devices, Rusen, PHI
5. Trouble shooting, Maintaining & Repairing PCs”, Bigelows, TMH





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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A54301) MATHEMATICS-III**  
**(Common to All Branches)**
**Objectives:**

- This course aims at providing the student with the concepts of Matrices, Numerical Techniques and Curve fitting.

**UNIT – I**

Elementary row transformations-Rank – Echelon form, normal form – Consistency of System of Linear equations. Linear transformations. Hermitian, Skew-Hermitian and Unitary matrices and their properties. Eigen Values, Eigen vectors for both real and complex matrices. Cayley – Hamilton Theorem and its applications – Diagonalization of matrix. Calculation of powers of matrix and inverse of a matrix. Quadratic forms – Reduction of quadratic form to canonical form and their nature.

**UNIT – II**

Solution of Algebraic and Transcendental Equations: The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout's triangularisation method, Gauss - Seidal iteration method.

**UNIT – III**

**Interpolation:** Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.

**UNIT – IV**

Curve fitting: Fitting of a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation for Newton's interpolation formula. Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

**UNIT – V**

Numerical solution of Ordinary Differential equations: Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method-Runge-Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation.

**TEXT BOOKS:**

3. Higher Engineering Mathematics, B.S.Grewal, Khanna publishers.
4. Introductory Methods of Numerical Analysis, S.S. Sastry, PHI publisher.

**REFERENCES:**

2. Engineering Mathematics, Volume - II, E. Rukmangadachari Pearson Publisher.
3. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S. Chand publication.
3. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.
4. Advanced Engineering Mathematics, by Erwin Kreyszig, Wiley India.

**Outcomes:** The student will be able to analyze engineering problems using the concepts of Matrices and Numerical methods.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (ME)**

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<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A52301) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**Course Objectives:** The objective of this course is to equip the student with the basic inputs of Managerial Economics and Economic Environment of business and to impart analytical skills in helping them take sound financial decisions for achieving higher organizational productivity.

**Unit I: INTRODUCTION TO MANAGERIAL ECONOMICS**

Managerial Economics – Definition- Nature- Scope - Contemporary importance of Managerial Economics - Relationship of Managerial Economics with Financial Accounting and Management. **Demand Analysis:** Concept of Demand-Demand Function - Law of Demand - Elasticity of Demand- Significance - Types of Elasticity - Measurement of elasticity of demand - Demand Forecasting- factors governing demand forecasting- methods of demand forecasting.

**UNIT II: THEORY OF PRODUCTION AND COST ANALYSIS**

**Production Function-** Least cost combination- Short-run and Long- run production function- Isoquants and Isocosts, MRTS - Cobb-Douglas production function - Laws of returns - Internal and External economies of scale - **Cost Analysis:** Cost concepts and cost behavior- Break-Even Analysis (BEA) -Determination of Break Even Point (Simple Problems)-Managerial significance and limitations of Break- Even Point.

**UNIT III: INTRODUCTION TO MARKETS AND NEW ECONOMIC ENVIRONMENT**

**Market structures:** Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition- Monopoly-Monopolistic Competition-Oligopoly-Price-Output Determination - Pricing Methods and Strategies-Forms of Business Organizations- Sole

Proprietorship- Partnership – Joint Stock Companies - Public Sector Enterprises – New Economic Environment- Economic Liberalization – Privatization - Globalization.

#### **UNIT IV: INTRODUCTION TO FINANCIAL ACCOUNTING AND ANALYSIS**

Financial Accounting – Concept - Emerging need and Importance - Double-Entry Book Keeping- Journal - Ledger – Trial Balance - Financial Statements - Trading Account – Profit & Loss Account – Balance Sheet (with simple adjustments). Financial Analysis – Ratios – Liquidity, Leverage, Profitability, and Activity Ratios (simple problems).

#### **UNIT V: CAPITAL AND CAPITAL BUDGETING**

Concept of Capital - Over and Undercapitalization – Remedial Measures - Sources of Short term and Long term Capital - Estimating Working Capital Requirements – Capital Budgeting – Features of Capital Budgeting Proposals – Methods and Evaluation of Capital Budgeting Projects – Pay Back Method – Accounting Rate of Return (ARR) – Net Present Value (NPV) – Internal Rate Return (IRR) Method (simple problems)

**Learning Outcome:** After completion of this course, the student will be able to understand various aspects of Managerial Economics and analysis of financial statements and inputs therein will help them to make sound and effective decisions under different economic environment and market situations.

#### **TEXT BOOKS:**

1. Managerial Economics 3/e, Ahuja H.L, S.Chand, 2013.
2. Financial Management, I.M.Pandey, Vikas Publications, 2013.

#### **REFERENCES**

1. Managerial Economics and Financial Analysis, 1/e, Aryasri, TMH, 2013.
2. Managerial Economics and Financial Analysis, S.A. Siddiqui and A.S. Siddiqui, New Age International, 2013.

Accounting and Financial Management, T.S.Reddy & Y. Hariprasad Reddy, Margham Publishers.

B. Tech II-I Sem. (ME)

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**(15A01308) MECHANICS OF SOLIDS****Course Objective:**

*The objective of the subject is to learn the fundamental concepts of stress, strain and deformation of solids with applications to bars and beams. The students shall understand the theory of elasticity including strain/displacement and hooks law relationships. To accesses stresses and deformations through the mathematical models of beams for bending and bars for twisting or combination of both. The knowledge of this subject will help in the design & Theory of machines courses.*

**UNIT I**

**SIMPLE STRESSES & STRAINS:** Elasticity and plasticity – Types of stresses & strains – Hooke's law – stress & strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings. Principle stresses and strains-computation of principle stresses and strains on inclined planes-theory of failures- minimum principle stress, strain, shear stress and strain energy theories.

**Learning Outcome & Suggested Student Activities:**

*This unit gives the student how to measure the strength of materials based on calculating stresses, strains and deformations for basic geometries subjected to axial loading and thermal effects. Students are advised to visit the URL [http://nptel.iitm.ac.in/courses/IIT-MADRAS/Strength\\_of\\_Materials/Pdfs/I\\_1.pdf](http://nptel.iitm.ac.in/courses/IIT-MADRAS/Strength_of_Materials/Pdfs/I_1.pdf).*

**UNIT II**

**SHEAR FORCE AND BENDING MOMENT :** Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly

varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

**Learning outcome & Suggested Student Activities:**

This unit gives awareness for the students how to draw shear force and bending moment diagrams for calculating maximum shear force and maximum bending moment for different types of beams with different lateral loadings conditions. This topic can be downloaded from the URL [http://vedyadhara.ignou.ac.in/wiki/images/a/ad/BME-017\\_B-1\(Unit\\_4\).pdf](http://vedyadhara.ignou.ac.in/wiki/images/a/ad/BME-017_B-1(Unit_4).pdf)

### UNIT III

**FLEXURAL STRESSES:** Theory of simple bending – Assumptions – Derivation of bending equation:  $M/I = f/y = E/R$  Neutral axis –Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections, crane hooks.

**SHEAR STRESSES:** Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I , T angle sections, shear centre.

**Learning outcome & Suggested Student Activities:**

*This unit gives knowledge to the students about the strength of the beams with different sections by bringing the relationship between the bending stress and maximum bending moment, bringing the relationship between the shear stress and maximum shear force which are calculated from previous unit. This topic can be downloaded from the following URL [http://web.mit.edu/emech/dontindex-build/full-text/emechbk\\_7.pdf](http://web.mit.edu/emech/dontindex-build/full-text/emechbk_7.pdf).*

### UNIT IV

**TORSION OF CIRCULAR SHAFTS-** Theory of pure torsion- Derivation of torsion equations;  $T/J = q/r = N\theta/L$  – Assumptions made in the theory of pure torsion- torsional moment of resistance- polar section modulus.

**DEFLECTION OF BEAMS:** Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and

simply supported beams subjected to point loads, - U.D.L uniformly varying load. Mohr's theorems – Moment area method – application to simple cases including overhanging beams.

***Learning outcome & Suggested Student Activities:***

*This unit gives awareness to the students how to calculate the shear strength of the solid and hollow shafts which are subjected to torsional loading in power transmitting. This topic related to torsion can be download from the following URLs*

*[http://www.mae.ncsu.edu/zhu/courses/mae314/lecture/Lecture4\\_Torsion.pdf](http://www.mae.ncsu.edu/zhu/courses/mae314/lecture/Lecture4_Torsion.pdf), and also gives better knowledge for students how to calculate deflections of beam using different methods under different boundary and loading conditions. Notes for this topic can be download from the web site [http://nptel.iitm.ac.in/courses/IIT-MADRAS/Strength\\_of\\_Materials/Pdfs/5\\_1.pdf](http://nptel.iitm.ac.in/courses/IIT-MADRAS/Strength_of_Materials/Pdfs/5_1.pdf).*

## UNIT V

**THIN CYLINDERS:** Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and Volumetric strains – changes in diameter, and volume of thin cylinders – Riveted boiler shells – Thin spherical shells.

**THICK CYLINDERS:** Lamé's equation – cylinders subjected to inside & outside pressure - compound cylinders.

***Learning outcome & Suggested Student Activities:***

*This unit gives application to mechanics of solids for students in which how to calculate different stresses and strains for the thin and thick cylinders in identifying safe design for boiler shells and thick shells as such in like domestic cylinders, air compressor and high pressure vessels used in thermal plants etc. Notes for this topic can be download from the site*

*[http://www.ewp.rpi.edu/hartford/users/papers/engr/ernesto/poworp/Project/4.%20Supporting\\_Material/Books/32658\\_09 & 10.pdf](http://www.ewp.rpi.edu/hartford/users/papers/engr/ernesto/poworp/Project/4.%20Supporting_Material/Books/32658_09%20&10.pdf).*

***Text Books:***



1. *Strength of Materials* by R.Subramaniam, oxford publishers.
2. *Strength of Materials* by R.K. Bansal, Laxmi Publishers, 5<sup>th</sup> Edition, 2012.
3. *Mechanics of Materials*, Andrews Pytel, Jaan Kiusallaas & M.M.M.Sarcar (Second Edition), Cengage Learning Publishers.

### **Reference Books:**

1. *Strength of Materials* by S. Ramamrutham, Dhanpat Rai Publishers
2. *Strength of Materials* by R.K. Rajput, S.Chand & Company, 5<sup>th</sup> Edition, 2012.
3. *Strength of Materials* by Dr. Sadhu Singh, Khanna Publishers, 10<sup>th</sup> Edition, 2013.
4. *Strength of Materials* by M.Chakraborti, S.K.Kataria & Sons, 2<sup>nd</sup> Edition, 2011.
5. *Strength of Materials* by S S Rattan, The McGraw-Hill Companies, 2<sup>nd</sup> Edition, 2011.

### **Suggestions:**

- Students are advised to buy a text book for understanding problems then they may buy *Strength of materials* by R.K.Bansal, Laxmi Publishers & For further more problems *Strength of Materials* by R.K. Rajput, S.Chand & Company
- Students may go around some of the small scale industries and domestic orientated jobs gives better knowledge on to check strength of materials.
- Some basic knowledge regarding Engineering mechanics, Mathematics and Physics are required for understanding this subject.

### **Web Resources:**

<http://nptel.iitm.ac.in/>

[www.learnerstv.com/Free-Engineering-video-lecture-courses.htm](http://www.learnerstv.com/Free-Engineering-video-lecture-courses.htm)

[http://en.wikibooks.org/wiki/Strength\\_of\\_Materials](http://en.wikibooks.org/wiki/Strength_of_Materials)

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A03301) ENGINEERING DRAWING FOR MECHANICAL ENGINEERS**

**Course Objective:** To enhance the student's knowledge and skills in engineering drawing of solids with interpenetration of solids and to present isometric and perspective projections.

**Unit –I**

**Sections and Developments of Solids:** Section Planes and Sectional View of Right Regular Solids-Prism, cylinder, Pyramid and Cone. True shapes of the sections and their development of Surfaces

**Unit –II**

Isometric projection: Isometric views of Sectional Planes, and Sectional Solids, Objects.

**Unit –III**

Conversion of Pictorial views to orthographic views –Conventions.

**Unit –IV**

**Interpenetration of Right Regular Solids:** Projections of Curves of intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone, Square Prism Vs Square Prism.

**Unit –V**

**Perspective Projections:** Perspective View of Plane Figures and simple Solids, Visual Ray Method, Vanishing point method.

**Text Books:**

1. *Engineering Drawing*, N.D. Bhat, Charotar Publishers
2. *Engineering Drawing*, K.L. Narayana & P. Kannai, Scitech Publishers, Chennai.

**References:**

1. *Engineering Drawing*, Johle, Tata McGraw-Hill Publishers, 2014
2. *Engineering Drawing*, N.S. Patha sarathy, vela murali, Oxford University Press, 2015
3. *Engineering Graphics* D.A. Hindoliya, BSP publications, 2014
4. *Engineering Graphics*, K.C. John, PHI, 2014

**Suggestions:**

*Student is expected to buy a book mentioned under 'Text books' for better understanding.*

*Student should prepare rough sketches for all the problems given at the end of each chapter to improve his / her imaginations.*

*Student should also practice Auto CAD or any other drawing software to help understanding better.*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A03302) ENGINEERING MECHANICS**

**OBJECTIVE:** *This course will serve as a basic course by introducing the concepts of basic mechanics which will help as a foundation to various courses.*

**UNIT – I**

**Introduction of Engineering Mechanics** – Basic concepts - System of Forces – Moment of Forces and its Application – Couples and Resultant of Force System – Equilibrium of System of Forces - Degrees of Freedom – Free body diagrams –Types of Supports – Support reactions for beams with different types of loading – concentrated, uniformly distributed and uniformly varying loading.

**UNIT – II**

**Friction :** Types of friction– laws of Friction – Limiting friction- Cone of limiting friction– static and Dynamic Frictions – Motion of bodies – Wedge and Screw jack

**UNIT – III**

**Centroid and Center of Gravity:** Centroids of simple figures – Centroids of Composite figures – Centre of Gravity of bodies – Area moment of Inertia - Parallel axis and perpendicular axis theorems - Moments of Inertia of Composite Figures.

**Mass Moment of Inertia:** Moment of Inertia of Simple solids – Moment of Inertia of composite masses.( Simple problems only)

**UNIT – IV**

**Kinematics:** Rectilinear and Curvilinear motion – Velocity and Acceleration – Motion of A Rigid Body – Types and their Analysis in Planar Motion.

**Kinetics:** Analysis as a particle and Analysis as a Rigid Body in Translation – Central Forces of motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies

## UNIT – V

**Analysis of Perfect Frames:** Types of frames – cantilever frames and simply supported frames – Analysis of frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

**Mechanical Vibrations:** Definitions, Concepts-Simple Harmonic motion-Free vibrations-Simple, Compound and Torsional pendulum- Numerical problems

### **Text Books:**

- (1) *Engineering Mechanics* by Jayakumar, Kumar, PHI, 2014
- (2) *Singer's Engineering Mechanics Statics and Dynamics*, Vijay Kumar Reddy, Suresh Kumar. BS Publications 2015
- (3) *Engineering Mechanics – B. Bhattacharyya*, Oxford University Publications, 2015

### **References:**

- (1) *Engineering Mechanics* by Seshigiri Rao, Rama Durgaiiah, Universities Press, 2005
- (2) *Engineering Mechanics* by Shames & Rao – Pearson Education.
- (3) *Engineering Mechanics* by Fedrinand L.Singer – Harper Collings Publishers.
- (4) *Engineering Mechanics (Statics and Dynamics)* by Pytel, Kiusalaas; Cengage, 2015
- (5) *Engineering Mechanics* by S.Timoshenko, D.H.Young and J.V.Rao, Tata McGraw-Hill Company
- (6) *Engineering Mechanics* by Chandramouli, PHI publications.

B. Tech II-I Sem. (ME)

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3	1	0	3

**(15A03303) THERMODYNAMICS****Course Objective:**

*By this subject students will get the awareness on basic thermodynamic principles, skills to perform the analysis and design of thermodynamic systems, First law and second law of thermodynamics and its applications to a wide variety of systems, principles of psychrometry and properties of pure substances. And also understand the concept of various air standard cycles with the help of P-v and T-s Diagrams.*

**UNIT I**

**BASIC CONCEPTS:** Macroscopic and Microscopic Approaches, Thermodynamic System, State, Property, Process and Cycle, Quasi Static Process, Thermodynamic Equilibrium, Quasi-static Process, Zeroth Law of Thermodynamics,

**WORK & HEAT TRANSFER:** Work transfer, types of work transfers, Point and Path Functions, Heat transfer, Comparison of Work and Heat transfers.

**Learning Outcome & Suggested Student Activities:**

*Students can able to understand thermodynamic property, cycle, constraints of equilibrium, reversibility and energy transfer in the form of Work and Heat with various applications. Students are advised to collect different types of thermometers, measure the temperature of a given room/substance and compare the values. Following URL is very useful for better understanding <http://www.nptel.iitm.ac.in>. Students may refer text book of Fundamentals of Engineering Thermodynamics By Michael J. Moran, Howard N. Shapiro.*

**UNIT II**

**FIRST LAW OF THERMODYNAMICS:** First Law applied to a process and a cycle, Energy - a property, Forms and transformation of Energy, Internal Energy and Enthalpy, PMM I.

**FLOW SYSTEMS:** Control Volume, Steady Flow Process, Mass balance and Energy Balance, Applications of Steady Flow Processes.

**Learning Outcome & Suggested Student Activities:**

*Student will learn how energy transformation occurs from one form into another form in open and closed systems and applying steady flow energy equation and mass balance equation to various applications.*

*Student is advised to observe the Nozzle, Diffuser, Throttling device, Turbine and compressor in laboratories or local industries and understand their working principles practically. Notes of First law of thermodynamics can be downloaded from the website <http://nptel.iitm.ac.in/courses/103101004/downloads/chapter-3.pdf>.*

**UNIT III**

Second Law of Thermodynamics: Heat Engine, Statements of Second law and their equivalence, Refrigeration and Heat Pump, Reversibility and Irreversibility, Carnot cycle and Carnot's Theorem, Thermodynamic Temperature Scale, Efficiency of Heat Engine, PMM II

Entropy: Clausius' Theorem, Entropy as a property, T-s Plot, Clausius Inequality, Principle of Entropy Increase and its applications. Available Energy, Quality of Energy, definitions of Dead state, Availability.

***Learning Outcome & Suggested Student Activities:***

*Student will identify the major difference in working of a heat engine, refrigerator and heat pump. to calculate the maximum efficiency of a cycle. Also student can learn calculating entropy change for a process, maximum available energy. Student is advised to visit laboratories of Heat Engines, Refrigeration and Air conditioning and observe how they work. Student may refer text book Fundamentals of Classical Thermodynamics - G.J.VanWylen& Sonntag*

#### UNIT IV

Pure Substances: P-v, P-T, T-s diagrams of Pure Substances, Mollier Diagram, Dryness Fraction, Use of Steam Tables for Thermodynamic Properties

Thermodynamic Relations: Maxwell's equations, TDS equations, Joule-Kelvin Effect, Clausius-clapeyron equation.

***Learning Outcome & Suggested Student Activities:***

*After the completion of the unit, student will be able to understand the method drawing phase equilibrium diagrams like P-v, h-s, T-s and P-T of a pure substance. Student can learn the usage of steam tables and mollier diagrams in solving problems. Also, the student will learn the cooling / heating effect of throttling process. Thermodynamic relations.*

*Student is advised to do the experiment on water (To cool / heat water) from atmospheric conditions and observe freezing / boiling point temperatures, changes in volume etc. Repeat the same experiment under different pressure.*

#### UNIT V

Properties of Gases and Gas Mixtures: Ideal Gas, Equation of State, Avogadro's Law, Internal Energy and Enthalpy of Ideal Gas, Entropy Change of Ideal Gas, Mixture of Gases- Dalton's Law of Partial Pressure, Specific Heats, Internal Energy and Enthalpy of Gas Mixtures

Gas Power Cycles: Carnot Cycle, Sterling Cycle, Ericson Cycle, Otto Cycle, Diesel Cycle, Dual Cycle, their applications, comparison of Otto, Diesel and Dual cycles, Second Law Analysis of Gas Power Cycles

***Learning Outcome & Suggested Student Activities:***

*Student will learn basic laws of ideal gas and gas mixtures. After studying Gas Power Cycles, student will understand the concept of ideal cycles for different engines and their working principle. Student can know drawing P-V and T-S diagrams for various air standard cycles and calculating work output, efficiency, mean effective pressure of each cycle.*

*Student is advised to conduct experiments in I.C Engines lab to find out the actual thermal efficiencies of Diesel and Petrol Engines and compare them with respect to ideal cycles.*

**Text Books:**

1. *Engineering Thermodynamics*, P.K Nag, TMH Publishers, New Delhi, 5<sup>th</sup> Edition, 2013.
2. *Engineering Thermodynamics* by P. Chattopadhyaya, Oxford, 1<sup>st</sup> Revised, 2016

**Reference Books:**

1. *Thermodynamics for Engineers*, Kenneth A. Kroos, Marle C. Potter, V. Pandurangadu.
2. *Fundamentals of Thermodynamics* – Sonntag, Borgnakke and van Wylen, John Wiley & sons
3. *Thermodynamics – An Engineering Approach* – Yunus Cengel & Boles, TMH, 2011.
4. *Thermodynamics* – J.P. Holman, McGraw Hill, 2<sup>nd</sup> Edition company New York 1975.
5. *An introduction to Thermodynamics*, YVC Rao, Universities press, 2009 Revised Edition,
6. *Engineering Thermodynamics* – J.B. Jones & R.E. Dugan, PHI, 1<sup>st</sup> Edition, 2009.

**NOTE:** Steam tables, Mollier Diagrams should be supplied



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech II-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(15A01309) MECHANICS OF SOLIDS LABORATORY****MECHANICS OF SOLIDS LAB**

1. Direct tension test beam
2. Bending test on
  - a) Simply supported beam
  - b) Cantilever beam
3. Torsion test
4. Hardness test
5. Brinells hardness test
6. Rockwell hardness test
7. Test on springs
8. Compression test on cube
9. Impact test
10. Punch shear test

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(15A03304) COMPUTER AIDED DRAFTING LAB****LIST OF EXPERIMENTS:**

- I Introduction to Computer Aided Drafting software packages.
- II. Practice on basic elements of a Computer Aided Drafting packages
- III. Practice on features of a Computer Aided Drafting package
- IV Drafting of Solids, Intersection of Solids
- V Drafting of Perspective views
- VI Drafting of Orthographic views of simple parts

Note: Any of the standard Software Packages like – AUTO CAD, Pro-E, Uni – Graphics, Catia .... Etc may be used

**References:**

1. Computer – Aided Engineering Drawing, S. Trymbaka Murthy. University Press.
2. Engineering Graphics for Degree, K.C. John. PHI Publications.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech II-II Sem. (ME)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A54401) PROBABILITY AND STATISTICS**

**(Common to CSE, IT, Civil, Mech.)**

**Objectives:** To help the students in getting a thorough understanding of the fundamentals of probability and usage of statistical techniques like testing of hypothesis, Statistical Quality Control and Queuing theory

**UNIT – I**

Basic concepts of Probability – Random variables – Expectation – Discrete and continuous Distributions – Distribution functions. Binomial and poisson distributions Normal distribution – Related properties.

**UNIT – II**

Test of Hypothesis: Population and Sample - Confidence interval of mean from Normal distribution - Statistical hypothesis - Null and Alternative hypothesis - Level of significance. Test of significance - Test based on normal distribution - Z test for means and proportions.

**UNIT – III**

Small samples - t- test for one sample and two sample problem and paired t-test, F-test and Chi-square test (testing of goodness of fit and independence).

**UNIT – IV**

Statistical Quality Control: Concept of quality of a manufactured product -Defects and Defectives - Causes of variations - Random and assignable - The principle of Shewhart Control Chart-Charts for attribute and variable quality characteristics- Constructions and operation of  $\bar{X}$  - Chart, R-Chart, p - Chart and C-Chart.

**UNIT – V**

Queuing Theory: Pure Birth and Death process, M/M/1 & M/M/S & their related simple problems.

**TEXT BOOKS:**

1. Probability & Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
2. Probability & Statistics for engineers by Dr. J. Ravichandran WILEY-INDIA publishers.

**REFERENCES:**

1. Probability & Statistics by T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham and M.V.S.S.N.Prasad, S.Chand publications.
2. Statistical methods by S.P. Gupta, S.Chand publications.
3. Probability & Statistics for Science and Engineering by G.Shanker Rao, Universities Press.
4. Probability and Statistics for Engineering and Sciences by Jay L.Devore, CENGAGE.
5. Probability and Statistics by R.A. Jhonson and Gupta C.B.

**Outcomes:** The student will be able to analyze the problems of engineering & industry using the techniques of testing of hypothesis, Statistical Quality Control and Queuing theory and draw appropriate inferences.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A99301) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**

**PART – A**  
**BASIC ELECTRICAL ENGINEERING**

**Objective:**

Basic Electrical Engineering contains basic Circuits, Network theorems, two port networks, DC generators & motors, Transformers, Induction motors. The objective is to study their performance aspects.

**UNIT – I Introduction to DC & AC Circuits**

Ohm's Law, R, L, C Components, Kirchhoff's Laws, Types of Sources, Simple problems on Resistive Networks, Series Parallel Circuits, Star Delta and Delta Star Transformation. Sinusoidal waveforms and Basic Definitions, Root Mean Square and average values of sinusoidal Currents and Voltages. Form Factor and Peak Factor.

**Network Theorems:** Thevenin's, Norton's, Maximum Power Transfer and Superposition Theorems for DC Excitations.

**Two Port Networks:** Two Port Network Parameters – Impedance, Admittance, Transmission and Hybrid Parameters and Their Relations.

**UNIT-II DC Machines**

**D.C Generators:** Constructional details of D.C. machines, Principle of Operation of D.C. generators, Types of D.C Generators, E.M.F Equation, O.C.C. of a D.C. Shunt Generator

**D.C Motors:** Principle of Operation of DC Motors, Torque Equation, Losses and Efficiency Calculation, Speed Control of D.C. shunt motor (Armature voltage control and Field flux control). Swinburne's Test and Applications.

**UNIT-III AC Machines**

**1-phase Transformers:** Principle of Operation, Constructional Details, E.M.F. equation, Losses and Efficiency, OC & SC Tests, Regulation of Transformers.

**3-Phase Induction Motors:** Principle of Operation, Slip, Torque (Simple Problems), Slip-Torque characteristics.

**3-phase Alternators:** Principle of Operation-Constructional Details-EMF Equation.

**OUTCOME:**

After going through this course the student acquires knowledge on basics of Electrical Circuits, Network theorems, two port networks, DC generators & motors, Transformers, Induction motors and Alternators.

**TEXT BOOKS:**

1. Basic Electrical Engineering, V. N. Mittle and Arvind Mittle, Mc Graw Hill (India) Pvt. Ltd., 2<sup>nd</sup> Edition, 2005.
2. Basic Electrical Engineering, T.K.Nagsarkar and M.S. Sukhija, Oxford University Press, 2<sup>nd</sup> Edition, 2011.

**REFERENCES:**

1. Basic Electrical Engineering, M.S.Naidu and S. Kamakshiah, Tata Mc Graw Hill, 3<sup>rd</sup> Edition, 2009.
2. Electrical and Electronic Technology, Hughes, Pearson Education.

**PART-B****UNIT I**

**Semiconductor Devices:** Intrinsic semiconductors-Electron-Hole Pair Generation, Conduction in Intrinsic Semiconductors, Extrinsic Semiconductors-N-Type and P-Type Semiconductors, Comparison of N-Type and P-Type Semiconductors. The p-n Junction – Drift and Diffusion Currents, The p-n Junction Diode-Forward Bias, Reverse Bias, Volt-Ampere Characteristics- Diode Specifications, Applications of Diode, Diode as a Switch. Diode as a Rectifier-Half-wave Rectifier, Full-Wave Rectifier, Full-Wave Bridge Rectifier, Rectifiers with Filters, Zener Diode- Volt-Ampere Characteristics, Zener Diode as Voltage Regulator.

**UNIT II**

**BJT and FETs:** Bipolar Junction Transistor (BJT) – Types of Transistors, Operation of NPN and PNP Transistors, Input-Output Characteristics of BJT-CB, CE and CC Configurations, Relation between  $I_C$ ,  $I_B$  and  $I_E$ . Transistor Biasing- Fixed Bias, Voltage Divider Bias, Transistor Applications- Transistor as an Amplifier, Transistor as a Switch,. Junction Field Effect Transistor (JFET)- Theory and Operation of JFET, Output Characteristics, Transfer Characteristics, Configurations of JFET-CD, CS and CG Configurations, JFET Applications- JFET as an Amplifier, JFET as a Switch, Comparison of BJT and JFET,MOSFET-The Enhancement and Depletion MOSFET, Static Characteristics of MOSFET, Applications of MOSFET.

**UNIT III**

**Oscillators and Op-Amps:** Sinusoidal Oscillators, Barkhausen Criteria for Oscillator Operation, Components of an Oscillator-Transistor Amplifier Circuits, Feedback Circuits and Oscillator Circuits, Classification of Oscillators, LC Tuned, RC Phase Shift Oscillator circuits.

**Operational Amplifiers(Op-Amps)**-Symbol of an Op-Amp, single Input and Dual Input Op-Amps(Differential Amplifier), Characteristics of an Ideal Op-Amp, Basic Forms of Op-Amps-Inverting & Non-Inverting Amplifiers, Applications of Op-Amps, summing, Differential, Integrator, differentiator Amplifier.

**TEXT BOOKS:**

1. Basic Electrical and Electronics Engineering, M.S.Sukhija, T.K.Nagsarkar, Oxford University Press, 1<sup>st</sup> Edition, 2012.
2. Basic Electrical and Electronics Engineering, S.K Bhattacharya, Pearson Education, 2012.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A03401) MACHINE DRAWING****Course Objective:**

*To make the students to understand the concepts of I.S. conventions, methods of dimensioning, the title boxes, to draw the machine elements and simple parts.*

*To make the students to understand and draw assemblies of machine parts and to draw their sectional views*

**UNIT I**

Machine Drawing Conventions: Need for drawing conventions- introduction to IS conventions

Conventional representation of material, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs. Parts not usually sectioned.

Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.

Title boxes, their size, location and details-common abbreviations & their liberal usage

**Learning Outcome & Suggested Student Activities:**

*This unit is useful to prepare the students for representing their ideas at International standards and will be able to convey in without much effort globally with ease. Students will acquire skills to draft on a drawing sheet without much effect. Students are advised to visit machine shop.*

**UNIT II**

Drawing of Machine Elements and simple parts: Selection of Views, additional views for the following machine elements and parts with drawing proportions:

Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws, Keys, cottered joints and knuckle joint, Rivetted joints for plates, flanged & protected flanged joint. Shaft coupling, spigot and socket pipe joint. Journal, and foot step bearings.

**Learning Outcome & Suggested Student Activities:**

*Students can represent various details of an object quickly without much time and ambiguity. These drawings can be easily prepared and understood by both the people in a manufacturing industry and the consumers too. Students are advised to visit machine shop.*

**UNIT III**

Assembly Drawings: Drawings of assembled views for the part drawings of the following.

Engine parts- stuffing boxes, cross heads, Eccentrics, Petrol Engine-connecting rod, piston assembly.

Other machine parts- Screw jack, Machine Vice, single tool post.

Valves: Steam stop valve, feed check valve. Non return valve.



**Learning Outcome & Suggested Student Activities:**

*Students can understand the working principles of an assembly or subassembly so that he/she will be able to produce the final product by procuring the units from various sources/suppliers and still produce any useful product serving effectively. It is not necessary that all the components to be made locally only. Students are advised to visit body building and assembly unit.*

*Note: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.*

**Text Books:**

1. Machine Drawing – N Siddeswar, P. Kannaiah, VVS Sastry, Mc Graw Hill, 2015
2. Machine Drawing- K.L. Narayana, P.Kannaiah & K.Venkata Reddy, New Age Publishers, 4<sup>th</sup> Edition, 2012.

**Reference Books:**

1. Machine Drawing- P.S. Gill, S.K. Kataria & Sons, 17<sup>th</sup> Edition, 2012.
2. Machine Drawing- Dhawan, S.Chand Publications, 1<sup>st</sup> Revised Edition, 1998.
3. Machine Drawing – Ajeet Singh, McGraw Hill, 2012
4. Machine Drawing- Luzzader, PHI Publishers, 11<sup>th</sup> Edition.
5. Textbook of Machine Drawing-K.C.John, 2009, PHI learning, 1<sup>st</sup> Edition.

**NOTE:**

- The End exam will be for 4 hrs in the following format
- All answers should be on the drawing sheet only. Answers on the drawing sheet only will be valued.
- First Angle Projections

Q1 Questions set on section I of the syllabus 2 out of 3 or 2 out of 4 to be

answered with a weightage of 4 marks each-08 marks.

Q2 Questions set on section II of the syllabus 2 out of 3 to be answered with a

weightage of 10 marks each-20 marks.

Q3 Drawing of assembled views of section III items of syllabus with a weightage of

42 marks

**Suggestions:**

*Student should buy a book mentioned under Text books and study all the exercises given at the end of each chapter to equip him/her with the required ammunition.*

*Student should visit an automobile shop while the unit is being disassembled / assembled.*

*Student should go through the exercises given under assembly drawings refereeing to various books in the library to improve his assimilation capacity.*

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-II Sem. (ME)

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### (15A03402) KINEMATICS OF MACHINES

#### **Course Objective:**

*The objective of this course is to cover the kinematics and dynamics of planar single degree of freedom mechanisms. After this course the student should have general mathematical and computational skills to enable the kinematics and dynamics analysis of machine elements including linkages, cams and gears and also becomes familiar with gear terminology and drawing of the cam profiles.*

#### **UNIT I**

**MECHANISMS AND MACHINES:** Elements or Links – Classification – Rigid Link, flexible and fluid link. Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained. Mechanisms and machines – classification of mechanisms and machines – kinematic chain – inversion of mechanisms – inversions of quadric cycle chain – single and double slider crank chain. Mobility of mechanisms. Straight Line Motion Mechanisms- Exact and approximate, copiers and generated types –Peaucellier, Hart and Scott Russel – Grasshopper, Watt, Tchebicheff and Robert Mechanisms. Pantograph.

#### **Learning outcome & Suggested Student Activities:**

*After completion of this unit students are in a position to identify different mechanisms, inversions of different kinematic chains and also to find mobility of mechanisms. To get more clarity on mechanisms and machines, the following URLs will be highly useful to the students to understand various concepts of mechanisms and machines.*  
<http://www.cs.cmu.edu/~rapidproto/mechanisms/chpt2.html>,  
<http://www.mhprofessional.com/downloads/products/0071704426/0071704426-ch01.pdf>

#### **UNIT II**

**STEERING MECHANISMS:** Conditions for correct steering – Davis Steering gear, Ackermanns steering gear. Hooke's Joint (Universal coupling) -Single and double Hooke's joint — applications – Simple problems.  
**Belt, Rope and Chain Drives :** Introduction, Belt and rope drives, selection of belt drive- types of belt drives, materials used for belts and ropes, velocity ratio of belt drives, slip of belt, creep of belt, tensions for flat belt drive, angle of contact, centrifugal tension, maximum tension of belt, Chains- length, angular speed ratio, classification of chains.

#### **Learning outcome & Suggested Student Activities:**

*After completion of this chapter students are able to understand the mechanism of Hooke's joint, steering mechanisms and belt friction. And are also able to solve numerical problems on Hooke's joint, belt and rope drives. Students can go through the*

*textbooks for the problems on Hooke's joint, belt and rope drives. The following URLs will be highly useful to the students to understand various concepts of steering mechanisms and belt friction.*

*<http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Machine%20design1/pdf/mod13les1.pdf>  
<http://www.youtube.com/watch?v=YzGM8Uc2HB0>*

### UNIT III KINEMATICS

Velocity and Acceleration Diagrams- Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method – Slider crank mechanism, four bar mechanism. Acceleration diagrams for simple mechanisms, Coriolis acceleration, determination of Coriolis component of acceleration. Kleins construction. Analysis of slider crank mechanism for displacement, velocity and acceleration of slider using analytical method Instantaneous Centre Method: Instantaneous centre of rotation, centrode and axode – relative motion between two bodies – Three centres in-line theorem – Locating instantaneous centres for simple mechanisms and determination of angular velocity of points and links.

#### ***Learning outcome & Suggested Student Activities:***

*After completion of this unit student are able to draw velocity and acceleration diagrams of simple plane mechanisms by using relative velocity method and instantaneous center method. Students can go through the textbooks given for the problems on analysis of mechanisms. The following URLs will be highly useful to the students to understand various concepts of velocity and acceleration diagrams.*

*<http://www.freestudy.co.uk/dynamics/velaccdiag.pdf>,  
[http://ebooks.library.cornell.edu/k/kmoddl/pdf/013\\_005.pdf](http://ebooks.library.cornell.edu/k/kmoddl/pdf/013_005.pdf)*

### UNIT IV

GEARS: Higher pairs, friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Forms of tooth-cycloidal and involute profiles. Velocity of sliding – phenomena of interference – Methods to avoid interference. Condition for minimum number of teeth to avoid interference, expressions for arc of contact and path of contact. Introduction to Helical, Bevel and worm gearing.

GEAR TRAINS: Introduction –Types of gears – Simple, compound, reverted and Epicyclic gear trains. Train value – Methods of finding train value or velocity ratio – Tabular column method for Epicyclic gear trains. Torque in epicyclic gear trains. Differential gear of an automobile.

#### ***Learning outcome & Suggested Student Activities:***

*After completion of this unit student are able to know gears terminology, types of gears, length of path of contact, contact ratio and interference in gears. Further students are also able to design the gears to avoid interference and to calculate train value for different gear trains. Students may go through text books given for more number of problems on gears and gear trains. Students may also refer the books authored by R.L. Norton and also by J.E. Shigley in addition to the textbooks for this unit to get more*

clarity on this unit. The following URLs will be highly useful to the students to understand various concepts of gears and gear trains [http://www.nptel.iitm.ac.in/courses/IIT-MADRAS/Machine\\_Design\\_II/pdf/2\\_1.pdf](http://www.nptel.iitm.ac.in/courses/IIT-MADRAS/Machine_Design_II/pdf/2_1.pdf), [http://vedyadhara.ignou.ac.in/wiki/images/e/e8/BME-020\\_B-3\(Unit\\_10\).pdf](http://vedyadhara.ignou.ac.in/wiki/images/e/e8/BME-020_B-3(Unit_10).pdf) <http://www.youtube.com/watch?v=qLVwXZ2sS48>

## UNIT V

CAMS: Definitions of cam and follower – uses – Types of followers and cams – Terminology. Types of follower motion - Uniform velocity – Simple harmonic motion and uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes. Drawing of cam profiles.

ANALYSIS OF MOTION OF FOLLOWERS: Tangent cam with roller follower – circular arc (Convex) cam with flat faced and roller follower.

### **Learning outcome & Suggested Student Activities:**

After completion of this unit the students are able to draw displacement diagram and cam profile for different types of motions of the follower. And also to find the displacement, velocity and acceleration of the follower at different positions of cam with specified contours. The following URLs will be highly useful to the students to understand various concepts of drawing the cam profile for different followers. <http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-Delhi/Kinematics%20of%20Machine/site/coursecontent/cntmod10.htm>, <http://www.youtube.com/watch?v=UpS8OjdXSow>

### **Text Books:**

1. *Theory of Machines*, S.S. Rattan, Tata McGraw Hill Publishers, 3<sup>rd</sup> Edition, 2013.
2. *Kinematics and dynamics of machinery*, R.L Norton, Tata McGraw Hill Publishers, 1<sup>st</sup> Edition, 2009.

### **Reference Books:**

1. *Theory of Machines and Mechanisms*, 3<sup>rd</sup> Edition, J.E. Shieglley et. al, Oxford International Student Edition.
2. *The theory of Machines*, Ballaney, Kanna Publishers
3. *Theory of Machines*, Thomas Bevan, Pearson (P) 3<sup>rd</sup> Edition, 2012.

**NOTE :** Exam should be conducted in Drawing Hall

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**Suggestions:**

*Students may visit nearby machine tool shops and automobile workshops to know about different mechanisms, gears, gear trains, flexible drives and cams. Students are suggested to search the web and identify different URLs which provide animations of mechanisms for better visualization and understanding purpose.*

**WEB References:**

<http://nptel.iitk.ac.in>

<http://ptumech.loremate.com/tom1/node/1>

<http://www.youtube.com/watch?v=6coD3oOuhr8>

## JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech II-II Sem. (ME)

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### (15A03403) THERMAL ENGINEERING – I

#### **Course Objective:**

*The objective of this subject is to impart the knowledge of engine components, working principles of IC engines, auxiliary systems, the combustion aspects of SI and CI engines in addition to the methods of improving performance. The students shall become aware on the latest developments in the field of IC engines like MPFI, CRDI etc. and also shall become familiar about the working of Reciprocating and Rotary Compressors. The student also shall apply the thermodynamic concepts in IC engines and compressors.*

#### **UNIT I**

I.C. ENGINES: Definition of Engine And Heat Engine, I.C Engine Classification – Parts of I.C.Engines, Working of I.C. Engines, Two Stroke & Four Stroke I.C.Engines SI & CI Engines, Valve and Port Timing Diagrams.

#### **Learning Outcome & Suggested Student Activities:**

*After completion of the unit, student can know working of both S.I and C.I engines with the help of indicator diagrams. Student can differentiate the working of 2-S and 4-S engines and also can draw valve and port timing diagrams. Student can know applications of IC engine in the automobile industry. Students are advised to visit nearby automobile service center/station and engines laboratory for Knowing the various engines and engine components. Student can also see various types of engines fitted to two wheelers, four wheelers, and diesel power plants. The following URLs will be highly useful to the students to understand various aspects of I.C.Engines <http://www.youtube.com/watch?v=XfJvRTOP3M>, [http://www.youtube.com/watch?v=MNrVYG\\_NdD4](http://www.youtube.com/watch?v=MNrVYG_NdD4), [http://www.youtube.com/watch?v=W8oWq2Iv\\_W4](http://www.youtube.com/watch?v=W8oWq2Iv_W4), [www.yo](http://www.youtube.com/user/Techtrixinfo)*

#### **UNIT II**

Fuel System: S.I. Engine: Fuel Supply Systems, carburetor types Air Filters, Mechanical and Electrical Fuel Pump – Filters– Gasoline Injection Systems..

Cooling & Lubrication Systems: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo Siphon, Water And Forced Circulation System; Lubrication Systems-Flash, Pressurized and Mist Lubrication.

Ignition System: Function Of An Ignition System, Battery coil Ignition System, Magneto Coil Ignition System, Electronic Ignition System using Contact Breaker, Electronic Ignition using Contact Triggers – Spark Advance And Retard Mechanism.

#### **Learning Outcome & Suggested Student Activities:**

*Student can understand the fuel supply systems, cooling, lubrication and ignition systems. Student can understand how auxiliary systems play key role in increasing the performance of an I.C engine.*

*Student is advised to visit nearby automobile service center/station for getting practical knowledge about various auxiliary systems. Student can find the radiator (air cooling and water cooling) in front of heavy vehicles and stationary engines and air cooling for two wheelers and three wheelers.*

*The following URLs will be highly useful to the students to understand various aspects of fuel supply systems, filters, cooling, lubrication systems and Ignition systems.*

*<http://www.youtube.com/watch?v=ksG4ypoMEaM>; <http://www.youtube.com/watch?v=LwrL-Cn9HT8>; <http://www.youtube.com/watch?v=OY3dM8ZApo>; <http://www.youtube.com/watch?v=mmmcj53TNic>*

### UNIT III

Fuels and Combustion:

S I engine :Normal Combustion and Abnormal Combustion – Importance of Flame Speed and Effect of Engine Variables – Type of Abnormal Combustion, Pre-Ignition and Knocking (Explanation) – Fuel Requirements and Fuel Rating, Anti Knock Additives, Combustion Chambers.

C.I. Engines: Stages Of Combustion – Delay Period And Its Importance – Effect Of Engine Variables – Diesel Knock– Combustion Chambers (DI And IDI), Fuel Requirements And Fuel Rating.

#### **Learning Outcome & Suggested Student Activities:**

Student can understand the flame propagation inside the cylinder, stages of combustion in S.I and C.I engines. Student can understand the knocking phenomenon. Student can know about Octane number and Cetane number of fuels and properties of fuel. Combustion Process is very typical process practically students can't see but student can understand the combustion process by visiting following URLs. Students are suggested to know various losses occurred through combustion chamber, at least theoretically.

<http://www.youtube.com/watch?v=ep1NhANcCL4>;

<http://www.youtube.com/watch?v=pqa4zCo4erY>

### UNIT IV

Testing and Performance : Parameters of Performance - Measurement of Cylinder Pressure, Fuel Consumption, Air Intake, Exhaust Gas Composition, Brake Power – Determination of Frictional Losses And Indicated Power – Performance Test – Heat Balance Sheet and Chart.

#### **Learning Outcome & Suggested Student Activities:**

*Student can be familiar with indicated power, brake power and friction power and their methods of measurement. Student can understand the methods to increase the engine performance. Also, student can know calculating specific fuel consumption, A/F ratio and mean effective pressure and estimating heat losses etc. Students are advised to visit heat engines laboratory for analyzing the effect of various parameters on engine performance.*

*To better understand the above following URLs are useful.*

<http://web.iitd.ac.in/~ravimr/courses/mel345/ignou-notes.pdf>;

## UNIT V

Air Compressors: Reciprocating Compressors, Effect of Clearance volume in Compressors, Volumetric Efficiency, Single Stage and Multi Stage Compressors, Effect of Inter cooling and Pressure Drop in Multi - Stage Compressors, Problems Related to Reciprocating Compressors, Working principles of Roots blower, Vane type Blower, Centrifugal Compressor - Axial Flow Compressors, Working Principle of Rotary Compressors.

### **Learning Outcome & Suggested Student Activities:**

*Student can differentiate the working of reciprocating and rotary air compressors. Student can calculate work done by single and multistage reciprocating air compressors. Student can understand how intercooling reduces the work done / kg of air.*

*To gain further practical knowledge students are advised to visit laboratory/automobile workshop to see different types of compressors. The following URLs will be highly useful to the students to understand the air compressors.*

<http://www.ustudy.in/node/5106> ; <http://www.youtube.com/watch?v=Ue7BkzBARXw>

<http://www.youtube.com/watch?v=6zYHUXSG3HE>;

<http://www.youtube.com/watch?v=OuK6nGibFqY>

**Students are advised to refer the text book of “Internal Combustion Engine Fundamentals” by John B. Heywood.**

### **Text Books:**

1. *Internal Combustion Engines* / V. Ganesan- TMH, 4<sup>th</sup> Edition, 2012
2. *Thermal Engineering* / Rajput / Lakshmi Publications, 9<sup>th</sup> Edition, 2013

### **Reference Books:**

1. *I.C. Engines fundamentals*, Heywood, McGrawHill, 1<sup>st</sup> Edition, 2011
2. *IC Engines – Mathur & Sharma – Dhanpath Rai & Sons*, 2010
3. *Engineering fundamentals of IC Engines – Pulkrabek*, Pearson, PHI, 2<sup>nd</sup> Edition, 2009
4. *Thermal Engineering*, Rudramoorthy – TMH, 10<sup>th</sup> Edition, 2010
5. *Thermodynamics & Heat Engines*, B. Yadav, Central publishing house., Allahabad, 2002
6. *Thermal Engineering – R.S. Khurmi & J.K. Gupta – S.Chand*, 15<sup>th</sup> Edition, 2012

### **WEB Resources:**

<http://autoclub.rso.siuc.edu/frange.html>

<http://www.howstuffworks.com/engine1.htm>

<http://inventors.about.com/library/inventors/blinternalcombustion.htm>

<http://www.animatedengines.com/>



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**(15A03404) MANUFACTURING TECHNOLOGY****Course Objective:**

*By this subject the students will understand how manufacturers use technology to change raw materials into finished products. The students shall also introduce the basic concepts of casting, pattern preparation, gating system and knowledge on basic features of various welding and cutting processes. And also to study the concepts of surface treatment process, their characteristics and applications*

**UNIT I**

**CASTING:** Definition, elements, Steps involved in making a casting– Types of patterns - Patterns and Pattern making — Materials used for patterns, pattern allowances and their Construction. Principles of Gating, Gating ratio and design of Gating systems, time of filling the cavity. Design of core prints, buoyancy principle. Moulds: definition, mould materials, types of moulds, moulding methods, moulding machines, tests. Solidification of casting – Concept – Solidification of pure metal and alloys, short & long freezing range alloys.

**Learning Outcome & Suggested Student Activities:**

*Students can understand the elements of casting, construction of patterns and gating systems, moulds, methods of moulding, moulding machines and solidification of castings of various metals. Students are advised to visit URLs <http://www.nptel.iitm.ac.in/> and [iitr.ac.in](http://iitr.ac.in), [www.learnerstv.com/Free-Engineering-Video-lectures-ltv234-Page1.htm](http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv234-Page1.htm).*

**UNIT II**

**SPECIAL CASTING PROCESSES:** Process Mechanics, characteristics, parameters and applications of Centrifugal, Die, and Investment casting.

**RISERS** – Types, function and design, casting design considerations, Design of feeding systems i.e., sprue, runner, gate and riser, moulding flasks

**METHODS OF MELTING:** Crucible melting and cupola operation, steel making processes.

Casting inspection and defects

**Learning Outcome & Suggested Student Activities:**

*Students can understand the different types of special casting methods and their applications, design of risers and feeding systems, crucible melting, cupola operation and steel making process. The students may also be able to design a casting process on his own. The students are also advised to visit a Casting Industry nearby to get practical exposure.*

### UNIT III

A) **WELDING** : Classification of welding processes types of welds and welded joints and their characteristics, design of welded joints, Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water ) welding.

B) **CUTTING OF METALS**: Oxy – Acetylene Gas cutting, water plasma. Cutting of ferrous, non-ferrous metals

***Learning Outcome & Suggested Student Activities:***

*Students can understand the different types of welding processes, welds and weld joints, their characteristics, cutting of ferrous and non-ferrous metals by various methods. The students are advised to visit nearby welding shop for better understanding of welding process.*

### UNIT IV

Mechanics, characteristics, process parameters, applications of Inert Gas welding, TIG & MIG welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing and adhesive bonding. Heat affected zones in welding; welding defects – causes and remedies – destructive and nondestructive testing of welds

***Learning Outcome & Suggested Student Activities:***

*Students can understand about advanced welding process, heataffected zone(HAZ), Defects and Identification Methods. The students are advised to visit nearby welding shop and MFT Lab in the college.*

### UNIT V

**SURFACE ENGINEERING**: Surface treatment processes and their characteristics and applications. (a) Overlay coatings (b) Diffusion coatings (c) Thermal or mechanical modification of surfaces

***Learning Outcome & Suggested Student Activities:***

*Students can understand the various surface treatment processes. Student is advised to visit the nearby surface coating industry.*

**Text Books:**

1. *Manufacturing Technology, Vol I P.N. Rao, Tata Mc Graw Hill, 4<sup>th</sup> Edition, 2013*
2. *Manufacturing Technology, Kalpakjain, Pearson education, 4<sup>th</sup> Edition, 2002*

**Reference Books:**

1. *Production Technology, K.L Narayana, I.K. International Pub, 3<sup>rd</sup> Edition, 2013*
2. *Manufacturing Process Vol. I, H.S.Shah Pearson, 2013,*
3. *Principles of Metal Castings, Rosenthal, Tata Mc Graw Hill ,2<sup>nd</sup> Edition, 2001*
4. *Welding Process, Parmar.*
5. *Manufacturing Technology, R.K. Rajput, Laxmi Pub, 1<sup>st</sup> Edition, 2007*
6. *Workshop Technology – B.S.RaghuVamshi – Vol I.*

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**WEB References:**

*NPTEL Lectures*

[http://teacher.buet.ac.bd/shabnam/14250\\_ch3.pdf](http://teacher.buet.ac.bd/shabnam/14250_ch3.pdf)

[http://me.emu.edu.tr/majid/MENG364/2\\_casting.pdf](http://me.emu.edu.tr/majid/MENG364/2_casting.pdf)

<http://en.wikipedia.org/wiki/Metalworking>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech II-II Sem. (ME)**

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<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(15A03405) THERMAL ENGINEERING LABORATORY**

1. Valve / Port Timing Diagrams of an I.C. Engines
2. Performance Test on a 4 -Stroke Diesel Engines
3. Performance Test on 2-Stroke Petrol engine
4. Evaluation of Engine friction by conducting Morse test on 4-Stroke Multi cylinder Engine
5. Retardation and motoring test on 4- stroke engine
6. Heat Balance of an I.C. Engine.
7. Air/Fuel Ratio and Volumetric Efficiency of an I.C. Engines.
8. Performance Test on Variable Compression Ratio Engines for CI Engines
9. Performance Test on Reciprocating Air – Compressor Unit
10. Study of Boilers
11. Dismantling / Assembly of Engines to identify the parts and their position in an engine.
12. Engine Emission Measurement for SI & CI Engines.

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<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**(15A03406) MANUFACTURING TECHNOLOGY LABORATORY****Minimum of 12 Exercises need to be performed****I. METAL CASTING LAB:**

- Pattern Design and making - for one casting drawing.
- Sand properties testing - Exercise -for strengths, and permeability – 1
- Moulding: Melting and Casting - 1 Exercise

**II. WELDING LAB:**

- Arc Welding: Lap & Butt Joint - 2 Exercises
- Spot Welding - 1 Exercise
- TIG Welding - 1 Exercise
- Plasma welding and Brazing - 2 Exercises (Water Plasma Device)

**III. MECHANICAL PRESS WORKING:**

- Blanking & Piercing operation and study of simple, compound and progressive press tool.
- Hydraulic Press: Deep drawing and extrusion operation.
- Bending and other operations

**IV. PROCESSING OF PLASTICS:**

- Injection Moulding
- Blow Moulding

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**15A01510 FLUID MECHANICS AND HYDRAULIC MACHINES****UNIT - I**

**FLUID STATICS** : Dimensions and units: physical properties of fluids – specific gravity, porosity surface tension – vapor pressure and their influence on fluid motion – atmospheric gauge and vacuum pressure – measurement of pressure – Piezometer, U-tube differential manometers.

**FLUID KINEMATICS** : stream line, path line and streak lines and stream tube, classification of flows-steady & unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows-equation of continuity for one dimensional flow.

**Fluid dynamics**: surface and body forces – Euler's and Bernoulli's equations for flowing stream line, momentum equation and its application on force on pipe bend.

**UNIT – II**

**CONDUIT FLOW**: Reynold's experiment – Darcy Weisbach equation – Minor losses in pipes – pipes in series and pipes in parallel – total energy line-hydraulic gradient line. Measurement of flow: pitot tube, venturimeter and orifice meter, Flow nozzle and Turbine current meter.

**UNIT – III**

**TURBO MACHINERY** : hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done efficiency, flow over radial vanes.

**HYDROELECTRIC POWER STATIONS**: Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements.

**UNIT – IV**

**HYDRAULIC TURBINES**: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies, hydraulic design-draft tube- theory- functions and efficiency.

**PERFORMANCE OF HYDRAULIC TURBINES** : Unit and specific quantities, characteristics, governing of turbines, selection of type of turbine, cavitation and surge tank.

**UNIT – V**

**CENTRIFUGAL PUMPS** : Classification- working-work done – manometric head – loss efficiencies – specific speed – pumps in series and parallel – performance characteristic curves and NPSH.

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**TEXT BOOKS :**

1. Fluid Mechanics, Hydraulic and Hydraulic Machines by Modi & Seth, Standard book house.
2. A Text of Fluid Mechanics and Hydraulic Machines by Dr.R.K.Bansal – Laxmi Publications (P) Ltd., New Delhi.
3. Mechanics of Fluids by Potter, Wiggert, Ramadan, M.M.M.SARCAR, Cengage Publishers.

**REFERENCE BOOKS :**

1. Fluid Mechanics and Machinery by D.Rama Durgaiah, New Age International.
2. Principles of Fluid Mechanics and Fluid Machines by M.Narayana Pillai, Universities Press.
3. Fluid mechanics and fluid machines by Rajput, S.Chand & Co.

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**15A03501 THERMAL ENGINEERING – II****Course Objective:**

*This subject is designed to provide a sound knowledge in various aspects of thermal equipments. This subject has an increasingly dominant role to play in the vital areas of power generation, Automobiles, R&AC and energy sector. The course contents aims at developing the necessary analytical and technical contents among engineers in these areas. The students shall become familiar with steam power plant, boilers, function of nozzle, gas turbines and jet propulsions.*

**UNIT I**

**BASIC CONCEPTS:** Rankine Cycle - Schematic Layout, Thermodynamic Analysis, Concept of Mean Temperature of Heat Addition, Methods to Improve Cycle Performance – Regeneration – Reheating- Combined- Cycles.

**Learning Outcome & Suggested Student Activities:**

*Student can be able to illustrate the power generation through Rankine cycle. Student can able understand efficiency enhancement methods of Reheating and regeneration. Student can able to understand the key role of quality of steam after evaporation. Students are advised to be acquainted with the terms related to steam, steam tables and mollierchart. Also, students are advised to visit the thermal power station to get real expose.*

**UNIT II**

**BOILERS:** Classification Based on Working Principles & Pressures of Operation - L.P & H.P. Boilers – Mountings and Accessories.

**DRAUGHT:** Classification – Height Of Chimney for Given Draught and Discharge, Condition for Maximum Discharge, Efficiency of Chimney – Artificial Draught, Induced and Forced Draught.

**Learning Outcome & Suggested Student Activities:**

*Student can able to understand the working of different high pressure and low pressure boilers. Student can distinguish mountings and accessories. The student can calculate the chimney height for maximum discharge. Student can know the draughts and its application in the steam generator. Students are advised to visit the Boilers in the power generation units to get better expose. And visit the following URLs will be highly useful to the students to understand various aspects of thermal power plants and boilers.*  
[https://www.youtube.com/watch?v=Ota2\\_LUuar0](https://www.youtube.com/watch?v=Ota2_LUuar0),  
<https://www.youtube.com/watch?v=8GSUgwombdE>



**UNIT III**

STEAM NOZZLES: Function of Nozzle – Applications - Types, Flow through Nozzles, Thermodynamic Analysis – Assumptions -Velocity of Nozzle at Exit-Ideal And Actual Expansion in Nozzle, Velocity Coefficient, Condition for Maximum Discharge, Critical Pressure Ratio.

Criteria for Design of Nozzle Shape: Super Saturated Flow and its Effects, Degree of Super Saturation and Degree of Under Cooling - Wilson Line –Shock at The Exit.

CONDENSERS: Classification, Air Leakage Vacuum Efficiency, condenser efficiency, problems.

**Learning Outcome & Suggested Student Activities:**

*Student can be able to distinguish the ideal flow and actual flow through nozzle. Student can know the importance of maximum discharge through nozzle. Student can able to entail the concept of Critical pressure ratio in calculations. Student can able to understand the effect of meta stable flow/ super saturation flow through nozzle.*

*Students are advised to visit the thermal power stations to acquire the practical expose and visit URL <http://www.youtube.com/watch?v=cdUNmzcu2rA>*

**UNIT IV**

IMPULSE TURBINE: Mechanical Details – Velocity Diagram – Effect of Friction – Power Developed, Axial Thrust Blade or Diagram Efficiency – Condition for Maximum Efficiency. De-Laval Turbine - Its Features. Methods To Reduce Rotor Speed - Velocity Compounding And Pressure Compounding, Velocity And Pressure Variation Along The Flow – Combined Velocity Diagram For A Velocity Compounded Impulse Turbine.

REACTION TURBINE: Mechanical Details – Principle of Operation, Thermodynamic Analysis of A Stage, Degree of Reaction –Velocity Diagram – Parson's Reaction Turbine – Condition for Maximum Efficiency.

**Learning Outcome & Suggested Student Activities:**

*At the end of unit, student can able to distinguish the working of impulse and reaction turbines. Student can able to construct the velocity triangle and combined velocity triangle and can learn its importance in determining the power produced by the turbine. Student can know why to reduce the rotor speed and methods to reduce.*

*Students are advised to visit thermal power stations for better understanding the working of turbines. Students are suggested to participate in science exhibitions based on the concept of thermal power plants. Student is advised to visit following URLs <http://www.youtube.com/watch?v=y2dOmpZgYW8&list=PLBD7B1EEF7CCB7D9D> , [https://www.youtube.com/watch?v=1b1Q3V\\_79I](https://www.youtube.com/watch?v=1b1Q3V_79I)*

**UNIT V**

**GAS TURBINES:** Simple Gas Turbine Plant – Ideal Cycle, Essential Components – Parameters of Performance – Actual Cycle – Regeneration, Inter Cooling and Reheating – Closed And Semi-Closed Cycles – Merits and Demerits, Brief Concepts of Compressors, Combustion Chambers and Turbines used in Gas Turbine Plants

**JET PROPULSION:** Principle of Operation – Classification of Jet Propulsive Engines – Working Principles with Schematic Diagrams and Representation on T-S Diagram - Thrust, Thrust Power and Propulsion Efficiency – Turbo Jet, Turbo Prop, Pulse Jet Engines – Schematic Diagram, Thermodynamic Cycle. Introduction to Rocket Propulsion.

**Learning Outcome & Suggested Student Activities:**

After the study of the unit, Student can be familiar with the basic components of a gas turbine power plant. Student can illustrate the power generation using Joule Cycle. Student can know the methods to increase the specific power output and efficiency of the cycle. Also, Student can able to know the working of various propulsive devices. Student can aware of using thrust equations in solving problems. Students advised to visit Gas power generation plants.

<http://www.youtube.com/watch?v=hnVWpOV5chs>, <http://www.youtube.com/watch?v=p1TqwAKwMuM>, <http://www.youtube.com/watch?v=MUXP3PCDRTE>

**Text Books:**

1. Thermal Engineering, R.K. Rajput, 9/e, Lakshmi Publications, 2013
2. Basic and Applied Thermodynamics, P.K. Nag, TMH, 2<sup>nd</sup> Edition, 2012.

**Reference Books:**

1. Gas Turbines, V. Ganesan, TMH
2. Thermodynamics and Heat Engines, R.Yadav, Central Publishing House, Allahabad, 2002.
3. Thermal Engineering, Mahesh M Rathore, McGrawHill, 2010
4. Gas Turbines and Propulsive Systems, P.Khajuria & S.P.Dubey, Dhanpatrai
5. Thermal Engineering, R.S Khurmi & JS Gupta, S.Chand, 2012.
6. Thermal Engineering Data Book, B.S. Reddy and K.H. Reddy, I.K. International, 2007.
7. Steam Tables SI Units- Dr.B.Umamaheswar Gowd and A. Nagaraju, Siri Publ.

**NOTE:** Steam tables and Mollier charts to be supplied for exam.

**Web References:**

<http://www.iscid.org/encyclopedia/Tthermodynamics>. <http://www.transtutors.com/>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (ME)**

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<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03502 DYNAMICS OF MACHINERY****Course objective:**

*To understand the method of static force analysis and dynamic force analysis of mechanism, undesirable effects of unbalance in rotors and engines. To understand the concept of vibratory systems and their analysis and also the principles of governors.*

**UNIT I**

**FRICTION:** Inclined plane, friction of screws and nuts, pivot and collar, uniform pressure, uniform wear. Friction circle and friction axis, lubricated surfaces, boundary friction, film lubrication.

**CLUTCHES:** Friction clutches- Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.

**BRAKES AND DYNAMOMETERS:** Simple block brakes, Band brake, internal expanding brake, braking of vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the basic concepts of friction in pivots and collars with uniform pressure and uniform wear, and also to solve the numerical problems on brakes, clutches and dynamometers.*

*Students may go through text books given for more number of problems on friction, brakes and clutches. The following URLs will be highly useful to the students to understand various concepts of friction and its application.*

*<http://nptel.iitm.ac.in/video.php?subjectId=112104121>,*

*<http://www.youtube.com/watch?v=FA04XFpJgwE>*

**UNIT II**

**PRECESSION:** Gyroscopes, effect of precession motion on the stability of moving vehicles such as motor car, motor cycle, aeroplanes and ships.

**TURNING MOMENT DIAGRAMS AND FLY WHEELS:** Turning moment diagrams for steam engine, IC Engine and multi cylinder engine. Crank effort - coefficient of Fluctuation of energy, coefficient of Fluctuation of speed – Fly wheels and their design, Fly wheels for Punching machines.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students can apply gyroscopic principles on Aeroplane, ship, four wheel and two wheel vehicles. Students are able to design a flywheel for IC engine. Students may go through text books given for more number of problems on gyroscopic*

effects and flywheels. The following URLs will be highly useful to the students to understand various concepts of gyroscopic couple and turning moment diagrams.

<http://www.youtube.com/watch?v=FydJu1A1oeM&list=PL46AAEDA6ABAFCA78&index=7>

<http://www.youtube.com/watch?v=swgvKwyOnYk&list=PL46AAEDA6ABAFCA78&index=16>

### UNIT III

GOVERNORS: Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung governors with auxiliary springs. Sensitiveness, isochronism and hunting. Effort and power of a governor.

#### **Learning outcome & Suggested Student Activities:**

The outcome of this unit is to study the basics and definitions related to governors and forces acting on various governors. After completion of this unit students are able to solve numerical problems on different governors.

Students may go through text books given for more number of problems on governors.

The following URLs will be highly useful to the students to understand various concepts on governors.

<http://nptel.iitm.ac.in/video.php?subjectId=112104121>,

<http://www.youtube.com/watch?v=OG1AiaNTT6s>

### UNIT IV

BALANCING: Balancing of rotating masses - single and multiple – single and different planes.

BALANCING OF RECIPROCATING MASSES: Primary and Secondary balancing of reciprocating masses. Analytical and graphical methods. Unbalanced forces and couples – V-engine, multi cylinder in-line and radial engines for primary and secondary balancing.

#### **Learning outcome & Suggested Student Activities:**

After completion of this unit students can solve numerical problems on balancing of rotating masses and reciprocating masses in V-engine and multi cylinder engines.

Students may go through text books given for more number of problems on balancing of rotating masses and balancing of reciprocating masses in locomotives and IC engines.

The following URLs will be highly useful to the students to understand various concepts of balancing of masses.

<http://www.youtube.com/watch?v=aRuIDXMuNDc&list=PL46AAEDA6ABAFCA78&index=8>

8

<http://nptel.iitm.ac.in/video.php?subjectId=112104121>

### UNIT V

VIBRATION: Free and forced vibration of single degree of freedom system, Role of damping, whirling of shafts and critical speeds. Simple problems on free, forced and damped vibrations. Vibration Isolation & Transmissibility. Transverse vibrations of

beams with concentrated and distributed loads. Dunkerly's method, Raleigh's method. Torsional vibrations - two and three rotor systems.

**Learning outcome & Suggested Student Activities:**

Upon completion of this unit, the student will perform detailed analysis of the response of one degree of freedom systems with free and forced vibrations, evaluate the critical speed of the shaft and simple vibration calculations of rotor systems. Students may go through text books given for more number of problems on single degree of freedom system, transverse and torsional vibrations. The following URLs will be highly useful to the students to understand various concepts on vibrations.  
<http://nptel.iitm.ac.in/video.php?subjectId=112104121>  
<http://www.youtube.com/watch?v=irudCaBrij0&list=PL46AAEDA6ABAFCA78&index=30>

**Text Books:**

1. Theory of Machines, S.S. Rattan, MGH Publishers, 3<sup>rd</sup> Edition, 2013.
2. Kinematics and Dynamics of Machinery R.L. Norton, Tata McGraw Hill.

**Reference Books:**

1. Theory of Machines, Thomas Bevan, Pearson, 3<sup>rd</sup> Edition, 2012.
2. The theory of Machines, Ballaney, Kanna Publishers
3. Theory of Machines and Mechanisms of Shigley et.al. Oxford International Student Edition.

**NOTE:** End Exam Should be conducted in Drawing Hall

**Suggestions:**

Students may visit near by machine tool shops and automobile work shops to know about clutches, bearings, brakes, dynamometers, flywheel, centrifugal governors and balancing equipment like wheel balancing. Students are suggested to search the web and identify different URLs which provide animations of mechanisms for better visualization and understanding purpose.

**Web References:**

Machine Dynamics by Prof. Amitabha Ghosh, IITK, Kanpur -  
<http://nptel.iitm.ac.in/video.php?subjectId=112104114>  
 Machine Dynamics by Prof. C. Amarnath, Prof. K. Kurien Issac, Prof. P. Seshu of IITB, Mumbai  
<http://www.cdeep.iitb.ac.in/nptel/Mechanical/Dynamics%20of%20Machines/TOC.html>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (ME)**

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**15A03503 MACHINE TOOLS****Course Objective:**

*The objectives of this course are to introduce to demonstrate the fundamentals of machining processes and machine tools.*

*To develop knowledge and importance of metal cutting parameters, tool materials, cutting fluids and tool wear mechanisms.*

*To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes and acquire knowledge on advanced manufacturing processes. The students will have the knowledge and hands-on experience that will enable them to work in a typical machine shop.*

**UNIT I**

Elementary treatment of metal cutting theory – Elements of cutting process – Geometry of single point tool and angles, chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting –Merchant's Force diagram, cutting forces – cutting speeds, feed, depth of cut, heat generation, tool life, coolants, machinability –economics of machining. cutting Tool materials and cutting fluids –types and characteristics .

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the basic concepts of the philosophy of metal cutting and the mechanism of chip formation. Student will understand the interface in the machining zone between the tool and the work piece and how the physical and mechanical parameters dictate the cutting performance.*

**UNIT II**

Engine lathe – Principle of working- specification of lathe – types of lathes – work holders and tool holders –Taper turning, thread turning and attachments for Lathes.Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout. Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes– tool layout and cam design.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the basic concepts of turning. Student shall be made familiar with various tooling accessories used in turning and understand different constructions of lathe depending on the nature of operation.*

**UNIT III**

Drilling and Boring Machines – Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring tools – machining time calculation.

Shaping, Slotting and Planing machines –Principles of working – Principal parts – specification, classification, Operations performed. Machining time calculations

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the basic principle of drilling, shaping and planing operation, parts of the drilling, shaping and planing machines and tool holding devices, operations performed on drilling, shaping and planing and machining calculations.*

**UNIT IV**

Milling machine – Principles of working – specifications – classifications of milling machines – Principal features – machining operations, Types and geometry of milling cutters– methods of indexing – Accessories to milling machines.

Grinding machine –Theory of grinding – classification– cylindrical and surface grinding machine – Tool and cutter grinding machine – special types of grinding machines – Grinding wheel: Different types of abrasives – bonds, specification and selection of a grinding wheel. Static and dynamic balancing of a wheel Truing and Dressing of wheels. Lapping, Honing and Broaching machines – comparison of grinding, lapping and honing. machining time calculations.

**Learning outcome &Suggested Student Activities:**

*After completion of this unit students are able to understand the principle of milling, grinding, Lapping, Honing and Broaching operation, parts of the milling machine and types of milling and grinding machines.*

**UNIT V**

Principles of design of Jigs and fixtures and uses, 3-2-1 Classification of Jigs & Fixtures – Principles of location and clamping – Types of clamping & work holding devices, Typical examples of jigs and fixtures

Unit built machine tools – multispindle heads. power units-principal of working types of UBMTS, characterization, applications

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the design of Jigs and fixtures and uses, Classification of Jigs & Fixtures – Principles of location and clamping. Some examples of jigs and fixtures. The outcome of this unit is to understand the basic principle of unconventional machining methods USM,AJM,EDM,LBM,EBM,CM and ECM and machining of the USM,AJM,EDM,LBM,EBM,CM and ECM.*

**Text Books:**

1. *Workshop Technology – Vol II*, B.S.RaghuVamshi, Dhanpat Rai & Co, 10<sup>th</sup> edition, 2013
2. *Production Technology* by R.K. Jain and S.C. Gupta, Khanna Publishers, 17<sup>th</sup> edition, 2012

**Reference Books:**

1. *Manufacturing Technology*-Kalpakzian- Pearson
2. *Metal cutting Principles* by Milton C.Shaw, oxford Second Edn, 2<sup>nd</sup> edition, 2012
3. *Production Technology* by H.M.T. (Hindustan Machine Tools),TMH, 1<sup>st</sup> edition, 2001
4. *Production Technology* by K.L.Narayana, IK International Pub.
5. *Machining and machine tools* by AB. Chattopadhyay, WileyEdn,2013
6. *Unconventional Machining process* by V.K.Jain, Allied Pub.
7. *Manufacturing technology Vol II* by P.N. Rao, Tata McGraw Hill, 4<sup>th</sup> edition, 2013
8. *Machine Technology Machine tools and operations* by Halmi A Yousuf&Harson, CRC Press Taylor and Francies .

**Web Resources:**

[www.hgfarley.com](http://www.hgfarley.com)

[www.kennametal.com/](http://www.kennametal.com/) - United States

[www.mini-lathe.com/links.htm](http://www.mini-lathe.com/links.htm); [machinedesign.com/.../designer-s-guide-to-metalcutting-machinery-0608](http://machinedesign.com/.../designer-s-guide-to-metalcutting-machinery-0608) -

[www.metalwebnews.com/wc.html](http://www.metalwebnews.com/wc.html)

[www.britannica.com/EBchecked/topic/463000/planer](http://www.britannica.com/EBchecked/topic/463000/planer)

[www.americanmachinist.com](http://www.americanmachinist.com)

[www.machinetools.net.tw/parts/taiwan\\_voltage\\_regulator.htm](http://www.machinetools.net.tw/parts/taiwan_voltage_regulator.htm)



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A03504 DESIGN OF MACHINE MEMBERS – I****Course Objective:**

*The primary objective of this course is to demonstrate how engineering design is used for many principles learned in previous engineering science courses and to show how these principles are practically applied. This subject will help to the students to learn to analyze and design basic machine elements in mechanical systems. By this subject students will become familiar on design principles, materials selection, stresses developed in machine elements under different loads. The students will also get knowledge on design of the permanent and temporary joints, shafts and keys.*

**UNIT I**

**INTRODUCTION:** General considerations of design, design process. Selection of Engineering Materials - properties –Manufacturing considerations in the design. BIS codes of materials, preferred numbers and interchangeability.

**STRESSES IN MACHINE MEMBERS:** Simple stresses – Combined stresses – Torsional and bending Stresses – impact stresses – stress -strain relation – Theories of failure – factor of safety.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are capable to apply design procedures using theories of failure for different elements. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of machine design.*  
<http://machinedesign.com/>  
<http://www.youtube.com/watch?v=qVj4VvMmQjc&list=PL3D4EECEFAA99D9BE&index=6>

**UNIT II**

**DESIGN FOR FLUCTUATING LOADS:** Stress concentration –notch sensitivity – Design for fluctuating stresses – Estimation of Endurance strength – Goodman's line – Soderberg's line. Design of components for finite and infinite life.

**Learning Outcome & Suggested Student Activities:**

*After completion of this chapter students are able to design simple components under cyclic loading using Goodman's and Soderberg's criterions. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of cyclic loading design.* <http://machinedesign.com/>  
<http://www.youtube.com/watch?v=SLqkITQfN1I&list=PL3D4EECEFAA99D9BE&index=8>

**UNIT III**

DESIGN OF RIVETED JOINTS: Types of riveted joints, design of riveted joints. Boiler shell riveting design and eccentric loading design of riveted joints.

DESIGN OF BOLTED JOINTS: Forms of Screw threads. Stresses in Screw fasteners. Design of bolts with pre-stresses, Design of bolted joints under eccentric loading, Bolts of uniform strength.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are able to design riveted joints with different configuration, boiler shell joint design and eccentric loading design of riveted joints. Further students are able to design bolted joints with direct loading and eccentric loading. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of joints. <http://machinedesign.com/> <http://www.youtube.com/watch?v=Z38Aq9ykUCM&list=PL3D4EECEFAA99D9BE&index=16>*

**UNIT IV**

DESIGN OF COTTERS AND KNUCKLE JOINTS: Design of Cotter joints: spigot and socket, sleeve and cotter, jib and cotter joints- Knuckle joints

DESIGN OF SHAFTS: Design of solid and hollow shafts for strength and rigidity – Design of shafts for combined bending and axial loads.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are able to design cotter joint, knuckle joint and shafts. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of shafts, <http://machinedesign.com/> <http://www.youtube.com/watch?v=4nlQwVqruRo&list=PL3D4EECEFAA99D9BE&index=20>*

**UNIT V**

DESIGN OF KEYS AND COUPLINGS: Design of Rigid couplings: Muff, Split muff and Flange couplings- Design of flexible couplings.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are able to design various rigid and flexible shaft couplings. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of couplings. <http://machinedesign.com/> <http://www.youtube.com/watch?v=4nlQwVqruRo&list=PL3D4EECEFAA99D9BE&index=21>*

**Text Books:**

1. MachineDesign, Schaum'sseries, TMH Publishers, NewDelhi, 1<sup>st</sup> edition, 2011
2. MachineDesign, R.S. Kurmi and J.K. Gupta ,S.ChandPublishers, NewDelhi

**Reference Books:**

1. *Machine Design*, R.K. Jain, Khanna Publishers, New Delhi.
2. *Machine Design*, Sadhu Singh, Khanna Publishers, New Delhi
3. *Mechanical Engineering Design*, Joseph E. Shigely, TMH Publishers, New Delhi, 9<sup>th</sup> edition, 2011 R
4. *Design of Machine Elements*, M.F. Spotts, PHI Publishers, New Delhi.
5. *Machine Design*, Pandya and Shah, Charotar Publishers, Anand, 17<sup>th</sup> edition, 2009
6. *Machine Design*, R.L. Norton, Tata McGraw Hill Publishers, 2<sup>nd</sup> edition, 2002
7. *Machine Design by Groover* – CBS Publications, 5<sup>th</sup> edition, 2012.
8. *Machine Design Data Book*, V B Bhandari, McGraw Hill, 2014

**NOTE:** Design data books are not permitted in the examinations.

**Web Resources:**

<http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv077-page1.htm>

<http://www.fastenal.com/content/feds/pdf/Article%20-%20Bolted%20Joint%20Design.pdf>

<http://people.rit.edu/megite> Lec%203%20Fatigue%20Failure%20031004\_for\_students.ppt

<http://engineershandbook.com/Tables/materials.htm>

[www.nptel.iitm.ac.in/video](http://www.nptel.iitm.ac.in/video)

**Suggestions:**

1. Students may visit nearby automobile workshops and machine tool shops or IC Engine Lab/Automobile Lab to know about different machine elements like shafts, keys, couplings and riveted and bolted joints.

2. In addition to the text books students may also go through the reference books authored by V.B.

Bhandari, by Pandya and Shah for more number of numerical problems.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A03505 ENTREPRENEURSHIP  
(MOOCS-I)**

**UNIT 1:** Introduction to Entrepreneurship Definition Types of Entrepreneur, Entrepreneurial Traits, Entrepreneur vs. Manager, Entrepreneur vs Intrapreneur. The Entrepreneurial decision process. Ethics and Social responsibility of Entrepreneurs. Opportunities for Entrepreneurs in India and abroad.

Creating and Starting the Venture, Sources of new Ideas, Methods of generating ideas, creative problem solving, product planning and development process.

**UNIT II:** The Business Plan Nature and scope of Business plan, Writing Business Plan, Evaluating Business plans, Using and implementing business plans. Marketing plan, financial plan and the organizational plan, Launching formalities.

**UNIT III:** Financing and Managing the new venture, Sources of capital, venture capital , angel investment, Record keeping, recruitment, motivating and leading teams, financial controls. Marketing and sales controls. E-commerce and Entrepreneurship, Internet advertising.

**UNIT IV:** New venture Expansion Strategies and Issues, Features and evaluation of joint ventures, acquisitions, merges, franchising. Public issues, rights issues, bonus issues and stock splits.Choosing location and layout, Issues related to Selection of layout.

**UNIT V:** Production and Marketing Management Thrust of production management, Selection of production Techniques, plant utilization and maintenance, Designing the work place, Inventory control, material handling and quality control.Marketing functions, market segmentation, market research and channels of distribution, Sales promotion and product pricing. Global aspects of Enterprenership.

**Text Books:**

- 1Entrepreneurship, Robert Hisrich, & Michael Peters, TMH, 5th Edition
2. Entrepreneurship, Dollinger, Pearson, 4/e 2004.

**REFERENCES:**

1. Dynamics of Entrepreneurial Development and management, Vasant Desai, Himalaya Publishing House, 2004.
2. Harvard Business Review on Entrepreneurship. HBR Paper Back, 1999.
3. Entrepreneurial Management, . Robert J.Calvin:, TMH, 2004.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A03506 NANO TECHNOLOGY  
(MOOCS-I)**
**Course objective**

On successful completion of the course, students should be able to: Understand the basic scientific concepts of nanoscience. Understand the properties of nano materials, characterization of materials, synthesis and fabrication. Understand the applications of nano technology in various science, engineering and technology fields.

**UNIT-I**

**INTRODUCTION:** History of nano science, definition of nano meter, nano materials, nano technology. Classification of nano materials. Crystal symmetries, crystal directions, crystal planes. Band structure.

**PROPERTIES OF MATERIALS:**

Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials.

**UNIT-II**

**SYNTHESIS AND FABRICATION:** Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD; Top Down Approach – Ball milling, micro fabrication, lithography. Requirements for realizing semiconductor nano structures, growth techniques for nano structures.

**UNIT-III**

**CHARACTERIZATION TECHNIQUES:** X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezoresponse microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy.

**UNIT-IV****CARBON NANO TECHNOLOGY:**

Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nano crystalline diamond films, graphene, applications of carbon nano tubes.

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**UNIT-V****APPLICATIONS OF NANO TECHNOLOGY:**

Applications in material science, biology and medicine, surface science, energy and environment. Applications of nano structured thin films, applications of quantum dots.

**TEXT BOOK:**

1. Nano science and nano technology / M.S Ramachandra Rao, Shubra Singh/Wiley publishers.
2. Introduction to Nanotechnology by Risal Singh, Shipra Mital Gupta, Oxford Higher Education, First Publication 2016.

**REFERENCE BOOKS:**

1. Introduction to Nano Technology /Charles P. Poole, Jr., Frank J.Owens/Wiley publishers.
2. Nanotechnology /Jermey J Ramsden/Elsevier publishers
3. Nano Materials/A.K.Bandyopadhyay/ New Age
4. Nano The Essentials, T.Pradeep, McGrawHill, 2014
5. Nanotechnology the Science of Small / M.A Shah, K.A Shah/Wiley Publishers.

**Course outcomes:**

- Upon successful completion of this course the student shall be able to:
- Identify the essential concepts used in nanotechnology. Identify the materials, properties, syntheses and fabrication, characterization and applications in various fields.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (ME)**

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**15A03507**
**MICRO ELECTRO MECHANICAL SYSTEMS (MEMS)**  
**(MOOCS-I)**
**Course Objectives:**

1. To learn basics of Micro Electro Mechanical Systems (MEMS).
2. To learn about various sensors and actuators used in MEMS
3. To learn the principle and various devices of MOEMS, Fluidic, bio and chemical systems

**UNIT – I**

**INTRODUCTION:** Definition of MEMS, MEMS history and development, micro machining, lithography principles & methods, structural and sacrificial materials, thin film deposition, impurity doping, etching, surface micro machining, wafer bonding, LIGA.

**MECHANICAL SENSORS AND ACTUATORS:** Principles of sensing and actuation: beam and cantilever, capacitive, piezo electric, strain, pressure, flow, pressure measurement by micro phone, MEMS gyroscopes, shear mode piezo actuator, gripping piezo actuator, Inchworm technology.

**UNIT – II**

**THERMAL SENSORS AND ACTUATORS:** Thermal energy basics and heat transfer processes, thermistors, thermo devices, thermo couple, micro machined thermo couple probe, peltier effect heat pumps, thermal flow sensors, micro hot plate gas sensors, MEMS thermo vessels, pyro electricity, shape memory alloys (SMA), U-shaped horizontal and vertical electro thermal actuator, thermally activated MEMS relay, micro spring thermal actuator, data storage cantilever.

**UNIT – III**

**MICRO-OPTO-ELECTRO MECHANICAL SYSTEMS:** Principle of MOEMS technology, properties of light, light modulators, beam splitter, micro lens, micro mirrors, digital micro mirror device (DMD), light detectors, grating light valve (GLV), optical switch, wave guide and tuning, shear stress measurement.

**MAGNETIC SENSORS AND ACTUATORS:** Magnetic materials for MEMS and properties, magnetic sensing and detection, magneto resistive sensor, more on hall effect, magneto diodes, magneto transistor, MEMS magnetic sensor, pressure sensor utilizing MOKE, mag MEMS actuators

**UNIT – IV**

**MICRO FLUIDIC SYSTEMS:** Applications, considerations on micro scale fluid, fluid actuation methods, dielectrophoresis (DEP), electro wetting, electro thermal flow, thermo capillary effect, electro osmosis flow, opto electro wetting (OEW), tuning using micro fluidics, typical micro fluidic channel, microfluid dispenser, micro needle, molecular gate, micro pumps.

**RADIO FREQUENCY (RF) MEMS:** RF – based communication systems, RF MEMS, MEMS inductors, varactors, tuner/filter, resonator, clarification of tuner, filter, resonator, MEMS switches, phase shifter.

**UNIT - V**

**CHEMICAL AND BIO MEDICAL MICRO SYSTEMS:** Sensing mechanism & principle, membrane-transducer materials, chem.-lab-on-a-chip (CLOC) chemoresistors, chemocapacitors, chemotransistors, electronic nose (E-nose), mass sensitive chemosensors, fluorescence detection, calorimetric spectroscopy.

**TEXT BOOK:**

1. MEMS/Nitaigour Premchand Mahalik/TMH Publishing co.
2. MEMS and NEMS/Sergey Edwrd Lyshevski/CRC Press, Indian Edition, 2013

**REFERENCE BOOKS:**

1. Foundation of MEMS/Chang Liu/Prentice Hall Ltd.
2. RF MEMS Theory, Design and Technology Gabriel M. Rebeiz, Wiley-India, 2010
3. MEMS and Micro Systems: Design and Manufacture/Tai-Ran Hsu/TMH Publishers.
4. Introductory MEMS/ Thomas M Adams, Richard A Layton/Springer International Publishers.

**Course outcomes:**

Upon successful completion of this course the student shall be able to know the importance and various devices of MEMS and their applications.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A01511 FLUID MECHANICS AND HYDRAULIC MACHINES LABORATORY**

**OBJECTIVE:** *The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.*

**SYLLABUS :**

1. Calibration of Venturimeter
2. Calibration of Orifice meter
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by variable head method.
5. Calibration of contracted Rectangular Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Verification of Bernoulli's equation.
8. Impact of jet on vanes.
9. Study of Hydraulic jump.
10. Performance test on Pelton wheel turbine.
11. Performance test on Francis turbine.
12. Efficiency test on centrifugal pump.

**LIST OF EQUIPMENT :**

1. Venturimeter Setup.
2. Orifice meter setup.
3. Small orifice setup.
4. External mouthpiece setup.
5. Rectangular and Triangular notch setups.
6. Friction factor test setup.
7. Bernoulli's theorem setup.
8. Impact of jets.
9. Hydraulic jump test setup.
10. Pelton wheel and Francis turbines.
11. Centrifugal pumps.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR****B. Tech III-I Sem. (ME)**

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**15A03508 MACHINE TOOLS LABORATORY**

1. Demonstration of construction & operations of general purpose machines:  
Lathe, Drilling machine, Milling machine, Shaper, Planning machine, Slotting machine, Cylindrical Grinder, Surface grinder and Tool & cutter grinder.
2. Job on Step turning and taper turning on lathe machine
3. Job on Thread cutting and knurling on -lathe machine.
4. Job on Drilling and Tapping
5. Job on Shaping and Planning
6. Job on Slotting
7. Job on Milling (groove cutting/ gear cutting)
8. Job on Cylindrical and Surface Grinding
9. Job on Grinding of Tool angles.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**

<b>B. Tech III-I Sem. (ME)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>2</b>	<b>0</b>	<b>2</b>	<b>0</b>
<b>15A99501 SOCIAL VALUES &amp; ETHICS (AUDIT COURSE)</b>				
<i>(Common to all Branches)</i>				

**UNIT - I**

**Introduction and Basic Concepts of Society: Family and Society:** Concept of family, community, PRIs and other community based organizations and society, growing up in the family – dynamics and impact, Human values, Gender Justice.

**Channels of Youth Moments for National Building: NSS & NCC:** History, philosophy, aims & objectives; Emblems, flags, mottos, songs, badge etc.; Organizational structure, roles and responsibilities of various NSS functionaries. **Nehru Yuva Kendra (NYK):** Activities – Socio Cultural and Sports.

**UNIT – II**

Activities of NSS, NCC, NYK:

**Citizenship:** Basic Features Constitution of India, Fundamental Rights and Fundamental Duties, Human Rights, Consumer awareness and the legal rights of the consumer, RTI.

**Youth and Crime:** Sociological and psychological Factors influencing youth crime, Peer Mentoring in preventing crimes, Awareness about Anti-Ragging, Cyber Crime and its prevention, Juvenile Justice

**Social Harmony and National Integration:** Indian history and culture, Role of youth in peace-building and conflict resolution, Role of youth in Nation building.

**UNIT – III**

**Environment Issues:** Environment conservation, enrichment and Sustainability, Climate change, Waste management, Natural resource management (Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation).

**Health, Hygiene & Sanitation:** Definition, needs and scope of health education, Food and Nutrition, Safe drinking water, Sanitation, Swachh Bharat Abhiyan.

**Disaster Management:** Introduction to Disaster Management, classification of disasters, Role of youth in Disaster Management. Home Nursing, First Aid.

**Civil/ Self Defense:** Civil defense services, aims and objectives of civil defense, Need for self defense training – Teakwondo, Judo, karate etc.,

## UNIT – IV

**Gender Sensitization:** Understanding Gender – Gender inequality – Role of Family, Society and State; Challenges – Declining Sex Ratio – Sexual Harassment – Domestic Violence; Gender Equality – Initiatives of Government – Schemes, Law; Initiates of NGOs – Awareness, Movements;

## UNIT - V

**Physical Education :** Games & Sports: Health and Recreation – Biological basis of Physical activity – benefits of exercise – Physical, Psychological, Social; Physiology of Muscular Activity, Respiration, Blood Circulation.

**Yoga:** Basics of Yoga – Yoga Protocol, Postures, Asanas, Pranayama: Introduction of Kriyas, Bandhas and Mudras.

### TEXT BOOKS:

1. NSS MANUAL
2. SOCIETY AND ENVIRONMENT: A.S.Chauha, Jain Brothers Publications, 6<sup>th</sup> Edition, 2006
3. INDIAN SOCIAL PROBLEM: G.R.Madan, Asian Publisher House
4. INDIAN SOCIAL PROBLEM: Ram Ahuja, Rawat Publications
5. HUMAN SOCIETY: Kingsley Davis, Macmillan
6. SOCIETY: Mac Iver D Page, Macmillan
7. SOCIOLOGY – THEMES AND PERSPECTIVES: Michael Honalambos, Oxford University Press
8. CONSTITUTION OF INDIA: D.D.Basu, Lexis Nexis Butterworth Publishers
9. National Youth Policy 2014 (available on [www.yas.nic.in](http://www.yas.nic.in))
10. TOWARDS A WORLD OF EQUALS: A.Suneetha, Uma Bhrugudanda, Duggirala Vasantha, Rama Melkote, Vasudha Nagraj, Asma Rasheed, Gogu Shyamala, Deepa Streenivas and Susie Tharu
10. LIGHT ON YOGA : B.K.S.Iyengar, Penguin Random House Publishers

[www.un.org](http://www.un.org)

[www.india.gov.in](http://www.india.gov.in)

[www.yas.nic.in](http://www.yas.nic.in)

<http://www.who.int/countries/ind/en/>

<http://www.ndma.gov.in>

<http://ayush.gov.in/event/common-yoga-protocol-2016-0>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ME)**

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**15A03601 OPERATIONS RESEARCH****Course Objective:**

*The subject should enable the students to the nature and scope of various decision making situations within business contexts, understand and apply operation research techniques to industrial applications,*

*To make the student capable of Formulating the various real life decision making problems as Mathematical programming problems. Students to learn the fundamental Techniques of Operations Research and to choose a suitable OR technique to solve problem on hand.*

**UNIT I**

Introduction to OR and Linear Programming-1

OR definition– Classification of Models –Types of Operations Research models;

Linear Programming- Problem Formulation, Graphical Method, Simplex Method, Two–Phase Simplex Method, Big-M Method

Special Cases of LP- Degeneracy, Infeasibility and Multiple Optimal Solutions;

**Learning Outcome & Suggested Student Activities:**

*At the end of the Unit, the student will be able to create mathematical models of the real life situations and capable of obtaining best solution using Graphical Method and Simplex Method.*

*(The student must refer to any of the text books and practice solving several problems as it is very common to make mistakes while solving due to lack of practice). The student should take up a real life problem and formulate it as a mathematical programming problem.*

*Further, the students may visit the following URL for live online tutorial for LPP formulation*

*<http://www.mathsdoctor.tv>*

**UNIT II**

Linear programming-2: Duality- Principle, Economic Interpretation of Duality, Dual Simplex Method

Transportation Problem – Formulation; Different Methods of Obtaining Initial Basic Feasible Solution- North-West Corner Rule, Least Cost Method, Vogel's Approximation Method;

Optimality Testing.

Special Cases -Unbalanced Transportation Problem, Degenerate Problem;

Assignment Problem – Formulation; Optimal Solution -Traveling Salesman problem.

**Learning Outcome & Suggested Student Activities:**

*At the end of this Unit, the student must be able to implement the theory of duality for simplifying the solution procedure for certain LPPs, and solve the special cases of LPP such as Transportation and Assignment problems. A large number of problems are to be solved by the student in order to gain much required capability of handling the problems without mistakes.*

*The following URLs will be useful to the students for in-depth knowledge*

*<http://nptel.iitm.ac.in/video.php?subjectId=112106134>,*

*[http://www.Math.harvard.edu/archive/20\\_spring\\_05/handouts](http://www.Math.harvard.edu/archive/20_spring_05/handouts)*

**UNIT III**

Game Theory: Introduction – Minimax (Maximin) Criterion and Optimal Strategy, Saddle Point, Solution of Games with Pure Strategy – Games with Mixed Strategies– Dominance Principle– Graphical Method, Algebraic methods, sub matrices method.

Queuing Theory: Introduction – Terminology, Service Channel, Arrival Pattern, Population, Departure Pattern (Service Pattern), Queue Discipline, Birth & Death Process, Balking, Reneging, Jockeying; Single Channel Models with Poisson Arrivals, Exponential Service Times with finite queue length and non-finite queue length; Multichannel Models with Poisson Arrivals, Exponential Service Times with finite queue length and non finite queue length.

**Learning Outcome & Suggested Student Activities:**

*At the end of this Unit, the student will have knowledge of choosing the best strategy out of the available strategies which is an essential skill for any business manager to successfully face the competition. The following web link will direct the students to the video lecture on Game Theory.*

*[http://www.youtube.com/watch?feature=player\\_detailpage&v=h0bdo06qNVw](http://www.youtube.com/watch?feature=player_detailpage&v=h0bdo06qNVw)*

*The student will be capable of identifying the suitable Queuing Model for real world waiting lines and make estimations like Average Waiting Times, Average Queue Length, Probability of Waiting in the queue etc.*

*The students may watch the following web video for better understanding of the subject.*

*[http://www.youtube.com/watch?feature=player\\_detailpage&v=xGkpXk-AnWU#t=104s](http://www.youtube.com/watch?feature=player_detailpage&v=xGkpXk-AnWU#t=104s)*

*The students should refer to any OR text book for more number of practice problems.*

**UNIT IV**

Sequencing -Assumptions-n-jobs-2 Machines model, n-jobs-3-machines models & n jobs – m Machines models.

PERT & CPM: Introduction to Project Management, Activities, Events, Predecessor Relationships, AOA Diagram, Early Start, Early Finish, Late Start & Late Finish Times, Earliest Occurrence and Latest Occurrence of the Event, Total Float, Free Float, Independent Float

CPM- Deterministic Model- Critical Path, Crashing, Optimal Project Duration, Least Possible Project Duration

PERT- Probabilistic Model- Various types of Activity Time Estimates, Standard Deviation and Variance of the Activities and Projects, and Probability of Completing the Project within scheduled time

**Learning Outcome & Suggested Student Activities:**

*At the end of this Unit, student will be able to represent any project in the form of a network and estimate the parameters like Project Completion Time, Project Costs, and Optimum Duration of the Project, Probabilities of completing Projects as per schedule etc by applying either CPM or PERT technique as per the suitability.*

*The following URL will lead us to a video lecture on this Unit*

*[http://www.youtube.com/watch?feature=player\\_detailpage&v=H58TPQNr2kM](http://www.youtube.com/watch?feature=player_detailpage&v=H58TPQNr2kM)*

## UNIT V

Dynamic Programming : Introduction – Bellman's Principle of Optimality – Applications of Dynamic Programming- Capital Budgeting Problem – Shortest Path Problem – Solution of Linear Programming Problem by DP

Replacement Models: Introduction –Types of Replacement Problem, Determination of Economic Life of an Asset, and Simple Probabilistic Model for Items which completely fail-Individual Replacement Model, Group Replacement Model.

**Learning Outcome & Suggested Student Activities:**

*At the end of this Unit, the student will be aware of applying Dynamic Programming technique to solve the complex problems by breaking them into a series of sub-problems. The following URL contains a video lecture on Dynamic Programming and the students are advised to go through*

*[http://www.youtube.com/watch?feature=player\\_detailpage&v=ug7O1ISZyg0](http://www.youtube.com/watch?feature=player_detailpage&v=ug7O1ISZyg0)*

*Further, the student will gain knowledge in different types of maintenance, failure patterns and the economic replacement policies which are very much important for the continuous functioning of machinery in an organization. The students may visit the following websites for better understanding of the subject.*

*<http://www2.ensc.sfu.ca/undergrad/courses/ENSC201/Unit09/lecture9.html>*

*<http://pakaccountants.com/what-is-depreciated-replacement-cost/>*

**Text Books:**

1. Operation Research, J.K.Sharma,MacMilan, 5<sup>th</sup> edition, 2013.
2. Introduction to Operations Research, H.A.Taha, PHI, 9<sup>th</sup> edition, 2013.

**Reference Books:**

1. *Operations Research*, Dr. C.Nadhamuni Reddy & Sri Gopal Krishna, Kurnool Publishers
2. *Operations Research* by R Panneerselvam, PHI, 2<sup>nd</sup> edition, 2012.
3. *Operations Research*, Wagner, PHI Publications , 2<sup>nd</sup> edition.
4. *Operations Research*, S.R. Yadav, A.K.Malik, Oxford, 2015
5. *Operations Research*, A.M.Natarajan,P.Balasubramani,A. Tamilarasi,Pearson Education, 8<sup>th</sup> edition, 2011.

**Web References:**

<http://www2.informs.org/Resources/>

<http://www.mit.edu/~orc/>

<http://www.ieor.columbia.edu/>

<http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm>

<http://www.wolfram.com/solutions/OperationsResearch/>

<http://nptel.iitm.ac.in/video.php?subjectId=112106134>



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03602 DESIGN OF MACHINE MEMBERS– II****Course Objective:**

*To aware the student about basic concepts of curved beams with different cross sections, design of power transmission elements, understand the design concepts of various types of springs, various types of bearings and gears.*

*To know the students how to apply design concepts in designing of IC engine parts like Piston, cylinder, connecting rod and crank shaft.*

**UNIT I**

**DESIGN OF CURVED BEAMS:** Stresses in curved beams, Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section. Design of crane hooks, C-clamps.

**DESIGN OF POWER TRANSMISSIONS SYSTEMS:** Design of Flat belt drives, V-belt drives & rope drives. Selection of wire ropes, design procedure for chain drives.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are able to design crane hooks, C-clamps and various belt, rope and chain drives. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of power transmission elements.*

*<http://machinedesign.com/>*

*<http://www.youtube.com/watch?v=PEKfS2Q1WqM&list=PL3D4EECEFAA99D9BE&index=19>*

*<http://www.youtube.com/watch?v=nMsB6Soz4Hc&list=PL3D4EECEFAA99D9BE&index=30>*

**UNIT II**

**DESIGN OF MECHANICAL SPRINGS:** Stress and deflections of helical Springs- Springs for fatigue loading – Natural frequency of helical springs-Energy storage capacity- Helical Torsion springs- Design of leaf springs.

**DESIGN OF POWER SCREWS:** Design of screw- Square, ACME and Buttress screws- Efficiency of the screw. Design of compound screw, differential screw, ball screw- possible failures

**Learning Outcome & Suggested Student Activities:**

After completion of this unit, students are able to design helical springs for two wheel vehicle and laminated springs for trucks. Also students can apply design concepts in designing power screws. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of springs and power screws.

<http://machinedesign.com/>

<http://www.youtube.com/watch?v=PEKfS2Q1WqM&list=PL3D4EECEFAA99D9BE&index=19>

<http://www.youtube.com/watch?v=46quOD7V-cQ&list=PL3D4EECEFAA99D9BE&index=28>

**UNIT III**

DESIGN OF BEARINGS: Types of Journal bearings – Lubrication – bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, bearing life –Failure of bearings.

**Learning Outcome & Suggested Student Activities:**

After completion of this unit students are able to design journal bearings, ball bearings and roller bearings and to know the advantages of rolling contact bearings against sliding contact bearings. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of bearings.

<http://machinedesign.com/>

<http://www.mae.ncsu.edu/klang/courses/mae442/Tranmission/Journal%20Bearing.ppt>

[http://nhbb.com/files/catalog\\_pages/HiTech\\_Catalog.pdf](http://nhbb.com/files/catalog_pages/HiTech_Catalog.pdf)

**UNIT IV**

DESIGN OF SPUR & HELICAL GEARS: Spur gears- Helical gears – Bending strength – Design analysis of spur and Helical gears – Estimation of centre distance, module and face width. Check for dynamic and wear considerations.

**Learning Outcome & Suggested Student Activities:**

After completion of this unit students are able to design spur and helical gears for different input conditions. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of gears.

<http://machinedesign.com/>

[http://nptel.iitm.ac.in/courses/IIT-MADRAS/Machine\\_Design\\_II/pdf/2\\_9.pdf](http://nptel.iitm.ac.in/courses/IIT-MADRAS/Machine_Design_II/pdf/2_9.pdf)

<http://www.youtube.com/watch?v=8bml2pK6Ra0>

**UNIT V**

DESIGN OF IC ENGINE PARTS: Pistons– Design of piston. Cylinder, Connecting Rod. Crank shafts- Center and over hung cranks.

**Learning Outcome & Suggested Student Activities:**

After completion of this unit students are able to know various forces acting on I C engine parts and failure criteria to be adopted for various parts. In addition to text books, the following URLs will be highly useful to the students to understand various concepts of design of IC Engine parts.

<http://machinedesign.com/>

[http://umpir.ump.edu.my/1778/1/Design\\_Of\\_Cooecting\\_Rod\\_Of\\_Internal\\_Combustion\\_Engine\\_A\\_Topology\\_Optimization\\_Approach.pdf](http://umpir.ump.edu.my/1778/1/Design_Of_Cooecting_Rod_Of_Internal_Combustion_Engine_A_Topology_Optimization_Approach.pdf)

<http://www.d-p.com.gr/pistons/piston-designs.html>

**Text Books:**

1. MechanicalEngineeringDesign, Joseph E. Shigely, TMH Publishers, New Delhi, 9<sup>th</sup> edition, 2010.
2. Machine Design, R.L. Norton, Tata McGraw Hill Publishers, 2<sup>nd</sup> edition, 2012.

**Reference Books:**

1. Machine Design, Schaum's series, TMH Publishers, New Delhi, 1<sup>st</sup> edition, 2011
2. Design of Machine Elements, V.B. Bhandari, TMH Publishers, New Delhi, 2<sup>nd</sup> edition, 2013.
3. Machine Design, Sadhu Singh, Khanna Publishers, New Delhi
4. Design of Machine Elements, M.F. Spotts, PHI Publishers, New Delhi.
5. Machine Design, Pandya and Shah, Charotar Publishers, Anand, 17<sup>th</sup> edition, 2012.

**NOTE:** Design data books are permitted in the examinations.

**Web References:**

<http://www.uni.edu/~rao/Md-17%20Shaft%20Design.pdf>

<http://www.uni.edu/~rao/Md-15%20Keys%20and%20Couplings.pdf>

<http://etidweb.tamu.edu/ftp/ENTC463/Notes/ENTC463Key%20and%20Coupling.pdf>

<http://www.science.howstuffworks.com/transport/engines.../bearing1.html>

<http://www.fi.edu/time/Journey/Time/Escapements/gearint.html>

**Suggestions:**

1. students may visit nearby automobile workshops and machine tool shops to know about different machine elements like gears, bearings, springs, power screws, flexible drives and I C engine parts.
2. In addition to the text books students may also go through the reference books authored by V.B. Bhandari, by Pandya and Shah for more number of numerical problems.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03603 HEAT TRANSFER****Course Objective:**

*The students will gain the ability to get an in-depth understanding of the principles governing the transfer of heat, the techniques, tools and skills required to solve typical thermal related problems, the analysis of energy flows in complicated systems and the design of efficient heat transfer equipments. Enables the student to utilize analogies to solve heat transfer problems. Further students gain hands-on experience in heat transfer experimentation through a number of laboratory tests.*

**UNIT I**

Introduction: Modes and Mechanisms of Heat Transfer – Basic Laws of Heat Transfer – General Applications of Heat Transfer.

Conduction Heat Transfer: Fourier Rate Equation – General Heat Conduction Equation In Cartesian, Cylindrical and Spherical Coordinates.

Simplification and Forms of the Field Equation – Steady, Unsteady and Periodic Heat Transfer – Boundary and Initial Conditions.

One Dimensional Steady State Heat Conduction: In Homogeneous Slabs, Hollow Cylinders and Spheres – Overall Heat Transfer Coefficient – Electrical Analogy – Critical Radius/Thickness of Insulation – With Variable Thermal Conductivity – With Internal Heat Sources or Heat Generation

**Learning Outcome & Suggested Student Activities:**

*After the completion of the unit, student can able to grasp the concept of steady state conduction. Student can learn representing conduction equation in various forms. Student can imply concept successfully to problems encounter in day to day life. The following URL's will be highly useful to students.*

*<http://k12videos.mit.edu/content/heat-transfer;>*

*<http://www.youtube.com/watch?v=9WwSaIP5pbs>*

*<http://www.youtube.com/watch?v=HIYCR7gXXFo;>*

*<http://www.youtube.com/watch?v=S57nls503fA>*

*<http://energy.concord.org/jr/experiments-page3.html>*

**UNIT II**

Heat Transfer in Extended Surface (Fins) – efficiency, effectiveness and temperature distribution on Long Fin, Fin with Insulated Tip and Short Fin, Application to Errors in Temperature Measurement.

One Dimensional Transient Heat Conduction: In Systems with Negligible Internal Resistance – Significance of Biot and Fourier Numbers – Chart Solutions of Transient Conduction Systems – Problems on Semi-infinite Body.

**Learning Outcome & Suggested Student Activities:**

*After the completion of the chapter, student is expected understand the concept of extended surfaces and its applications. Also, student can aware transient heat conduction and how it vary w.r.t time. Student is expected to develop the ability to formulate practical conduction heat transfer problems by transforming the physical system into a Mathematical model and selecting an appropriate solution technique and evaluating the significance of results.*

*The following URLs will be highly useful to the students*  
<http://www.youtube.com/watch?v=cMmREKOhIV8>  
<http://www.youtube.com/watch?v=HiX7DKUIAOM>

### UNIT III

Convective Heat Transfer: Dimensional Analysis – Buckingham  $\Pi$  Theorem and Its Application for Developing Semi – Empirical Non-Dimensional Correlations for Convective Heat Transfer – Significance of Non-Dimensional Numbers – Concepts of Continuity, Momentum And Energy Equations.

Forced Convection: External Flows: Concepts of Hydrodynamic and Thermal Boundary Layer and Use of Empirical Correlations for Convective Heat Transfer for Flow Over – Flat Plates, Cylinders and Spheres.

Internal Flows: Division of Internal Flow through Concepts of Hydrodynamic and Thermal Entry Lengths – Use of Empirical Relations for Convective Heat Transfer in Horizontal Pipe Flow, Annular Flow.

Free Convection: Development of Hydrodynamic and Thermal Boundary Layer along a Vertical Plate – Use of Empirical Relations for Convective Heat Transfer on Plates and Cylinders in Horizontal and Vertical Orientation.

**Learning outcome & Suggested Student Activities:**

*At the end of the chapter, Student will have the ability to formulate practical forced and natural convection heat transfer problems by transforming the physical system into a mathematical model, selecting an appropriate solution technique and evaluating the significance of results. Students will also demonstrate an ability to analyze the performance.*

*The following URLs will be highly useful to the students*  
<http://www.youtube.com/watch?v=HIYCR7gXXFo>  
<http://www.youtube.com/watch?v=S57nls503fA>;  
<http://energy.concord.org/ir/experiments-page3.html>

## UNIT IV

Heat Transfer with Phase Change:

Boiling: Pool Boiling – Regimes, Determination of Heat Transfer Coefficient in Nucleate Boiling, Critical Heat Flux and Film Boiling.

Condensation: Filmwise and Dropwise Condensation – Nusselt's Theory of Condensation on a Vertical Plate – Film Condensation on Vertical and Horizontal Cylinders Using Empirical Correlations.

Heat Exchangers: Classification of Heat Exchangers – Overall Heat Transfer Coefficient and Fouling Factor – Concepts of LMTD and NTU Methods – Problems using LMTD And NTU Methods.

### **Learning outcome & Suggested Student Activities:**

*After the completion of the chapter, student will be able to calculate heat transfer in condensation and boiling systems, turbulent and laminar film condensation. Student can understand the concepts of critical heat flux and different models of critical heat flux. Student can able to grasp the fundamentals of heat exchangers and its analysis. The following URLs will be highly useful to the students to understand simple heat exchangers.*

*MIT: Professor Z. S. Spakovszky's Lecture Notes on Thermodynamics & Propulsion: "Section 18.5: Heat Exchangers" (HTML)*

*Lecture: YouTube: Stanford University: Professor Channing Robertson's Introduction to Chemical Engineering: "Lecture 12: Heat Exchangers"*

*<http://www.youtube.com/watch?v=Gu1ApKpcxQc>*

## UNIT V

Radiative Heat Transfer: Emission Characteristics and Laws of Black-Body Radiation – Irradiation – Total and Monochromatic Quantities– Laws of Planck, Wien, Kirchoff, Lambert, Stefan And Boltzmann – Heat Exchange Between Two Black Bodies – Concepts of Shape Factor – Emissivity – Heat Exchange Between Gray Bodies – Radiation Shields – Electrical Analogy for Radiation Networks.

### **Learning outcome & Suggested Student Activities:**

*At the end of the unit, student can have knowledge on fundamental laws of radiative heat transfer. Also, student can understand the concept of radiative heat transfer between black bodies and grey bodies. Student can know radiation shields and their applications. Student can determine shape factor for different geometries and can know its importance in determining radiative heat transfer.*

*The following URLs will be highly useful to the students - <http://energy.concord.org/ir/experiments-page5.html>*

**Text Books:**

1. *Fundamentals of Engg. Heat and Mass Transfer*, R.C. Sachdeva, 4/e, New Age International, 2010.

**Reference Books:**

1. *Heat Transfer*, P.K.Nag, 3/e, TMH, 2011
2. *Heat Transfer*, S.P.Sukhatme, University Press, 4<sup>th</sup> edition, 2005
3. *Heat Transfer*, Holman.J.P, 10/e, TMH, 2012
4. *Heat and Mass Transfer*, R.K.Rajput, S.Chand & Company Ltd, 2001
5. *Fundamentals of Heat and Mass Transfer*, Kondandaraman, C.P., 3/e, New Age Publ.
6. *Heat and Mass Transfer*, D.K.Dixit, McGrawHill, 2016
7. *Thermal Engineering Data Book*, B.S.Reddy and K.H.Reddy Rev/e, I.K. International, 2007

**NOTE:** Heat transfer Data books are permitted for Exam.

**Suggestion:**

1. Student is advised to visit heat transfer laboratory to understand the concept of three modes of heat transfer.

**Web References:**

IIT video lectures (NPTEL)

<http://www.wisc-online.com/Objects/ViewObject.aspx?ID=SCE304>

<http://web.cecs.pdx.edu/~gerry/heatAnimations/sphereTransient/#TOC>

<http://rpaulsingh.com/animated%20figures/animationlisttopic.htm>

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<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03604 FINITE ELEMENT METHODS****Course objective:**

*The subject should enable the students to learn the principles involved in discretization in finite element approach, form stiffness matrices and force vectors for simple elements, find the various approach followed in finite element approach, use the various elements for discretization and learn about shape functions.*

*To learn the application of FEM to various structural problems incorporating temperature.*

*and boundary conditions and heat transfer problems.*

**UNIT I**

INTRODUCTION: Equilibrium equations in elasticity subjected to body force, traction forces and point loads, stress strain relations in 3D elasticity, plane stress and plane strain, Boundary conditions, Initial conditions. Governing equation for Steady state heat conduction with convective boundary conditions.

Approximate methods for solving the differential equations: Rayleigh-Ritz method, Weighted residual methods, Galerkin's method.

Integral formulation: Principle of a minimum potential energy, principle of virtual work, Generalized Finite element approach in solving these problems.

Solution methods for solving simultaneous equations.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are able to know introductory basic principles and approaches for solving FEM problems in different fields. In addition to text books, the following URLs will be highly useful to the students to understand basic approaches to formulate and solving of FEM problems.*

*<http://www.youtube.com/watch?v=NYiZQszx9cQ&list=PLA4CBD0C55B9C3878&index=1>*

*<http://www.youtube.com/watch?v=RQBXWF9b-Fs&list=PLA4CBD0C55B9C3878>*

**UNIT II**

Problems with One-dimensional geometry:

Bars: Formulation of stiffness matrix, Load vectors, Incorporation of boundary conditions: Elimination approach and penalty approach.

Trusses: Plane truss and space truss elements, Example problems involving plane truss elements. Examples involving multipoint constraints. Stress calculations.



Beams & Frames: Bending of beams, Interpolation functions, formulation of stiffness matrix and load vectors. Plane frames, space frames. Transformations of stiffness and load vectors.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are able to formulate FEM model for simple problems. In addition to text books, the following URLs will be highly useful to the students to formulate FEM models for simple problems using different elements.*

[http://web.iitd.ac.in/~achawla/public\\_html/429/fem/overview.pdf](http://web.iitd.ac.in/~achawla/public_html/429/fem/overview.pdf)

[http://www.cmmacs.ernet.in/cmmacs/Lect\\_notes/sangeeta1.pdf](http://www.cmmacs.ernet.in/cmmacs/Lect_notes/sangeeta1.pdf)

<http://www.mecheng.iisc.ernet.in/~suresh/me237/fea/Chapter4.pdf>

### UNIT III

INTERPOLATION MODELS: Polynomial form of interpolation functions - linear, quadratic and cubic, simplex, complex, Multiplex elements, Selection of the order of the interpolation polynomial, Convergence requirements, 2D Pascal Triangle, Linear interpolation polynomials in terms of global coordinates for triangular (2D simplex) elements, Linear interpolation polynomials in terms of local coordinates for triangular (2D simplex) elements, quadrilateral element.

HIGHER ORDER AND ISOPARAMETRIC ELEMENTS: Lagrangian interpolation, Higher order one dimensional elements- quadratic, Cubic element and their shape functions, properties of shape functions, Shape functions of 2D quadratic triangular element in natural coordinates, 2D quadrilateral element shape functions – linear, quadratic, Biquadric rectangular element Tetrahedral and hexahedral elements.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are able to write interpolation functions to higher order isoparametric elements. In addition to text books, the following URLs will be highly useful to the students to understand basic concepts of isoparametric elements.*

<http://www.kochmann.caltech.edu/ae108a/IsoparametricElements.pdf>

<http://www.me.mtu.edu/~bettig/MEEM4405/Lecture08.pdf>

<http://site.iugaza.edu.ps/marafa/files/FEM-Chapter-10.pdf>

### UNIT IV

FINITE ELEMENT APPLICATION IN SOLID MECHANICS:

Problem modeling and Finite element analysis in 2D plane elasticity with triangular and quadrilateral elements, Isoparametric, subparametric and superparametric elements. Interpolation, Jacobian, matrices relating strain and nodal displacements, stiffness matrix formulation, Consistent and lumped load vectors, Numerical integration Gaussian quadrature.

Axi-symmetric triangular elements: formulation of stiffness and load vectors.

Introduction to 3D stress analysis.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are able to derive element matrices for applying the principles to find stresses in beams and trusses and temperature distribution in composite walls and fins. In addition to text books, the following URLs will be highly useful to the students to develop and solve FEM models using beam and truss elements.*

<http://www.youtube.com/watch?v=UeatU9OpDNA&list=PLA4CBD0C55B9C3878>

[http://uqu.edu.sa/files2/tiny\\_mce/plugins/filemanager/files/4041296/ComputerApplicationsInStructures/LeturesTutorialsDownloadedFromWeb/Lecture%202%20Truss%20and%20Beam%20FEM.pdf](http://uqu.edu.sa/files2/tiny_mce/plugins/filemanager/files/4041296/ComputerApplicationsInStructures/LeturesTutorialsDownloadedFromWeb/Lecture%202%20Truss%20and%20Beam%20FEM.pdf)

<http://www.engineering.uiowa.edu/~sxiao/class/058-153/lecture-24.pdf>

[www.rpi.edu/~des/CST.ppt](http://www.rpi.edu/~des/CST.ppt)

**UNIT V****HEAT TRANSFER AND FLUID MECHANICS PROBLEMS:**

Steady state heat conduction with convective and heat flux boundary conditions, Functional approach, Galerkin approach formulation of element characteristic matrices and vectors in 1D and 2D problems. Temperature distribution in composite walls one dimensional and two dimensional fins and extended surfaces.

Two dimensional potential flow problems: Potential function formulation and stream function formulation.

**Learning Outcome & Suggested Student Activities:**

*After completion of this unit students are able to solve bars, trusses, beams and heat transfer problems using FEM and also to apply boundary conditions in realistic problems. In addition to text books, the following URLs will be highly useful to the students to develop and solve FEM models using different elements. The students are also advised to use FEM software to solve all application problems.*

<http://www.mecheng.iisc.ernet.in/~suresh/me237/fea/Chapter6.pdf>

<http://www.colorado.edu/engineering/cas/courses.d/IFEM.d/IFEM.Ch22.d/IFEM.Ch22.pdf>

**Text Books:**

1. *Introduction to Finite Element in Engineering*, Tirupati Chandrapatla and Bellagundu, Pearson Education, New Delhi.
2. *Finite Element Methods*, S. S. Rao, Pergamom Press, New York

**Reference Books:**

1. *Finite Element Method* by R. Dhanaraj, K. Prabhakaran Nair Oxford University Press
2. *Introduction to FEM*, J. N. Reddy, TMH Publishers, New Delhi.
3. *Finite Element Analysis*, C.S. Krishna Moorthy, TMH Publishers, New Delhi.
4. *Fundamentals of Finite Element Analysis*, David V. Hutton , TMH Publishers, New Delhi.
5. *Introduction to the Finite Element Methods*, Desai and Abel , CBS Publishers, New Delhi.
6. *Finite and Boundary Methods in Engineering*, O.P.Gupta, Oxford and IBH Publishers, New Delhi.
7. *Finite Element Modeling for Stress Analysis*, R. D. Cook, John. Wiley & Sons, 1995.

**WEB REFERENCES**

1. *Finite Element Method* IIT Kanpur Course, Prof. C.S. Upadhyay  
<http://nptel.iitm.ac.in/video.php?subjectId=112104115>
2. *Computational Methods in Design and Manufacturing* by Dr. R. Krishnakumar,  
Department of Mechanical Engineering, IIT Madras  
<http://nptel.iitm.ac.in/video.php?subjectId=112106135>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ME)**

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**15A03605 METAL FORMING PROCESSES****Course Objective:**

*Metal forming processes are highly non linear because they involve geometric, material and contact non linearity. And so this subject introduce the concepts of one, two and three dimensional stress analysis, theory of plasticity, strain hardening, hot and cold working process. The students also will get the awareness on various types of rolling mills, forgings, extrusions, wire drawing processes, sheet metal operations, concepts on plastic manufacturing processes and rapid manufacturing process and its applications.*

**UNIT 1**

Stress, strain, Two dimensional stress analysis and three dimensional stress analysis, relation between engineering stress and true stress, relation between engineering strain and true strain, yield criteria, yield locus, theory of plasticity, Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of Cold and Hot worked parts

**Learning Outcome & Suggested Student Activities:**

*Students can understand the basic concept on one, two and three dimensional stress analysis, theory of plasticity, strain hardening, hot and cold working process. The students are advised to visit the URLs <http://www.nptel.iit.ac.in/iitkgp.ac.in>, <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv234-Page1.htm>.*

**UNIT II**

ROLLING: Bulk deformation processes – Economics of bulk forming, principles and theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements, applications and, limitations, defects in rolled products – machinery and Equipment.

FORGING PROCESSES: Principles of forging –Types Forging – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects, Forces in forging of strip, disc and power requirements, applications, Equipment and their selection.

**Learning Outcome & Suggested Student Activities:**

*Students can understand the principles of rolling and forging processes, their applications and defects. The students are advised to visit URLs <http://www.nptel.iit.ac.in/iitkgp.ac.in>, <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv234-Page1.htm>*

**UNIT III**

**EXTRUSION PROCESSES:** Basic extrusion process and its characteristics. Mechanics of hot and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion Hydrostatic extrusion, forces in extrusion of cylindrical and non cylindrical components – characteristics and defects in extruded parts.

**Wire Drawing:** Process Mechanics and its characteristics, determination of degree of drawing, drawing force, power, and number of stages-defects in products.

**Learning Outcome & Suggested Student Activities:**

*Students can understand the fundamentals of extrusion process and wire drawing processes and their industrial applications. The students are advised to visit the URLs <http://www.nptel.iitm.ac.in/iitkgp.ac.in>, <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv234-Page1.htm>.*

**UNIT IV**

**Sheet Metal Working – Economical Considerations** - Stamping, forming and other cold working processes: Blanking and piercing – Bending and forming – Drawing and its types – Cup drawing and Tube drawing – coining – Hot and cold spinning. Force and power requirement in sheet metal operations, defects in sheet metal products – Equipment, tooling and their characteristics.

**Learning Outcome & Suggested Student Activities:**

*Students can understand the various press working processes, their advantages and disadvantages. The students are advised to refer the text book Workshop Technology by Hajra Choudhary. **Students are advised to visit nearby sheet metal works industries.***

**UNIT V**

**Processing of plastics**, injection and blow moulding, calendaring, thermo forming, compression moulding, transfer moulding, High energy rate forming methods Rapid manufacturing: - Introduction – concepts of rapid manufacturing, information flow for rapid prototyping, classification of rapid prototyping process, steric holography fused deposition modeling, selective laser sintering, Applications of rapid prototyping process

**Learning Outcome & Suggested Student Activities:**

*Students can understand the concept of plastic manufacturing process, rapid manufacturing process and its applications. Students are advised to visit the following URLs <http://www.nptel.iitm.ac.in/iitkgp.ac.in>, <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv234-Page1.htm>.*

**Text Books:**

1. *Manufacturing Technology, Schmid and kalpakjin, Pearson Education.*
2. *Manufacturing Technology, Foundry forming and welding, Vol I , P.N. Rao, TMH*

**Reference Books:**

1. *Production Technology*, R.K. Jain, Khanna Publishers, 17<sup>th</sup> edition, 2012
2. *Process and materials of manufacturing* –Lindberg, PE
3. *Principles of Metal Castings*, Rosenthal.
4. *Welding Process*, Parmar
5. *Manufacturing Technology*, R.K. Rajput, Laxmi Pub
6. *Rapid Prototyping Principles and Applications*, RafiqNoorani, Wiely Pub.

**Web Resources:**

[www.casde.iitb.ac.in/store/events/2003/IAT-Pune.../DFMA.ppt](http://www.casde.iitb.ac.in/store/events/2003/IAT-Pune.../DFMA.ppt)  
[www.rose-hulman.edu/~stienstr/ME470/DFA.ppt](http://www.rose-hulman.edu/~stienstr/ME470/DFA.ppt)  
[www.design4manufacturability.com/DFM\\_article.htm](http://www.design4manufacturability.com/DFM_article.htm)

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A03606 NONCONVENTIONAL SOURCES OF ENERGY  
(CBCC- I)**
**Course Objective:**

To create awareness to the student about basic concepts of non-conventional source of energy, to understand the process of collection, storage, conversion and applications of Solar Energy, Wind Energy, Bio Mass, OTEC. To learn about direct conversion methods.

**UNIT – I**

**PRINCIPLES OF SOLAR RADIATION:** Role and potential of new and renewable source, the solarenergy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrialand terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

**UNIT-II**

**SOLAR ENERGY COLLECTION:** Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

**UNIT-III**

**SOLAR ENERGY STORAGE AND APPLICATIONS:** Different methods, Sensible, latent heat andstratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**WIND ENERGY:** Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

**UNIT-IV**

**BIO-MASS:** Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gasyield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

**GEOHERMAL ENERGY:** Resources, types of wells, methods of harnessing the energy, potential inIndia.

**UNIT-V**

**OCEAN ENERGY:** OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidaland wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

**DIRECT ENERGY CONVERSION:** Need for DEC, Carnot cycle, limitations, and principles of DEC.

Thermo-electric generators, Seebeck, Peltier and Joule Thomson effects, Figure of merit, materials, applications,

MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator,

MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

**Outcomes:**

- *Understanding various Non-conventional sources of Energy.*
- *Able to learn how to use renewable energies instead of conventional fuels.*

**TEXT BOOKS:**

1. *Non-Conventional Energy Sources /G.D. Rai*
2. *Energy Resources Utilization and Technologies, Anjaneyulu Yerramilli, Francis Tului, BS Publications, 2012*

**REFERENCES :**

1. *Renewable Energy Sources/ Twidell & Weir*
2. *Non Conventional Energy Resources, B.H.Khan, McGrawHill, 2015*
3. *Solar Power Engineering/B.S.Magal Frank Kreith & J.F.Kreith.*
4. *Principles of Solar Energy/ Frank Krieth & John F Kreider.*
5. *Non-Conventional Energy/ Ashok V Desai/ Wiley Eastern*



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03607 TOTAL QUALITY MANAGEMENT  
(CBCC-I)**
**Course Objective:**

*To understand the concept of quality, cost of quality, international quality standards.*

*To learn the principles of Total quality management, techniques for problem solving.*

*To learn about various tools of quality management used in various industrial applications.*

**UNIT – I**

TQM – overview , concepts, elements – History-Quality management philosophies- Juran, Deming, Crosby , Feigenbaum, Ishikawa– Stages of Evolution– continuous improvement

– objectives – internal and external customers.

Quality standards – Need of standardization - Institutions – bodies of standardization, ISO 9000 series – ISO 14000 series – other contemporary standards – ISO certification process-Third party audit.

**UNIT – II**

Process management- Quality measurement systems (QMS) – developing and implementing QMS – nonconformance database- TQM tools & techniques- 7 QC tools- 7 New QC tools.

Problem Solving techniques - Problem Solving process – corrective action – order of precedence

**UNIT – III**

System failure analysis approach – flow chart – fault tree analysis – failure mode assessment and assignment matrix – organizing failure mode analysis – pedigree analysis.

Quality circles – organization – focus team approach – statistical process control – process chart – Ishikawa diagram – preparing and using control charts.

**UNIT IV**

Quality Function Development (QFD) – elements of QFD – benchmarking-Types- Advantages & limitations of benchmarking – Taguchi Analysis – loss function - Taguchi design of experiments. Poka-yoke, Kaizen, Deming cycle.

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**UNIT – V**

Value improvement elements – value improvement assault – supplier teaming.  
Business process reengineering & elements of Supply chain management.

Six sigma approach – application of six sigma approach to various industrial situations.

**Outcomes:**

- *Understanding the concepts of TQM.*
- *Able to use tools and techniques for problem solving.*
- *To formulate quality circles to find solutions to problems in industry.*
- *Analyze various quality problems and contribute towards continuous improvement in the system.*

**TEXT BOOKS:**

1. Total Quality Management, D.R.Kiran, BS Publications, 2016
2. Total Quality Management by Besterfield, Pearson.

**REFERENCE BOOKS:**

1. Quality management by Howard Giltow-TMH
2. Quality management by Evans.
3. Quality management by Bedi
4. Total Quality Management by Joseph & Susan Berg
5. Total Quality Management-Toward the Emerging Paradigm, Bounds, Yorks, Adams, Ranney, McGraHill, 1994

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03608 MECHATRONICS  
(CBCC- I)**
**Course Objective:**

*To make the students to learn about the Basic electronics, electrical and mechanical components used to control the machines and industries. Various types of sensors, signal conditioning systems and various pneumatic and hydraulic components used in control systems. Micro controllers, PLCS and PLC program and programmable motion control systems.*

**UNIT I**

**INTRODUCTION:** Definition – Trends - Control Methods: Stand alone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) - Applications: SPM, Robot, CNC, FMS, CIM.

***Learning outcome &Suggested Student Activities:***

*This unit helps the students to understand the importance of mechatronicssubject and controlling the various machines, robots etc. Students may observe CNC machines in CAD/CAM lab to understand the mechatronics concepts.*

*Student may refer text book - Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, Chapter- 1, by the authors - W .Bolton, publishers - Pearson Education Press, 3rd edition, 2005.Students may refer the following website  
[www.nptel.iitm.ac.in/ECE/mechatronics](http://www.nptel.iitm.ac.in/ECE/mechatronics)[www.ustudy.in/mech/mechs](http://www.ustudy.in/mech/mechs) [en.wikipedia.org/wiki/mechatronics](http://en.wikipedia.org/wiki/mechatronics) for better understanding of this topic.*

**UNIT II**

**SIGNAL CONDITIONING:** Introduction – Hardware - Digital I/O , Analog input – ADC , resolution , speed channels Filtering Noise using passive components – Resistors, capacitors - Amplifying signals using OP amps –Software - Digital Signal Processing – Low pass , high pass , notch filtering.

**Learning outcomes & Suggested Student Activities:**

*This unit helps the students to understand how to convert the analog signals into useful required form. These signal condition systems may be observed in electronics and communication engineering department labs.*

*Student may refer text book - Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, Chapter – 3, by the authors - W Bolton, publishers- Pearson Education Press, 3rd edition, 2005.*

*Students may refer the following website [www.nptel.iitm.ac.in/ECE/mechatronics](http://www.nptel.iitm.ac.in/ECE/mechatronics) [www.saylor.org/courses/me302](http://www.saylor.org/courses/me302) for better understanding of this topic.*

**UNIT III**

PRECISION MECHANICAL SYSTEMS: Pneumatic Actuation Systems - Electro-pneumatic Actuation Systems - Hydraulic Actuation Systems - Electro-hydraulic Actuation Systems - Timing Belts – Ball Screw and Nut - Linear Motion Guides - Linear Bearings - Bearings- Motor / Drive Selection.

**Learning outcome & Suggested Student Activities:**

*In this unit the students learn about the pneumatic and hydraulic systems and about some precision mechanical component which are useful in the field of automation. This automation system can be observed in many processing industries and manufacturing industries to handle the materials and control the machines (or) process. Student may refer text book - Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, Chapter-5, 6 & 7 by the authors - W .Bolton, publishers - Pearson Education Press, 3rd edition, 2005. Students may refer the following website [www.pic-design.com](http://www.pic-design.com), [www.sdp-si.com](http://www.sdp-si.com), [www.csio.res.in](http://www.csio.res.in),*

**UNIT IV**

ELECTRONIC INTERFACE SUBSYSTEMS: Motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers, over current sensing, resettable fuses, Power Supply - Bipolar transistors/ mosfets.

ELECTROMECHANICAL DRIVES: Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - PWM's - Pulse Width Modulation – Variable Frequency Drives.

**Learning outcome & Suggested Student Activities:**

The objective of this unit is to make the student aware of electronic systems, electromechanical drives used in automation. Some of the systems may be observed electrical and electronics labs for better understanding. Student may refer text book - *Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering*, Chapter- 7 by the authors – W. Bolton, publishers- Pearson Education Press, 3rd edition, 2005. Students may refer the following website [www.pic-design.com](http://www.pic-design.com), [www.sdp-si.com](http://www.sdp-si.com), [www.csio.res.info](http://www.csio.res.info) better understanding of this topic.

**UNIT V**

MICROCONTROLLERS OVERVIEW: 8051 Microcontroller , micro processor structure - Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors – Applications, Programming –Assembly.

PROGRAMMABLE LOGIC CONTROLLERS: Basic Structure - Programming: Ladder diagram -Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling -Analog input / output - PLC Selection, interface – R232 etc.,- Applications.

**Learning outcome & Suggested Student Activities:**

This unit helps the student to know about microcontrollers and to programming of programmable logic controls. Students may visit pharmaceutical industries, thermal power plants etc. To observe the PLC based control systems. to know about the interface between processing equipment and central system.

Student may refer text book - *Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering*, Chapter- 15, 14 & 19 by the authors - W .Bolton, publishers- Pearson Education Press, 3rd edition, 2005. Students may refer the following website [www.authorstream.com](http://www.authorstream.com), [www.atmel.in](http://www.atmel.in), [www.lifehacker.com](http://www.lifehacker.com)

**Text Books:**

1. *Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering*, W Bolton, Pearson Education Press, 3rd edition, 2005.
2. *Mechatronics*, M.D.Singh, J.G.Joshi, PHI.

**Reference Books:**

1. *Mechatronics Principles, concepts and applications*. Nitaigour premchand mahalik, MC Graw Hill Edu.
2. *Mechatronics Source Book*, Newton C Braga, Thomson Publications, Chennai.
3. *Mechatronics*, N. Shanmugam, Anuradha Agencies Publisers.
4. *Mechatronics System Design*, Devdas shetty, Richard, Thomson.
5. *Mechatronics Er. R.K. Rajput. S. Chand Publications.*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A01608 INTELLECTUAL PROPERTY RIGHTS  
(CBCC – I)**
**COURSE OBJECTIVE:**

*This course introduces the student to the basics of Intellectual Property Rights, Copy Right Laws Trade Marks and Issues related to Patents. The overall idea of the course is to help and encourage the student for startups and innovations.*

**UNIT – I**

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

**UNIT – II**

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

**UNIT – III**

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.  
Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

**UNIT – IV**

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.  
Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

**UNIT – V**

New Developments Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.  
International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law.

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**TEXT BOOKS & REFERENCES:**

1. Intellectual Property Rights, Deborah. E. Bouchoux, Cengage Learning.
2. Intellectual Property Rights– Unleashmy The Knowledge Economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing Company Ltd.,

**Course Outcomes:**

*On completion of this course, the student will have an understanding of the following:*

- a) *Intellectual Property Rights and what they mean*
- b) *Trade Marks and Patents and how to register them*
- c) *Laws Protecting the Trade Marks and Patents*
- d) *Copy Right and laws related to it.*

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR

B. Tech III-II Sem. (ME)

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## 15A03609 HEAT TRANSFER LABORATORY

**NOTE:** Thermal Engineering data books are permitted in the examinations

1. Thermal conductivity of insulating powder material through Concentric Sphere apparatus.
2. Thermal conductivity of insulating material through lagged pipe apparatus
3. Overall heat transfer co-efficient through Composite Slab Apparatus
4. Thermal Conductivity of metal (conductor).
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer coefficient in forced convection.
8. Heat transfer coefficient in natural convection
9. Experiment on Parallel and counter flow heat exchanger.
10. Emissivity of a gray body through Emissivity apparatus.
11. Experiment on Stefan Boltzman Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Experiment on Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.
15. Study of Two – Phase flow.

**Note:** Any 10 of the above 15 experiments are to be conducted.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech III-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A03610 COMPUTER AIDED ENGINEERING LAB (CAE LAB)**

I. Introduction to Analysis Software Package

II. Structural analysis: (Any Six exercises)

1. Analysis of a rectangular plate with a hole.
2. Analysis of a truss member under loading.
3. Analysis of a bracket plate with axial loading
4. Analysis of a bracket plate with eccentric loading
5. Static Analysis of Prismatic bar
6. Static Analysis of a Corner Bracket
7. Static Analysis of beam
8. Analysis of Thermally Loaded support Structure
9. Analysis of Hinged support member
10. Analysis of Tapered plate under transverse load

III. Thermal analysis:(Any two exercises)

1. Analysis of a square plate considering conduction.
2. Analysis of a square plate considering conduction and convection.
3. Analysis of a compound bodies considering conduction and convection.

IV. Computational Fluid Dynamics (Any four exercises)

1. Determine the flow of incompressible gas through an S-bend for laminar flow.
2. Determine the flow of incompressible gas through an S-bend for turbulent flow.
3. Determine that of incompressible water flowing over a cylinder.
4. Determine air flow over a simple geometry (aerofoil) in a wind tunnel (2-D).
5. Determine heat transfer from the heated fin within a rectangular enclosure containing air.
6. Determine how to solve a natural convection problem (in an infinitely long concentric cylinders).
7. Determine liquid enters through two inlets with different temperatures (multiphase flow) and leaves one outlet.

**Software can be used:** ANSYS, ALG Nastran, Star-CCM+, Fluent, FIRE. CFX.

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**B. Tech III-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A52602      ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS  
(AELCS) LAB (Audit Course)**
**1. INTRODUCTION**

With increased globalization and rapidly changing industry expectations, employers are looking for the wide cluster of skills to cater to the changing demand. The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information and to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Taking part in social and professional communication.

**2. OBJECTIVES:**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

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### 3. SYLLABUS:

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

#### **UNIT-I: COMMUNICATION SKILLS**

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary Development
4. Common Errors

#### **UNIT-II: WRITING SKILLS**

1. Report writing
2. Resume Preparation
3. E-mail Writing

#### **UNIT-III: PRESENTATION SKILLS**

1. Oral presentation
2. Power point presentation
3. Poster presentation

#### **UNIT-IV: GETTING READY FOR JOB**

1. Debates
2. Group discussions
3. Job Interviews

#### **UNIT-V: INTERPERSONAL SKILLS**

1. Time Management
2. Problem Solving & Decision Making
3. Etiquettes

### **4. LEARNING OUTCOMES:**

- Accomplishment of sound vocabulary and its proper use contextually
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

### **5. MINIMUM REQUIREMENT:**

The Advanced English Communication Skills (AECS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system

- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

## 6. SUGGESTED SOFTWARE:

The software consisting of the prescribed topics elaborated above should be procured and G

1. **Walden Infotech: Advanced English Communication Skills Lab**
2. **K-VAN SOLUTIONS-Advanced English Language Communication Skills lab**
3. **DELTA's key to the Next Generation TOEFL Test: Advanced Skills Practice.**
4. **TOEFL & GRE( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)**
5. **Train2success.com**

## 7. BOOKS RECOMMENDED:

1. **Objective English for Competitive Exams**, Hari Mohana Prasad, 4<sup>th</sup> edition, Tata Mc Graw Hill.
2. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, O U Press 3<sup>rd</sup> Edn. 2015.
3. **Essay Writing for Exams, Audrone Raskauskiene, Irena Ragaisience & Ramute Zemaitience,OUP, 2016**
4. **Soft Skills for Everyone**, Butterfield Jeff, Cengage Publications, 2011.
5. **Management Shapers Series** by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. **Campus to Corporate**, Gangadhar Joshi, Sage Publications, 2015
7. **Communicative English**,E Suresh Kumar & P.Sreehari, Orient Blackswan, 2009.
8. **English for Success in Competitive Exams**, Philip Sunil Solomon OUP, 2015

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A52601 MANAGEMENT SCIENCE**

**Course Objective:** The objective of the course is to equip the student the fundamental knowledge of management science and its application for effective management of human resource, materials and operation of an organization. It also aims to expose the students about the latest and contemporary developments in the field of management.

**UNIT –I**

**Introduction to Management:** Concept-Nature and Importance of Management, Functions-Evaluation of Scientific Management, Modern management-Motivation Theories-Leadership Styles-Decision Making Process-Designing Organization Structure-Principles and Types of Organization.

**UNIT- II**

**Operations Management:** Plant location and Layout, Methods of production, Work-Study-Statistical Quality Control through Control Charts, Objectives of Inventory Management, Need for Inventory Control-EOQ&ABC Analysis(Simple Problems)**Marketing Management:**

Meaning,Nature, Functions of Marketing, Marketing Mix, Channels of distribution- Advertisement and sales promotion-Marketing strategies-Product Life Cycle.

**UNIT –III**

**Human Resource Management(HRM):** Significant and Basic functions of HRM- Human Resource Planning(HRP), Job evaluation, Recruitment and Selection, Placement and Induction-Wage and Salary administration. Employee Training and development-Methods-Performance Appraisal-Employee Grievances-techniques of handling Grievances.

**UNIT –IV**

**Strategic Management:** Vision, Mission, Goals and Strategy- Corporate Planning Process-Environmental Scanning-SWOT analysis-Different Steps in Strateg Formulation, Implementation and Evaluation. **Project Management:** Network Analysis- PERT, CPM, Identifying Critical Path-Probability-Project Cost Analysis, Project Crashing (Simple Problems).

**UNIT-V**

**Contemporary Management Practices:** Basic concepts of MIS-Materials Requirement Planning(MRP),Just-In-Time(JIT)System, Total Quality Management(TQM)-Six Sigma

and Capability Maturity Models(CMM) evies, Supply Chain Management, Enterprise Resource Planning(ERP),Performance Management, Business Process Outsourcing(BPO), Business Process Re-Engineering and Bench Marking, Balance Score Card.

**Learning Outcome:** This course enables the student to know the principles and applications of management knowledge and exposure to the latest developments in the field. This helps to take effective and efficient management decisions on physical and human resources of an organization. Beside the knowledge of Management Science facilitates for his/her personal and professional development.

#### **TEXT BOOKS:**

1. A.R Aryasri: Management Science, TMH, 2013
2. Kumar /Rao/Chalill 'Introduction to Management Science' Cengage, Delhi, 2012.

#### **REFERENCE BOOKS:**

1. A.K.Gupta "Engineering Management",S.CHAND, New Delhi, 2016.
2. Stoner, Freeman, Gilbert, Management, Pearson Education,New Delhi, 2012.
3. Kotler Philip & Keller Kevin Lane: Marketing Mangement , PHI,2013.
5. Koontz & Weihrich: Essentials of Management, 6/e, TMH, 2005.
6. Kanishka Bedi, Production and Operations Management, Oxford University Press, 2004.
7. Memoria & S.V.Gauker, Personnel Management, Himalaya, 25/e, 2005
8. Parnell: Strategic Management, Biztantra, 2003.
9. L.S.Srinath: PERT/CPM,Affiliated East-West Press, 2005.

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<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03701 AUTOMOBILE ENGINEERING****Course Objective:**

*The students acquires sufficient knowledge to classify Engines, Chassis, Fuel Supply Systems, Cooling Methods, Lubrication Methods, Ignition Systems, Generating Systems, Suspension Systems, transmission system, steering mechanism and braking methods.*

*The students get the working knowledge of assembly of various components of layout and of various electrical equipment of an automobile.*

**UNIT I**

Introduction: Components of a Four Wheeler Automobile – Chassis and Body – Power Unit –Power Transmission – Rear Wheel Drive, Front Wheel Drive, Four Wheel Drive – Types of Automobile Engines, Engine Construction, Turbo Charging and Super Charging – Oil Filters, Oil Pumps – Crank Case Ventilation.

**Learning outcome & Suggested Student Activities:**

*Student can understand the function of each and every component of an automobile. Student can understand the use of turbo charging and super charging. Students may refer the following website [auto.howstuffworks.com](http://auto.howstuffworks.com), [www.em.gov.au](http://www.em.gov.au) for better understanding of this topic.*

**UNIT II**

Transmission System: Clutches- Principle- Types: Cone Clutch, Single Plate Clutch, Multi Plate Clutch, Magnetic and Centrifugal Clutches, Fluid Fly Wheel – Gear Box- Types: Sliding Mesh, Constant Mesh, Synchromesh, Epi-Cyclic, Over Drive, Torque Converter.

Propeller Shaft – Hotch – Kiss Drive, Torque Tube Drive, Universal Joint, Differential, Rear Axles.

**Learning outcome & Suggested Activities:**

*Student can be able to grasp the knowledge on emission standards, emission control techniques and electrical systems. Student can identify thrust areas for carrying their dissertation in future. Students may refer the following website [www.dec.ny.gov](http://www.dec.ny.gov), [www.studymode.com](http://www.studymode.com), [www.ehow.com](http://www.ehow.com), [www.automotiveservices.blogspot.com](http://www.automotiveservices.blogspot.com) for better understanding of this topic.*

**UNIT III**

Steering System: Steering Geometry – Camber, Castor, King Pin Rake, Combined Angle Toe-In, Center Point Steering. Types Of Steering Mechanism – Ackerman Steering Mechanism, Davis Steering Mechanism, Steering Gears – Types, Steering Linkages.

**Learning outcome & Suggested Student Activities:**

*At the end of the unit, student can have broad knowledge on each and every component of transmission system of a automobile. Students may refer the following websites [en-wikipedia.org/wiki/transmission](http://en-wikipedia.org/wiki/transmission), [www.youtube.com](http://www.youtube.com), [www.youtube.com](http://www.youtube.com), [jalopink.com](http://jalopink.com), [www.geansandstuff.com](http://www.geansandstuff.com) for better understanding of this topic.*

**UNIT IV**

Suspension System: Objects of Suspension Systems – Rigid Axle Suspension System, Torsion Bar, Shock Absorber, Independent Suspension System.  
Braking System: Mechanical Brake System, Hydraulic Brake System, Pneumatic and Vacuum Brake Systems.

**Learning outcome & Suggested Student Activities:**

*After the completion of the chapter, student can able to understand purpose and methods of steering systems and their applications. Students may refer the following website [www.scribd.com](http://www.scribd.com), [www.youtube.com](http://www.youtube.com), [leemyles.com](http://leemyles.com) [www.howcanworks.com](http://www.howcanworks.com), [www.forza.se/sider/of/listton/bi/stein1.pdf](http://www.forza.se/sider/of/listton/bi/stein1.pdf) for better understanding of this topic.*

**UNIT V**

Emissions from Automobiles – Pollution Standards National and International – Pollution Control– Techniques – Multipoint Fuel Injection for SI Engines- Common Rail Diesel Injection, Emissions from Alternative Energy Sources– Hydrogen, Biomass, Alcohols, LPG, CNG - Their Merits And Demerits.  
Electrical System: Charging Circuit, Generator, Current – Voltage Regulator – Starting System, Bendix Drive, Mechanism of Solenoid Switch, Lighting Systems, Horn, Wiper, Fuel Gauge – Oil Pressure Gauge, Engine Temperature Indicator.

**Learning outcome & Suggested Student Activities:**

*At the end of the unit. Student can have ample knowledge on suspension system and braking system of an automobile.  
Students may refer the following website [www.youtube.com](http://www.youtube.com), [www.howcanworks.com](http://www.howcanworks.com), [www.forza.se/sider/of/listton/bi/stein1.pdf](http://www.forza.se/sider/of/listton/bi/stein1.pdf) for better understanding of this topic.*



**Text Books:**

1. *Automotive Mechanics – Vol. 1 & Vol. 2*, Kirpal Singh, Standard Publishers Distributors, 13<sup>th</sup> edition, 2013.
2. *Automobile Engineering*, William Crouse, TMH, 10<sup>th</sup> edition, 2006.

**Reference Books:**

1. *Automobile Engineering*, R.K.Rajput, Laxmi Pub, 1<sup>st</sup> edition, 2013.
2. *Automobile Engineering*, K.K.Ramalingam/Scitech Pub, 2<sup>nd</sup> edition.
3. *Automotive engines*, Newton, Steeds & Garret.

**Books in Digital Libraray:**

[www.nptel.iitm.ac.in](http://www.nptel.iitm.ac.in)

**Suggestions:**

*Student is requested to visit the research and development cell of Automobile manufacturing companies and A.R.A.I emission testing centers.*

*For better understanding of these systems students may visit the Automobile service centre and APSRTC workshop.*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (ME)**

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**15A03702 CAD/CAM****Course objective:**

*The objective of the this subject is to enable the students to understand and handle design problems in symmetric manner, gain practical experience in handling 2-D drafting and 3-D modeling software systems, apply CAD in real life applications, understand the concepts G and M codes and manual part programming and know the applications of CNC machines. Further the students will become familiar on principles of computer graphics, geometric modeling, NC and CNC machines, group technology and FMS.*

**UNIT I**

Overview of CAD/CAM: Product cycle, CAD, CAM and CIM. CAD Tools, CAM Tools, Utilization in an Industrial Environment, Evaluation criteria. CAD standards, CAD data structure, Data base management systems.

Computer Graphics: Co-ordinate systems, Graphics package functions, 2D and 3D transformations, homogeneous transformations, clipping, hidden line / surface removal colour, shading.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the basic concepts Automation, components of CAD/CAM, input and output components of CAD, Steps involved in computer aided design.*

**UNIT II**

Geometric Modeling: Representation techniques, Parametric and non parametric representation, various construction methods, wire frame modeling, synthetic curves and their representations, surface modeling, synthetics surfaces and their representations.

Solid modeling, solid representation, fundamentals, introduction to boundary representations, constructive solid geometry, analytical solid modeling.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the geometric model of the component in CAD technology of computer graphics. The techniques of raster technology, scan conversion, clipping, removal of hidden lines and hidden surfaces, color, shading and texture.*

**UNIT III**

Numerical Control: NC, NC Modes, NC Elements, NC Machine tools and their structure, Machining centre, types and features. Controls in NC, CNC systems, DNC systems. Adaptive control machining systems, types of adaptive control.

CNC Part Programming: Fundamentals, NC word, NC Codes, canned cycles, cutter radius compensation, length compensation, computed assisted part programming using APT: Geometry statements, motion statements, post process statements, auxiliary statements, macro statement program for simple components.

**Learning outcomes & Suggested Student Activities:**

*Geometric Modelling constitutes the most important and complex part in most of CDA software packages. Hence the students should focus on various requirements of information that are generated during geometric modeling stage, various types and its applications. Mathematical representations of curves used in geometric construction.*

**UNIT IV**

Group Technology & FMS: Part Family, Classification and Coding, advantages & limitations, Group technology machine cells, benefits. FMS: Introduction, components of FMS, material handling systems, Computer control systems, advantages.

Computer Aided Quality Control: Terminology in Quality control, Inspection and testing, Contact inspection methods - optical and non optical, integration of CAQC with CAD and CIM

**Learning outcome & Suggested Student Activities:**

*CNC has revolutionized the manufacturing automation. The flexibility of manufacturing achieved with the use of CNC and associated Technology. The students should aimed to understand the principle of NC, CNC, Machining Centre and various methods of part programming. The student is advised to visit manufacturing industry where the CNC machines are using and also interact with CNC programmer in industry.*

**UNIT V**

Computer Aided Processes Planning: Retrieval type and Generative type, benefits, Machinability data systems, Computer generated time standards.

Computer integrated production planning: Capacity planning, shop floor control, MRP-I, MRP-II, CIMS benefits. Trends in Manufacturing systems: Concepts of Reconfigurable manufacturing, Sustainable manufacturing and lean manufacturing.

**Learning outcomes & Suggested Student Activities:**

*Understanding the need of GT as a means of bringing the benefits of mass production to relatively smaller production. Understanding the need of computers in process planning and QC. Understanding the definition and concept of FMS, and its elements etc.*

**Text Books:**

1. CAD/CAM, A Zimmers&P.Groover, PE, PHI
2. CAD/CAM-Principles and applications, P.N. Rao, TMH, 3<sup>rd</sup> edition, 2010

**Reference Books:**

1. Computer Aided Design & Manufacturing, Lalit Narayan/Mallikarjuna Rao/M.M.M.Sarcar.PHI(2015)
2. Automation, Production systems & Computer integrated Manufacturing ,Groover, P.E
3. CAD/CAM/CIM, Radhakrishnan and Subramaniam, New Age, 3<sup>rd</sup> edition, 2008
4. Principles of Computer Aided Design and Manufacturing, FaridAmirouche, Pearson
5. CAD/CAM Theory and Practice, R. Sivasubramaniam, TMH
6. Computer Aided Design and Manufacturing, K.Lalit Narayan , PHI, 2008.
7. Computer Aided Manufacturing, T.C. Chang, Pearson, 3<sup>rd</sup> edition, 2008
8. A text book of CAD/CAM, CSP Rao, Hitech Publ.

**Web References:**

[http://www.cadcamfunda.com/cam\\_computer\\_aided\\_manufacturing](http://www.cadcamfunda.com/cam_computer_aided_manufacturing)  
<http://wings.buffalo.edu/eng/mae/courses/460-564/Course-Notes/cnc-classnotes.pdf>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
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**15A03703 METROLOGY AND MEASUREMENTS****Course objective:**

*Students will be able to understand the Limits and Fits, linear measurements and angular measurements, gauges, comparators, optical measuring methods, measurement of flatness and roughness of surface. And also learn about the screw thread and gear measuring methods, Alignment tests on machine tools.*

*Students will be able to understand various transducers to measure displacement like Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers and also learn about Calibration procedure, temperature and pressure calibration methods, the measurement of flow stress, strain measurements acceleration and vibration.*

**UNIT I**

LIMITS, FITS and TOLERANCES : Introduction, Definitions, fits and their types – unilateral and bilateral tolerance system, hole and shaft basis systems – interchangeability and selective assembly. Indian standard system – International Standard organization system for plain work.

LIMIT GAUGES and GAUGE DESIGN: Plug, Ring, Snap, Gap, Taper gauges. Taylor's principle. Design of Go and No Go gauges.

COMPARATORS: Principle of Measurement with Mechanical, Optical, Electrical, Electronic, Pneumatic comparators and their uses.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the Limits, Fits and Tolerance. Indian standard system – International Standard organization system. He will know the principles of working of the most commonly used instruments for measuring linear and angular distances.*

<http://www.nptel.iit.ac.in>

<http://www.learnerstv.com/Free-Engineering-Video-lectures-Itv113-Page1.htm>

**UNIT II**

LINEAR MEASUREMENT: Length standard, line and end & wavelength standards, slip gauges – calibration of the slip gauges, Dial indicator, micrometers, vernier height gauges.

MEASUREMENT OF ANGLES AND TAPERS: Different methods – Bevel protractor – angle gauges – spirit levels – sine bar – Sine plate, rollers and spheres used to determine the tapers.

FLATNESS MEASUREMENT: Measurement of flatness of surfaces – straight edges– surface plates – optical flat and auto collimators, interferometer and their uses.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to study the different types of Comparators, optical measuring instruments, flatness measurement methods and measuring methods of surface roughness. <http://www.nptel.iitm.ac.in/> and for notes, <http://www.learnerstv.com/Free-Engineering-Video-lectures-Itv113-Page1.htm>*

### UNIT III

SURFACE ROUGHNESS MEASUREMENT: Differences between surface roughness and surface waviness- Numerical assessment of surface finish – CLA, R.M.S Values –  $R_a$ ,  $R_z$  values, Methods of measurement of surface finish-profilograph, Talysurf, BIS symbols for indication of surface finish.

SCREW THREAD MEASUREMENT: Elements of measurement – errors in screw threads – measurement of effective diameter, angle of thread and thread pitch- profile thread gauges.

GEAR MEASUREMENT: Gear measuring instruments, Gear tooth profile measurement. Measurement of diameter, pitch, pressure angle and tooth thickness.

MACHINE TOOL ALIGNMENT TESTS: Requirements of Machine Tool Alignment Tests, Alignment tests on lathe, milling and drilling machine tools. Preparation of acceptance charts.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand, Screw thread elements and measuring methods, Gear tooth profile measurement, CMM, Alignment tests on lathe, milling and drilling machine tools.*

### UNIT IV

MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement - Piezo electric, Inductive, capacitance, resistance, ionization and Photo electric transducers, Calibration procedures.

MEASUREMENT OF SPEED: Mechanical Tachometers - Electrical tachometers - Stroboscope, Noncontact type of tachometer .

STRESS & STRAIN MEASUREMENTS: Various types - electrical strain gauge - gauge factor - method of usage of resistance strain gauge for bending, compressive and tensile strains - usage for measuring torque, Strain gauge Rosettes.

MEASUREMENT OF ACCELERATION AND VIBRATION: Different simple instruments - Principles of Seismic instruments - Vibrometer and accelerometer.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand working of various instruments used for measuring for displacement, temperature and pressure.*

**UNIT V**

MEASUREMENT OF TEMPERATURE: Standards and calibration, thermal expansion methods, thermo electric sensors(thermocouples), Electrical Resistance sensors, Junction semiconductor sensors, Digital thermometers, Radiation methods.

MEASUREMENT OF PRESSURE AND SOUND: Standards and calibration, basic methods of pressure measurement, dead weight gauges and manometers, Elastic transducers, vibrating cylinder, resonant transducers, High and low pressure measurement, sound measurement.

MEASUREMENT OF FORCE, TORQUE, POWER: Standards and calibration, Basic methods of Force Measurement, Torque measurement on rotating shafts, shaft power measurement(dynamometers), Vibrating wire force transducers.

**Learning outcome & Suggested Student Activities:**

After completion of this unit students are able to understand working of various instruments used for measuring for flow, speed, stress, strain and Vibration.

**Text Books:**

- (1) *Mechanical Measurements*, Beckwith, Marangoni, Linehard, PHI, PE
- (2) *Measurement systems: Application and design*, Doebelin Earnest. O. Adaptation by Manik and Dhanesh, TMH, 2012.
- (3) *Engineering Metrology*, R.K. Jain, Khanna Publishers, 20<sup>th</sup> edition, 2013.

**Reference Books:**

- (1) *Engineering Metrology*, Mahajan, Dhanpat Rai, 2<sup>nd</sup> edition, 2013.
- (2) *BIS standards on Limits & Fits*
- (3) *Fundamentals of Dimensional Metrology*, Connie Dn, CENGAGE LEARNERS
- (4) *Metrology & Measurement* by Anand K Bewoor, vinay A kulkarni, McGrawHill, 2013.
- (5) *Instrumentation, measurement & analysis*, B.C.Nakra&KKChoudhary, TMH, 6<sup>th</sup> edition, 2011.

**Web References:**

<http://emtoolbox.nist.gov>  
[CambridgeViscosity.com/Viscometer](http://CambridgeViscosity.com/Viscometer)  
[www.e.FlukeCal.com/Calibration](http://www.e.FlukeCal.com/Calibration)  
[www.inscotemperature.com/](http://www.inscotemperature.com/)  
[www.solartronmetrology.com/](http://www.solartronmetrology.com/)

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**15A03704 REFRIGERATION AND AIR CONDITIONING  
(CBCC- II)**
**Course Objective:**

*This subject provides insights in how thermodynamic principles are applied within the refrigeration and air conditioning industry. It gives details on how different components work and influence each other. Students will learn how real systems used in commercial , industrial refrigeration and air conditioning industries are built-up.*

*The objective this subject is to make the student to have complete knowledge on various refrigeration methods like VCR, VAR and latest developments, knowledge on various air conditioning methods like summer, winter and year round air conditioning and to make the student to understand the practical applications of refrigeration and air conditioning systems.*

**UNIT I**

Introduction to Refrigeration: Necessity and Applications, Carnot Refrigerator, First and Second Law Applied to Refrigerating Machines, Unit of Refrigeration, COP, EER, Different Refrigeration Methods

Air Refrigeration: Bell-Coleman Cycle, Ideal and Actual Cycles, Open and Dense Air Systems -Numerical Problems – Refrigeration Needs of Air Crafts.

**Learning Outcome & Suggested Student Activities:**

*At the end of the chapter, student can able to understand the terminologies associated with refrigeration and also understand the basic principles of Refrigeration and applications. Student can also know the aspects of various natural refrigeration methods; understand the components of Air refrigeration system and the necessity of air craft refrigeration.*

*The following URLs are very useful to the students*

*<http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/pdf/RAC%20%20Lecture%201.pdf>*

*<http://www.ignou.ac.in/upload/Unit%201-32.pdf>*

*<http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/pdf/RAC%20Lecture%209.pdf>*

**UNIT II**

Vapour Compression Refrigeration ( VCR ) System – Basic Cycle - Working Principle and Essential Components of The Plant – COP – Representation of Cycle On T-S and P-h Charts – Expander Vs. Throttling, Effect of Sub Cooling and Super Heating – Cycle



Analysis – Actual Cycle- Influence of Various Parameters on System Performance – Construction and Use of P-h Charts – Numerical Problems.

Refrigerants – Desirable Properties – Classification of Refrigerants Used – Nomenclature- Secondary Refrigerants- Lubricants – Ozone Depletion – Global Warming- Newer Refrigerants.

**Learning Outcome & Suggested Student Activities:**

*After the completion of the chapter, student can know the purpose and function of each of the components in the domestic refrigerator, analyzing the concepts of sub-cooling and super heating to improve the COP and also necessity of replacements for CFCs and HCFCs with new refrigerants. Following URLs are highly useful to the students*

*[http://www.nptel.iitm.ac.in/courses/IITMADRAS/Applied\\_Thermodynamics/Module\\_6/6\\_Simple\\_Vapor\\_Compression\\_RS.pdf](http://www.nptel.iitm.ac.in/courses/IITMADRAS/Applied_Thermodynamics/Module_6/6_Simple_Vapor_Compression_RS.pdf)*

*[http://www.mcquay.com/mcquaybiz/literature/lit\\_ch\\_wc/AppGuide/AG31-007.pdf](http://www.mcquay.com/mcquaybiz/literature/lit_ch_wc/AppGuide/AG31-007.pdf)*

### UNIT III

Vapor Absorption Refrigeration ( VAR ) System – Description and Working of NH<sub>3</sub> – Water System and Li Br –Water ( Two Shell & Four Shell) System -Calculation of Max COP, Principle of Operation of Three Fluid Absorption System.

Steam Jet Refrigeration System: Working Principle and Basic Components-Estimation of Motive Steam Required, Principle and Operation of: (I) Thermo-Electric Refrigerator (II) Vortex Tube OrHilsch Tube.

**Learning Outcome & Suggested Student Activities:**

*After the completion of the chapter, student can know the purpose and function of each of the basic components of the absorption refrigeration system. Student can have knowledge on latest developments of Electrolux, thermo electric vortex tube methods. Following URLs are highly useful to the students*

*[http://nptel.iitm.ac.in/courses/Webcourse-](http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/pdf/RAC%20Lecture%2014.pdf)*

*[contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/pdf/RAC%20Lecture%2014.p](http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/pdf/RAC%20Lecture%2014.pdf)*

*[df](http://en.wikipedia.org/wiki/Thermoelectric_cooling)*  
*[http://en.wikipedia.org/wiki/Thermoelectric\\_cooling](http://en.wikipedia.org/wiki/Thermoelectric_cooling)*

### UNIT IV

Introduction to Air Conditioning: Psychrometric Properties & Processes – Characterization of Sensible and Latent Heat Loads — Need For Ventilation, Consideration of Infiltrated Air – Heat Load Concepts.

Air Conditioning Systems: Air Cooler (Evaporative Cooling) ,Window, Split, Summer , Winter, Year Round, Central Air Conditioning Systems.

**Learning Outcome & Suggested Student Activities:**

*After the end of the chapter, student can have knowledge on the use of psychrometric terms in Air conditioning. Student can learn the use of psychrometric chart to know psychrometric properties of air. Student can able to understand the terms sensible heat load and latent heat load. This technical information is fundamental to all types of*

domestic, commercial and industrial systems for the calculations of heat loads. Student is advised to conduct experiment on A.C tutor in the laboratory. Following URLs are highly useful to the students

<http://server.fst.uga.edu/kerr/FDST%204060/pdf%20files/7%20Psychrometrics.pdf>

<http://people.eng.unimelb.edu.au/mjbrear/436-432/chapter%208%20-%20psychrometry.pdf>

<http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/pdf/R&AC%20Lecture%2031.pdf>

## UNIT V

Air Conditioning Equipment - Humidifiers – Dehumidifiers – Air Filters, Fans and Blowers.

Human Comfort: Requirements of Temperature, Humidity And Concept of Effective Temperature, Comfort Chart. Heat Pump – Heat Sources – Different Heat Pump Circuits.

### **Learning Outcome & Suggested Student Activities:**

After the completion of the chapter, student can understand the components of A/C system and describe the cooling equipment combinations. Student can describe the concept of human comfort chart and the processes by which the body produces and rejects heat. Student can be familiar with the Heat pump circuit analysis. Following URLs are highly useful to the students

Effective temp- <http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Ref%20and%20Air%20Cond/pdf/R&AC%20Lecture%2029.pdf>

[http://courses.washington.edu/me333afe/Comfort\\_Health.pdf](http://courses.washington.edu/me333afe/Comfort_Health.pdf)

<http://web.me.unr.edu/me372/Spring2001/Heat%20Pumps.pdf>

### **Text Books:**

1. Refrigeration and Air Conditioning ,CP Arora,TMH, 15<sup>th</sup> edition, 2013.
2. A Course in Refrigeration and Air conditioning,S.CArora&Domkundwar, Dhanpatrai

### **Reference Books:**

1. Refrigeration and Air Conditioning / Manohar Prasad / New Age, 2<sup>nd</sup> edition, 2013
2. Principles of Refrigeration - Dossat / Pearson Education, 4<sup>th</sup> edition, 2007.
3. Refrigeration and Air Conditioning-P.L.Ballaney, 2<sup>nd</sup> edition, 2012.
4. Basic Refrigeration and Air-Conditioning – P.N.Ananthanarayanan / TMH, 4<sup>th</sup> edition, 2013.

**NOTE:** Tables/Codes: Thermal Engineering Data Book containing Réfrigérant and Psychrometric property Tables and charts are permitted in Exam

**Suggestions:**

The entire syllabus is covered in the text book – “A Course in Refrigeration and Air conditioning” by Domkundwar, Arora, Dhanpatrai Publications (Highly useful book for GATE exam and other Government /Private sector competitive examinations)

Students can visit the nearby small scale Industries like Ice Plants to understand the principles of production of Ice and to observe the other simple components for practical understanding. Student is also advised to visit domestic refrigerator manufacturing industries/ Centralized and Split A/C system units.

Students are advised to watch the video lectures in the website - <http://nptel.iitm.ac.in>  
The fundamental concepts of Thermodynamics, Psychrometrics etc., are required for better understanding of this subject.

**Web Resources:**

<http://www.refrigerationbasics.com/index.htm> <http://www.howstuffworks.com/ac.htm>

<http://www.ashrae.org>

<http://www.taftan.com/thermodynamics/AIRCOND.HTM>

<http://www.wisegeek.com/how-does-air-conditioning-work.htm>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (ME)**

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**15A03705 TOOL DESIGN  
(CBCC- II)**
**Course Objective:**

*To make the students to understand the design of single point cutting tool.*

*To learn about the design of drilling tool, tool wear Machinability index and tool life.*

*To make the students to understand jigs and fixtures, design principle of jigs and fixtures, locating and clamping principles.*

*To learn about the sheet metal operations, Design forming ,drawings ,Bending and drawing dies, forming dies.*

*To make the students to understand plastics commonly used as tooling material.*

**UNIT I**

Tool materials: Ferrous, non ferrous, materials, heat treatment, plastics Classification of moulds used in processing of plastics, Design of injection, blow, and compression moulds.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit, students are able to understand the fundamentals of plastics as tooling materials, processing of plastics for tooling materials, heat treatment of materials, ferrous, nonferrous, non metallic, tooling materials.*

**UNIT II**

Design of single point cutting tools: Single point, cutting tools-various systems of specifications, geometry and their interrelation, theories of formation of chip and their effect.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand single point cutting tool geometry and its design theory of chip formation.*

**UNIT III**

Design of multipoint cutting tools: Drill geometry, Design of Drills, Rake & Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, milling cutters, cutting speeds and feed-machining times-design-form cutters, combination tools, reamers etc.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the drilling tool geometry and its design. Tool life, machinability and tool wear.*

**UNIT IV**

Design of jigs and fixtures: Basic principles of location and clamping, locating, methods and devices, jigs, definitions, types, general consideration in the design of jigs, drills bushing, methods of construction, fixtures-vice fixtures milling, boring, and lathe grinding fixtures.

**Learning outcome &Suggested Student Activities:**

*After completion of this unit students are able to understand the design of Jigs and fixtures and advantages and disadvantages of Jigs and fixtures, types of Jigs & Fixtures – Principles of location and clamping. Some examples of jigs and fixtures.*

**UNIT V**

Design of sheet metal blanking and piercing: Fundamentals of die cutting operating, power press- types, General press information, Material handling equipment, cutting action in punch and die operation. Die clearance, and types of Die construction. Die design fundamentals-blanking and piercing die construction, pilots, stripper and pressure pads presswork material, strip layout.

Design of sheet metal bending, forming and drawings die: Bending dies, drawing dies, forming dies, drawing operations, variables that effect metal flow during drawing. Determination of blank size, drawing force, single and double action draw dies.

**Learning outcome &Suggested Student Activities:**

*After completion of this unit students are able to understand the press working operations like punching, blanking, bending, drawing and forming, types of power presses, design of die, strip layout*

**Text Books:**

1. Tool Design, Donaldson, Lecain and Goold, Tata McGraw Hill, 4<sup>th</sup> edition, 2012.
2. Principles of Metal cutting, A Bhattacharya, New Central Book Agency, Calcutta
3. ASTME Hand book on Tool Design.

**Reference Books:**

1. Production Engineering Design (Tool Design) , SurendraKenav and Umesh 'Chandra, Satyaprakashan, New Delhi 1994..
2. Design of cutting Tools. Use of Metal Cutting Theory. ASTME publication Michigan USA, 1969.Amitabha Battacharya

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (ME)**

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**15A03706 MODERN MANUFACTURING METHODS  
(CBCC- II)**
**UNIT I**

Need for Modern Manufacturing Methods: Non-traditional machining methods and rapid prototyping

methods - their relevance for precision and lean manufacturing.

Classification of non-traditional processes - their selection for processing of different materials and the range of applications.

Introduction to rapid prototyping - Classification of rapid prototyping methods - stereolithography, fused deposition methods - materials, principle of prototyping and various applications.

**UNIT II**

Ultrasonic machining – Elements of the process, mechanics of material removal, process parameters, applications and limitations.

Abrasive jet, Water jet and abrasive water jet machining: Basic mechanics of material removal, descriptive of equipment, process variables, applications and limitations.

**UNIT III**

Electro – Chemical Processes: Fundamentals of electro chemical machining, electrochemical grinding, metal removal rate in ECM, Tooling, process variables, applications, economic aspects of ECM.

Chemical Machining: Fundamentals of chemical machining- Principle of material removal- maskants – etchants- process variables, advantages and applications.

**UNIT IV**

Thermal Metal Removal Processes: Basic principle of spark erosion (EDM), Wire cut EDM, and Electric Discharge Grinding processes - Mechanics of machining, process parameters, selection of tool electrode and dielectric fluids, choice of parameters for improved surface finish and machining accuracy -

Applications of different processes and their limitations.

Plasma Machining: Principle of material removal, description of process and equipment, process

variables, scope of applications and the process limitations.

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**UNIT V**

Electron Beam Machining: Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non-thermal processes - process mechanics, parameters, applications and limitations. Laser Beam Machining: Process description, Mechanism of material removal, process parameters, capabilities and limitations, features of machining, applications and limitations.

***Text Books:***

1. *Advanced machining processes*, VK Jain, Allied publishers.
2. *Manufacturing processes for engineering materials* by Serope Kalpakjian and Steven R Schmid, 5edn, Pearson Pub.

***Reference Books:***

1. New Technology , Bhattacharya A, The Institution of Engineers, India 1984
2. Manufacturing Technology, Kalpakzian, Pearson
3. Modern Machining Process , Pandey P.C. and Shah H.S., TMH.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (ME)**

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**15A03707 COMPUTATIONAL FLUID DYNAMICS  
(CBCC- III)**
**Course Objective:**

*This course covers topics related to Computational Fluid Dynamics (CFD). CFD is an important tool in engineering analysis and design of fluid systems. In this course Students will develop the equations describing fluid flow and numerical solutions to these equations. Emphasis will be placed on understanding different approaches employed for both time and spatial discretization and how to evaluate these approaches. Students will look at time accurate and steady-state methods, explicit and implicit techniques, laminar and turbulent flow, compressible and incompressible approaches, stability considerations, etc. These techniques will be applied to applications of mixing and heat transfer.*

**UNIT I**

INTRODUCTION: Methods to solve a physical problem , numerical methods , brief comparison between FDM, FEM & FVM, applied numerical methods. Solution of a system of simultaneous linear algebraic equations, Iterative schemes of matrix inversion, direct methods for matrix inversion, direct methods for banded matrices. Finite difference applications in heat conduction and convection, heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer.

**Learning outcome & Suggested Student Activities:**

*This chapter gives the overall view of the various kinds of numerical methods adopted. It also discusses about various solutions for the numerical methods adopted in CFD. The applications of finite difference methods with examples in conduction and convective heat transfer are introduced.*

**UNIT II**

FINITE DIFFERENCES: Discretization, consistency, stability, and fundamentals of fluid flow modeling. Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods.

**Learning outcome & Suggested Student Activities:**

*This chapter gives how to discretize partial differential equations, including the governing flow equations which is the foundation for the finite difference method. Explicit and implicit approaches represent the fundamental distinction between various numerical techniques.*



**UNIT III**

ERRORS AND STABILITY ANALYSIS: introduction, first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme.

REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER: Introduction, Conservation of mass Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier stokes equations.

**Learning outcome & Suggested Student Activities:**

*This chapter focuses on numerical errors that are generated and how the numerical calculations become unstable and also entails the conservations of mass, momentum and energy equations to the fluid flow along with Navier stokes equation.*

**UNIT IV**

STEADY FLOW: Dimensions form of momentum and energy equations, navier stokes equation, and conservative body force fields, stream function, vorticity formulation, boundary, layer theory, buoyancy, driven convection and stability.

**Learning outcome & Suggested Student Activities:**

*This unit gives the fundamental principles of fluid mechanics, its governing differential equations and boundary conditions.*

**UNIT V**

SIMPLE CFD TECHNIQUES: Viscous flows conservation form space marching, relocation techniques, viscous flows, conservation from space marching relocation techniques, artificial viscosity, the alternating direction implicit techniques, pressure correction technique, computer graphic techniques used in CFD. Quasi one dimensional flow through a nozzle, turbulence models, standard and high reynolds number models and their applications.

**Learning outcome & Suggested Student Activities:**

*This unit gives the information about some techniques for numerical solutions for flow problems. These equations are applicable to time and space marching solutions especially parabolic hyperbolic and elliptic equations.*

**Text Books:**

1. Computational Fluid Dynamics, J Chung (2010), 2nd edition, Cambridge University Press, India.
2. Computational Fluid Dynamics, John .D. Anderson (2010), 3rd edition, McGraw- Hill International Edition, India.

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**Reference Books:**

1. *Computational Fluid Mechanics and Heat Transfer*, Ronnie Anderson, 3rd edition, CRC Press, Special Indian Edition.
2. *Computational aerodynamics and fluid dynamics an introduction*, Jean-Jacques Chattot (2010), 3rd edition, Springer, Germany.
3. *Essential computational fluid Dynamics* – olegzikanov, wiley India.
4. *Introduction to computational fluid dynamics* – pradip, Niyogi S.K. Chakrabary, M.K. Laha – pearson.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (ME)**

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**15A03708      AUTOMATION AND ROBOTICS**  
**(CBCC- III)**
**Course Objective:**

*The subject should enable the students to understand the principles of automation, importance of automated flow lines and its types.*

*To learn the concepts of Robotics, kinematics of robot, principles of robot drives and controls, sensors used in robots and programming methods.*

**UNIT I**

Introduction to Automation: Need, Types, Basic elements of an automated system, Manufacturing Industries, Types of production, Functions in manufacturing, Organization and information processing in manufacturing, Automation strategies and levels of automation.

Hardware components for automation and process control, mechanical feeders, hoppers, orienters, high speed automatic insertion devices.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand to know what is automation, types of automation, components of automation, strategies and levels of automation. Student is advised to visit URLs <http://www.nptel.iitm.ac.in/> and [iitb.ac.in](http://www.iitb.ac.in) , <http://www.learnerstv.com/video/Free-video-Lecture-30103-Engineering.htm> for video lectures.*

**UNIT II**

Automated flow lines: Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage.

Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

**Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the types of flow lines, quantitative analysis of flow lines, how the assembly is carried out on automated flow line without interruption and how to balance the line and flexible assembly lines. Student is advised to visit URLs <http://www.nptel.iitm.ac.in/> and [iitb.ac.in](http://www.iitb.ac.in), <http://www.learnerstv.com/video/Free-video-Lecture-30103-Engineering.htm> for video lectures.*

### UNIT III

Introduction to Industrial Robotics: Classification of Robot Configurations, functional line diagram, degrees of freedom. Components common types of arms, joints grippers, factors to be considered in the design of grippers.

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

#### **Learning outcome & Suggested Student Activities:**

*Student should come to know the various components in the anatomy of robot. By knowing this the student may apply in the design of new robotic structure. Student is advised to visit URLs*

*<http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv071-Page1.htm>*

### UNIT IV

Manipulator Kinematics: Homogenous transformations as applicable to rotation and transition - D-H notation, Forward inverse kinematics.

Robot actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

#### **Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand the applications of various types of end effectors, and sensor devices. Student should also learn about the homogeneous transformations and its applications in the analysis of a robotic structure and method of developing different types of mechanisms and kinematics of the robot. Student is advised to visit URLs <http://www.nptel.iitm.ac.in> , <http://www.iitb.ac.in> , <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv071-Page1.htm>*

### UNIT V

Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton - Euler formations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

#### **Learning outcome & Suggested Student Activities:**

*After completion of this unit students are able to understand robot programming languages which may adopt in different applications of robot. Student also knows the control motion mechanism in all devices of robot and application of robots in manufacturing sector. Student is advised to visit URLs <http://www.nptel.iitm.ac.in> and <http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv071-Page1.htm>*

**Text Books:**

1. *Automation , Production systems and CIM*, M.P. Groover/Pearson Edu.
2. *Industrial Robotics - M.P. Groover, TMH.*

**Reference Books:**

1. *Robotics , Fu K S, McGraw Hill, 4<sup>th</sup> edition, 2010.*
2. *An Introduction to Robot Technology, P. Coiffet and M. Chaironze, Kogam Page Ltd. 1983 London.*
3. *Robotic Engineering , Richard D. Klafter, Prentice Hall*
4. *Robotics, Fundamental Concepts and analysis – Ashitave Ghosal, Oxford Press, 1/e, 2006*
5. *Robotics and Control , Mittal R K & Nagrath I J , TMH.*
6. *Introduction to Robotics – John J. Craig, Pearson Edu*

**Web References:**

[http://www.cadcamfunda.com/cam\\_computer\\_aided\\_manufacturing](http://www.cadcamfunda.com/cam_computer_aided_manufacturing)  
<http://wings.buffalo.edu/eng/mae/courses/460-564/Course-Notes/cnc-classnotes.pdf>  
<http://nptel.iitm.ac.in/courses.php?branch=Mechanical>  
<http://academicearth.org/courses/introduction-to-robotics> Video  
 references:- <http://nptel.iitm.ac.in/video.php?courseId=1052>

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (ME)**

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**15A03709 PRODUCTION AND OPERATIONS MANAGEMENT  
(CBCC- III)**
**Course Objective:**

*To make the students understand the functions of production planning & controls, generating of new products, issues in product design and strategies of aggregate planning. To provide the knowledge on principles of forecasting, forecasting methods, types and its accuracy. To provide the knowledge on facilities location, various types layouts and assembly line balancing. To provide the knowledge on lean management, concepts of JIT, six sigma, quality control, MRP, ERP and LOB.*

*To make the students understand the inventory management and scheduling techniques.*

**UNIT I**

Functions of Production Planning & Controls operations & productivity, productivity measurement, Design of goods and services: selection, generating new products, product development, issues in product design.

Strategies for aggregates planning, aggregate planning using O.R. Models, Chase planning, Expediting, controlling aspects.

**Learning Outcome & Suggested Student Activities:**

*At the end of this unit students can get the concepts on Production planning & controls operations and its functions, productivity and productivity measurements, design of goods and services and aggregate planning. Students are advised to visit following URLs*

*[http://www.nptel.iitm.ac.in/courses/IIT-MADRAS/Management\\_Science\\_II/Pdf/3\\_5.pdf](http://www.nptel.iitm.ac.in/courses/IIT-MADRAS/Management_Science_II/Pdf/3_5.pdf). And also well documented note is available in pdf form at the following links.*

*[www.processprotocol.com/extranet/documents/pdf/.../production1.pdf](http://www.processprotocol.com/extranet/documents/pdf/.../production1.pdf)*

*[elearning.dbhosting.net/.../Production%20Planning%20And%20Control](http://elearning.dbhosting.net/.../Production%20Planning%20And%20Control)*

*<http://www.academicearth.org/lectures/product-development-process-observation>*

**UNIT II**

Forecasting – Importance of forecasting – Types of forecasting, their uses – General Principles of forecasting – Forecasting techniques – qualitative methods and quantitative methods – accuracy of forecasting methods. Scheduling Policies – Techniques, flow shop and job shop Scheduling techniques.

**Learning Outcome & Suggested Student Activities:**

*Students can understand the importance of forecasting, uses of long term and short term forecasting and application of qualitative and quantitative methods for finding the future demands. Students are advised to refer the text book Forecasting: Methods and Applications Spyros G. Makridakis, Steven C. Wheelwright, Rob J Hyndman. For video lectures advised to visit following URLs <http://www.learnerstv.com/video/Free-video-Lecture-2496-Management.htm>; [http://www.slideshare.net/jrdn\\_27/qualitative-and-quantitative-methods-of-research](http://www.slideshare.net/jrdn_27/qualitative-and-quantitative-methods-of-research)*

**UNIT III**

Factors affecting facilities location, mathematical models for facilities, location, Types of facilities- layout: product layout, process layout, group technology layout, Assembly line balancing, computerized layout: ALDEP, CRAFT, CORELAP.

**Learning Outcome & Suggested Student Activities:**

*At the end of the unit the student will be able to understand where the plant is to be located based on facilities available and what are the important factors affecting the facilities location of a plant, and plant layout. And also able to understand plant layout design to facilitate material flow and processing of a product in the most efficient manner through the shortest possible time. Can compare the rural & urban sites, methods of selection. The following URLs are useful to the students*  
<http://www.slideshare.net/satya4/plant-layout-16143741>  
<http://freevideolectures.com/Course/2371/Project-and-Production-Management/32>  
<http://www.tcyonline.com/video-tutorials-computerised-layout-planning/101568>

**UNIT IV**

Lean Management, philosophy and creation of lean enterprise, JIT concepts-Kanban System-Elements of total quality management, Six Sigma Quality Control.  
 MRP, lot sizing techniques in MRP, introduction to ERP, LOB (Line of Balance).

**Learning Outcome & Suggested Student Activities:**

*Students can understand the how philosophy of lean management applied to develop lean enterprise and basic concepts JIT, Six sigma control etc., Students are advised to visit the following URLs <http://www.learnerstv.com/video/Free-video-Lecture-6944-Management.htm>; <http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-852j-integrating-the-lean-enterprise-fall-2005/lecture-notes/>  
<http://freevideolectures.com/Course/2688/Human-Resource-Management/13>*

**UNIT V**

Inventory management – Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – various models Simple Problems.

**Learning Outcome & Suggested Student Activities:**

*At the end of the unit the student will be able to understand the scheduling policies, flow shop and job shop scheduling techniques and concepts of Inventory, Classification, Functions, it's associated costs etc., and also able to recognize the importance of Inventory control to ensure their availability with minimum capital lock up. The following URLs are useful to the students.*

*<http://www.technologyevaluation.com/search/for/inventory-management-pdf.html>*

*<http://freevideolectures.com/Course/3096/Operations-and-Supply-Chain-Management/10>*

**Text Books:**

1. *Production and Operations Management*, Ajay K Garg, McGrawHill, 2015
2. *Operation Management* by B. Mahadevan, PearsonEdu.
3. *Operation and O.M* by Adam & Ebert- PHI Pub.,

**Reference Books:**

1. *Operations Management* – S.N. Chary.
2. *Modern Production , Operations Management* , Baffa&Rakesh Sarin.
3. *Production Control A Quantitative Approach* , John E. Biegel.
4. *Production Control* , Moore.
5. *Operations Management* , Joseph Monks.
6. *Operation Management* by Jay Heizar& Read new Pearson
7. *Elements of Production Planning and Control*, Samuel Eilon.



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (ME)**

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**15A03710 CAD/CAM LABORATORY****LIST OF EXPERIMENTS:**

- I. 2D Drafting using Auto CAD or any drafting package
- II. 3D Modeling :
  1. Modeling of Component in 3D – V block
  2. Modeling of Component in 3D – Open Bearing
  3. Modeling of Component in 3D – Angular block
  4. Modeling of Component in 3D – Dovetail Guide
  5. Modeling of Component in 3D – Dovetail Bracket
  6. Modeling of Component in 3D – Tool post

Geometric Modeling may be done Using Auto CAD or Pro-E or CATIA or Solid Works or Iron CAD

**III. Assembly Modeling:**

1. Assembly of a screw jack parts
2. Assembly of a knuckle joint
3. Assembly of a Oldham's coupling
4. Assembly of a footstep bearing
5. Assembly of a stuffing box
6. Assembly of a square tool post

**IV. Machining of Simple Components on CNC Lathe and CNC Milling Machine.**

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-I Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A03711 METROLOGY & MEASUREMENTS LABORATORY**

Any 6 experiments from each section

**Section A:**

1. Measurement of bores by internal micrometers and dial bore indicators.
2. Use of gear teeth vernier calipers and checking the chordal addendum and chordal height of spur gear.
3. Alignment test on the lathe and milling machine
4. Study of Tool makers microscope and its application
5. Angle and taper measurements by Bevel protractor, Sine bars, spirit level etc.
6. Thread measurement by Two wire/ Three wire method.
7. Surface roughness measurement by Talysurf instrument.
8. Use of straight edge and spirit level in finding the flatness of surface plate.

**Section B:**

1. Calibration of Pressure Gauges
2. Calibration of transducer or thermocouple for temperature measurement.
3. Study and calibration of LVDT transducer for displacement measurement.
4. Study and calibration of capacitive transducer for angular measurement.
5. Study and calibration of photo and magnetic speed pickups for the measurement of speed.
6. Study and calibration of a rotometer for flow measurement.
7. Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.
8. Study and calibration of Mcleod gauge for low pressure.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**15A03801 INDUSTRIAL ENGINEERING  
(MOOCS-II)**
**UNIT I**

Concepts of Management-Administration and Organization – Functions of Management – Schools of Management Thought: Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Y, Mayo's Hawthorne Experiments, Herzberg's Two factor Theory of Motivation, Maslow's Hierarchy of Human needs – Systems Approach to Management. Organizational Structures- Functional- Divisional- Matrix etc., Basic Concepts Related to Organization – Departmentation and Decentralization and their Merits, Demerits and Suitability

**UNIT II**

Plant Location: Definition, Factors affecting the Plant Location, Comparison of Rural and Urban sites, Selection of Plant Location – Types of Production; Plant Layout: Definition, Objectives, Types of Plant Layout - Materials Handling: Functions- Objectives – Types, Selection Criteria of Material Handling Equipment.

**UNIT III**

Work Study – Definition, Objectives, Method Study – Steps Involved – Various Types of Process Charts – Micro motion and Memo motion Studies. Work Measurement - Definition, Time Study, Steps involved - Equipment, Different Methods of Performance Rating - Allowances, Standard Time Calculation. Work Sampling - Definition, Steps Involved, Standard Time Calculations - Applications.

**UNIT IV**

Inventory Models- Deterministic models- EOQ Models – With and Without Shortages Models; Inventory Models with Price Breaks - Probabilistic Models – Discrete Variable, Continuous Variable. Inventory Control Systems

**UNIT V**

Inspection & Quality Control: Statistical Quality Control- Techniques-Variables and Attributes- Control Charts: X and R Charts; P Charts and C Charts. Acceptance Sampling Plan - Single Sampling and Double Sampling Plans- OC Curves. Introduction to TQM- Quality circles-BIS & ISO Standards-Importance .

**Text Books:**

1. Manufacturing Organization and Management, T.Amrine/ Pearson, 2nd Edition, 2004
2. Industrial Engineering and Management ,O.P.Khanna, DhanpatiRai, 18th edition, 2013.
3. Industrial Engineering and Management, Dr. C.Nadamuni Reddy, New Age International Publishers, 1<sup>st</sup> edition, 2011.

**Reference Books:**

1. *Industrial Engineering and production management*, MartindTelsang S.Chand..
2. *Work Study by ILO(International Labour Organization)*
3. *Management by James AF Stoner, Freeman 6th Ed, Pearson Education, New Delhi,2005*
4. *Production and Operations management, PanneerSelvam, PHI,2004.*
5. *Statistical Quality Control by EL Grantt, McGrawhil*
6. *Motion and time studies by Ralph M Barnes, John Wiley and Sons,2004*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (ME)**

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**15A03802 PRODUCT DESIGN  
(MOOCS-II)**
**Course Objective:**

*To make the students understand the product development process, requirements setting, conception design,, embodiment design principles, to understand the basics of mechatronics and adaptronics.*

**UNIT I****PRODUCT DEVELOPMENT PROCESS**

General problem solving process - Flow of Work during the process of designing - Activity Planning Timing and scheduling, Planning Project and Product Costs - Effective Organization Structures - Interdisciplinary Cooperation, Leadership and Team behavior.

**UNIT II****TASK CLARIFICATION**

Importance of Task Clarification - Setting up a requirements list - Contents, Format, Identifying the requirements, refining and Extending the requirements, Compiling the requirements list, Examples. Using requirements lists - Updating, Partial requirements lists, Further uses - Practical applications of requirements lists.

**UNIT III****CONCEPTUAL DESIGN**

Steps in Conceptual Design.

Abstracting to identify the essential problems - Aim of Abstraction, Broadening the problem. Formulation, Identifying the essential problems from the requirements list, Establishing functions structures, Overall function, Breaking a function down into sub-functions.

Developing working structures - Searching for working principles, Combining Working Principles, Selecting Working Structures, Practical Application of working structures.

Developing Concepts - Firming up into principle solution variants, Evaluating principle solution variants, Practical Applications of working structures.

Examples of Conceptual Design - One Handed Household Water Mixing Tap, Impulse - Loading Test Rig.

## UNIT IV

EMBODIMENT DESIGN - Steps of Embodiment Design, Checklist for Embodiment Design Basic rules of Embodiment Design Principles of Embodiment Design - Principles of Force Transformations, Principles of Division of Tasks, Principles of Self-Help, Principles of Stability and Bi-Stability, Principles of Fault-Free Design

Guide for Embodiment Design - General Considerations, Design to allow for expansion, Design to allow for creep and relaxation, Design against Corrosion, Design to minimize wear, Design to Ergonomics, Design for Aesthetics, Design for Production, Design for Assembly, Design for Maintenance, Design for Recycling, Design for Minimum risk, Design to standards.

Evaluation of Embodiment Designs.

## UNIT V

MECHANICAL CONNECTIONS, MECHATRONICS AND ADAPTRONICS

Mechanical Connections - General functions and General Behavior, Material connections, From Connections, Force connections, Applications.

Mechatronics - General Architecture and Terminology, Goals and Limitations, Development of Mechatronic Solution, Examples.

Adaptronics - Fundamentals and Terminology, Goals and Limitations, Development of Adaptronics Solutions, Examples.

### **Text Books:**

1. *Engineering Design: G.Paul; W. Beitzetal, Springer International Education 2010.*
2. *Product Design And Developement: Kevin Otto: K. Wood Pearson Education 2016.*

### **Reference Books:**

1. *Product Planning Essentials: Kenith B. Kahu, Yes dee Publishing 2011.*
2. *Product Design and Development: K.T. Ulrich TMH Publishers 2011.*

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03803 COMPOSITE MATERIALS  
(MOOCS-II)**
**Unit-I**

**Introduction to Composite Materials:** Introduction, Classification: Polymer Matrix Composites. Metal Matrix Composites, Ceramic Matrix Composites, Carbon–Carbon Composites, Fiber. Reinforced Composites and nature-made composites, and applications

**Reinforcements:** Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide. fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites.

**Unit-II**

**Manufacturing methods:** Autoclave curing, tape production, moulding methods, filament winding, hand layup, pultrusion, RTM. Compression moulding, tape winding.

**Macromechanical Analysis of a Lamina:** Introduction ,Definitions: Stress, Strain ,Elastic Moduli, Strain Energy. Hooke's Law for Different Types of Materials, Plane Stress Assumption, Reduction of Hooke's Law in Three Dimensions to Two Dimensions, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina.

**Unit-III**

**Micromechanical Analysis of a Lamina:** Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi Empirical Models ,Elasticity Approach, Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion

**UNIT-IV**

**Macromechanical Analysis of Laminates:** Introduction, Laminate Code, Stress–Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate , Hygrothermal Effects in a Laminate, Warpage of Laminates

**UNIT-V**

**Failure Analysis and Design of Laminates:** Introduction, Special Cases of Laminates, Failure Criterion for a Laminate.

**Text Books:**

1. Engineering Mechanics of Composite Materials- Isaac and M Daniel, Oxford University Press, 1994.
2. Mechanics of Composite Materials, R. M. Jones, Mc Graw Hill Company, New York, 1975.

**References:**

1. Analysis and performance of fibre Composites, B. D. Agarwal and L. J. Broutman Wiley- Interscience, New York, 1980.
2. Mechanics of Composite Materials, Second Edition (Mechanical Engineering)- Autar K. Kaw, Publisher: CRC
3. Finite Element Analysis of Composite Materials, Ever J. Barbero , CRC Press, 2007.
4. Analysis of Laminated Composite Structures, L. R. Calcote, Van Nostrand Rainfold, New York, 1969.
5. Mechanics of Composite Materials and Structures, Madhujit Mukhopadhyay, University Press, 2009.
6. Composite Materials Science and Engineering, Krishan K. Chawla, Springer, 2009



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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03804 POWER PLANT ENGINEERING  
(MOOCS-III)**
**UNIT I**

Introduction To The Sources Of Energy – Resources and Development of Power in India. Layouts of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants - Combined Power Cycles - Comparison and Selection, Power Plant Economics and Environmental Considerations: Capital Cost, Investment of Fixed Charges, Operating Costs, General Arrangement of Power Distribution, Load Curves, Load Duration Curve. Definitions of Connected Load, Maximum Demand, Demand Factor, Average Load, Load Factor, Diversity Factor – Tariff - Related Exercises. Effluents from Power Plants and Impact on Environment – Pollutants and Pollution Standards – Methods of Pollution Control. Inspection And Safety Regulations.

**UNIT II**

Steam Power Plant : Modern High Pressure and Supercritical Boilers - Analysis of Power Plant Cycles - Modern Trends in Cycle Improvement - Waste Heat Recovery, Fluidized Bed Boilers., Fuel and Handling Equipments, Types of Coals, Coal Handling, Choice of Handling Equipment, Coal Storage, Ash Handling Systems.

Steam Power Plant : Combustion Process : Properties of Coal – Overfeed and Under Feed Fuel Beds, Traveling Grate Stokers, Spreader Stokers, Retort Stokers, Pulverized Fuel Burning System And Its Components, Combustion Needs and Draught System, Cyclone Furnace, Design and Construction, Dust Collectors, Cooling Towers And Heat Rejection. Analysis of Pollution from Thermal Power Plants - Pollution Controls.CO2 Recorders

**UNIT III**

Diesel Power Plant: Diesel Power Plant: Introduction – IC Engines, Types, Construction– Plant Layout with Auxiliaries – Fuel Storage Gas Turbine Plant : Introduction – Classification - Construction – Layout With Auxiliaries – Principles of Working Closed and Open Cycle Gas Turbines. Advantages And Disadvantages Combined Cycle Power Plants.

**UNIT IV**

Hydro Electric Power Plant: Water Power – Hydrological Cycle / Flow Measurement – Drainage Area Characteristics – Hydrographs – Storage and Pondage – Classification of Dams and Spill Ways.

Hydro Projects and Plant: Classification – Typical Layouts – Plant Auxiliaries – Plant Operation Pumped Storage Plants. .

## **UNIT V**

Power from Non-Conventional Sources: Utilization of Solar Collectors- Principle Of its Working, Wind Energy – Types of Turbines – HAWT & VAWT-Tidal Energy. MHD power Generation.

Nuclear Power Station: Nuclear Fuel – Nuclear Fission, Chain Reaction, Breeding and Fertile Materials – Nuclear Reactor –Reactor Operation.

Types of Reactors: Pressurized Water Reactor, Boiling Water Reactor, Sodium-Graphite Reactor, Fast

breeder Reactor, Homogeneous Reactor, Gas Cooled Reactor, Radiation Hazards and Shielding –

Radioactive Waste Disposal.

### **Text Books:**

1. *Power plant Engineering*, P.K. Nag, TMH, 3rd edition, 2013.
2. *A course in power plant Engineering*, Arora and S. Domkundwar.

### **Reference Books:**

1. *A Text Book of Power Plant Engineering* , Rajput , Laxmi Publications, 4th edition, 2012.
2. *Power plant Engineering*, Ramalingam, Scietech Publishers
3. *power plant engineering* P.C. Sharma, S.K. Kataria Publications, 2012.

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03805 GAS TURBINES AND JET PROPULSION  
(MOOCS- III)**
**UNIT-I**

Gas Turbine Operating Cycles: Simple open cycle gas turbine or air standard Brayton cycle, Actual Brayton cycle, the cycle air flow rate, the cycle work ratio, optimum pressure ratio or maximum cycle thermal efficiency, means of improving the efficiency and the specific out put of simple cycle.

**UNIT-II**

Gas Turbines; gas turbine applications, gas turbine advantages & disadvantages, energy flow & back work, deviation from ideal cycle, gas turbine with regeneration, thermal efficiency of gas turbine with & without regenerator, gas turbine engines, inter-cooling & reheating, turbojet engine, turbofan engine, turboprop engine.

**UNIT-III**

**Jet propulsion:** Historical sketch- reaction principle- essential features of propulsion devices- Thermal jet engines, classification of – energy flow, thrust, thrust power and propulsion efficiency- need for thermal jet engines and applications.

Turboprop and turbojet – thermodynamic cycles, plant layout, essential components, and principles of operation – performance evaluation – thrust augmentation and Thrust reversal – contrasting with piston engine propeller plant.

**UNIT-IV**

Ram jet- Thermo dynamic cycle, plant lay out, essential components – principle of operation – performance evaluation – comparison among atmospheric thermal jet engines- serqujet and pulse jet, elementary treatment.

**Rocket Engines:** Need for, applications- basic principle of operation and parameters of performance – classification, solid and liquid propellant rocket engines, advantages, domains of application – propellants – comparison of propulsion systems.

**UNIT-V**

**Rocket Technology:** Flight mechanics, application thrust profiles, acceleration- staging of rockets, need for – feed systems, injectors and expansion nozzles – rocket transfer and ablative cooling.

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Testing & instrumentation - need for Cryogenics – advanced propulsion systems, elementary treatment of Electrical nuclear and plasma Arc Propulsion.

**TEXT BOOKS:**

1. Gas Turbines , V. Ganesan TMGH
2. Gas turbines , cohen , Rogers & Sarvana Muttoo , Addison Wiley & longman

**REFERENCES BOOK:**

1. Thermodynamics of propulsion, Hill & Paterson.
2. Rocket Propulsion , Sutton.
3. Element of Gas Turbines propulsion , Jack D Matingly, MGH

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**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**
**B. Tech IV-II Sem. (ME)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**15A03806 ENERGY MANAGEMENT  
(MOOCS-III)**
**UNIT - I****ENGINEERING ECONOMICS:**

Managerial objectives - steps in planning- Capital budgeting- Classification of costs- Interest- Types- Nominal and effective interest rates Discrete and continuous compounding - discounting - Time value of money - Cash flow diagrams - Present worth factor, Capital recovery factor, Equal annual payments - Equivalence between cash flows.

**UNIT - II****DEPRECIATION & COST ANALYSIS:**

Aims-Physical depreciation-Functional depreciation- Methods of depreciation-Straight line method, Declining balance method, Sum of years digits method, Sinking fund method, Service output method- Capital recovery with return-Service life estimation- Morality curves. Break even analysis and break even chart- Minimum cost analysis- Benefit cost analysis- Life cycle cost analysis.

**UNIT - III****PROJECT MANAGEMENT:**

Methods of investment appraisal- Rate of return method, Payback period method, Net present value method (NPV)- Internal Rate of Return method(IRR)- Adoption of the methods in energy conservation campaign- Types of projects- Purpose of project management - Classification – Role and qualities of project manager - Types of budgets - Budget committee – budgeting.

**ENERGY MANAGEMENT PROGRAMS:**

Necessary steps of energy management programmer - Concepts of Energy management - General principles of energy management – Energy management in manufacturing and process industries- Qualities and functions of Energy manager - Language of Energy manager-Checklist for top management.

**UNIT - IV****ENERGY AUDITING:**

A definition- Objectives- Level of responsibility- Control of Energy- Uses of Energy checklists - Energy conservation- Energy index - Cost index - Pie charts-sankey diagrams Load profiles - Types of energy audits- Questionnaire - Energy audit of industries - General energy audit- Detailed energy audit - Energy saving potential.

**UNIT - V****ENERGY POLICY, SUPPLY, TRADE& PRICES:**

Energy resources in India – level of power generation – transmission & distribution of power. Indian energy policy, Energy trade & its economic impacts – domestic energy production – Energy transformation & distribution & energy self sufficiency. International & National crude oil prices – domestic fuel prices – natural gas, LPG, kerosene and firewood - pricing policy.

**TEXT BOOKS:**

1. Energy Management, Murphy W.R and Mckay G, , Elsevier, 2007
2. Albert Thumann, Handbook of Energy Audits, The Fairmont Press Inc., Atlanta gergia, 1979.

**REFERENCES BOOKS:**

1. Albert Thumann, Plant Engineer and Management guide to Energy Conservation, Van Nost and Reinhold Co., Newyork.
2. Energy Audits, E.E.O.-Book-lets, U.K. 1988.
3. Craig B.Smith, "Energy Management Principles", Pergamon Press.
4. The role of Energy Manager, E.E.O., U.K.
5. The Energy conservation Design Resource Hand Book-The Royal architectural Institute of Canada.
6. Energy Management Hand Book-Ed. By Wayne C. Turner, John Wiley and sons, 1982.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**ANANTHAPURAMU (A.P.)**  
**COURSE STRUCTURE AND SYLLABUS**  
**(For Affiliated Engineering Colleges w.e.f. 2017-18 Admitted Batch)**

**M.Tech-ECE-VLSI, VLSI SYSTEMS, VLSI SYSTEM DESIGN (VLSI, VLSIS, VLSISD)**

**M.Tech I Semester**

S.No	Subject Code	Subject	L	T	P	C
1.	17D06101	Structural Digital System Design	4	-	-	4
2.	17D57101	Advanced MOSFET Modeling	4	-	-	4
3.	17D57102	CMOS Analog IC Design	4	-	-	4
4.	17D57103	CMOS Digital IC Design	4	-	-	4
5.	17D57104 17D06103 17D57105	<b>Elective-I</b> a. VLSI Signal Processing b. Advanced Computer Architecture c. CAD for VLSI	3	-	-	3
6.	17D06202 17D55206 17D57106	<b>Elective-II</b> a. CPLD and FPGA Architectures and Applications b. ASIC Design c. Optimization Techniques in VLSI Design	3	-	-	3
7.	17D38107	Structural Digital System Design Lab	-	-	3	2
8.	17D57107	VLSI System Design Lab - I	-	-	3	2
<b>Total</b>			<b>22</b>	<b>-</b>	<b>06</b>	<b>26</b>

**M.Tech II Semester**

S.No	Subject Code	Subject	L	T	P	C
1.	17D57201	Low Power VLSI Design	4	-	-	4
2.	17D57202	CMOS Mixed signal Design	4	-	-	4
3.	17D06201	Embedded System Design	4	-	-	4
4.	17D06109	Test and Testability	4	-	-	4
5.	17D55201 17D57203 17D57204	<b>Elective-III</b> a. System On Chip Architecture b. Semiconductor Memory Design and Testing c. RF IC Design	3	-	-	3
6.	17D38202 17D55204 17D57205	<b>Elective-IV</b> a. Internet of Things b. Hardware and Software Co-design of Embedded System c. Physical Design Automation	3	-	-	3
7.	17D38208	Embedded System Design Lab	-	-	3	2
8.	17D57206	VLSI System Design Lab - II	-	-	3	2
<b>Total</b>			<b>22</b>	<b>-</b>	<b>06</b>	<b>26</b>





**M.Tech. II YEAR (III Semester)**

S. No	Course Code	Subject	L	T	P	C
1.	17D20301 17D20302 17D20303	Elective – V ( Open Elective) 1. Research Methodology 2. Human Values & Professional Ethics 3. Intellectual Property Rights	4	---	---	4
2.	17D57301	ELECTIVE – VI ( MOOCs)	--	---	---	--
3.	17D57302	Comprehensive Viva Voce	--	---	---	2
4.	17D57303	Seminar	--	---	---	2
5.	17D57304	Teaching Assignment	--	---	---	2
6.	17D57305	Project Work Phase I	--	---	---	4
	Total		4			14

**M.Tech. II YEAR (IV Semester)**

S. No	Course Code	Subject	L	T	P	C
1.	17D57401	Project Work Phase II	--	---	---	12
	Total					12

**Project Viva Voce Grades:****A: Satisfactory****B: Not Satisfactory**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year I Semester (VLSI SYSTEM DESIGN)**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**(17D06101) STRUCTURED DIGITAL SYSTEM DESIGN**

**Course Objective:**

- To study about structural functionality of different Digital blocks (Both combinational and Sequential)
- To provide an exposure to ASM charts, their notations and their realizations.
- To provide an exposure to VHDL and different styles of modeling using VHDL.
- To introduce the concept of micro programming and study issues related to micro programming

**Course Outcome:**

After Completion of this course, students will be able to

- Understand structural functionality of different digital blocks
- Represent and Realize their designs in ASM charts
- Represent their designs in different modeling styles by using VHDL
- Understand concept of Micro program and issues related to micro programming

**UNIT-1**

**BUILDING BLOCKS FOR DIGITAL DESIGN:** Multiplexer, Demultiplexer, Decoder, Encoder, Comparator, Adder, ALU, Carry-look-ahead adder.

**BUILDING BLOCKS WITH MEMORY:** Clocked building blocks, register building blocks, RAM, ROM, PLA, PAL, Timing devices.

**UNIT -II**

**DESIGN METHODS:** Elements of design style, top-down design, separation of controller and architecture, refining architecture, and control algorithm, Algorithmic State Machines, ASM chart notations.

**UNIT-III**

**REALISING ASMS** - Traditional synthesis from ASM chart, multiplexer controller method, one-shot method, ROM based method.

**ASYNCHRONOUS INPUTS AND RACES** - Asynchronous ASMs, Design for testability, test vectors, fault analysis tools.

**UNIT-IV**

**MICROPROGRAMMED DESIGN:** Classical Microprogramming with Modern Technology; Enhancing the Control Unit; The 2910 Microprogram Sequencer; Choosing a Microprogram Memory; A Development System for Microprogramming; Designing a Microprogrammed Minicomputer

**UNIT-V**

**MODELLING WITH VHDL:** CAD tools, simulators, schematic entry, synthesis from VHDL.

**DESIGN CASE STUDIES:** Single pulse, system clock, serial to parallel data conversion, traffic light controller.

**TEXT BOOKS:**

1. Franklin P. Prosser and David E. Winkel, "The Art of Digital Design", Prentice Hall.
2. Roth, "Digital System Design using VHDL", Mc. Graw Hill, 2000

**REFERENCE BOOKS:**

1. William Fletcher, An Engineering Approach to Digital Design, 1st Edition, Prentice-Hall India, 1997.
2. William J Dally and John W Poulton, Digital Systems Engineering, Cambridge University Press, 2008.
3. Jayaram Bhasker, A VHDL Primer, 3rd edition, Prentice-Hall India, 2009.
4. VHDL for Programmable Logic - Kevin Skahill, Cypress Semiconductors

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year I Semester (VLSI SYSTEM DESIGN)**  

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

  
**(17D57101) ADVANCED MOSFET MODELING**

**Course Outcomes:**

After the completion of this course, student will be able to

- Derive mathematical models for modern MOS devices.
- Provide solution to overcome short channel issues.
- Create various compact models appropriate for industry.

**UNIT I**

**BASIC DEVICE PHYSICS**

Intrinsic and extrinsic semiconductors, direct and indirect semiconductors- Electrons and holes in silicon energy bands: electron and hole densities in equilibrium- Fermi Dirac statistics, carrier concentration, ionization of impurities. Carrier transport in silicon : drift current, diffusion current. pn junctions built in potential, electric field, current voltage characteristics.

**UNIT II**

**MOSFET DEVICES**

MOS capacitors surface potential- structure characteristics, electrostatic potential and charge distribution- threshold voltage- polysilicon work function- interface states and oxide traps. Long channel MOSFETs : threshold voltage, substrate bias and temperature dependence of threshold voltage, drain current model, subthreshold characteristics, channel mobility, capacitances.

**UNIT III**

**NANO SCALED MOSFETs**

Scaling of MOSFETs: Short channel MOSFETs – short channel effects, velocity saturation, channel length modulation, DIBL, GIDL. Variability in MOSFETs. Reliability of MOSFETs high field effects, hot carrier degradation, negative bias temperature instability, MOSFET breakdown, high k dielectrics. Non classical MOSFETs : SOI MOSFETs Current voltage equations, fully depleted SOI MOSFETs, partially depleted SOI MOSFETs, Heterostructure MOSFETs, strained channel MOSFETs, Power MOSFETs, SiC MOSFETs- Silicon Nanowires-Carbon Nanotubes.

**UNIT IV**

**NOISE MODELING AND PROCESS VARIATION**

Noise sources in MOSFET: Flicker noise modeling, Thermal noise modeling- model for accurate distortion analysis- nonlinearities in CMOS devices and modeling- calculation of distortion in analog CMOS circuits. Influence of process variation- modeling of device mismatch for Analog/RF Applications- Benchmark circuits for quality assurance- Automation of the tests.

**UNIT V**

**COMPACT MODELS FOR CIRCUIT SIMULATORS**

Introduction to compact models, SPICE Level 1, 2 and 3 MOS models, BSIM model, EKV model, High frequency models- Parameter extraction of MOSFETs.

**TEXT BOOKS:**

1. Taur and T. H. Ning, —Fundamentals of Modern VLSI Devices, Cambridge University Press, Cambridge, United Kingdom, 1998.
2. Trond Ytterdal, Yuhua Cheng and Tor A. Fjeldly Wayne Wolf, —Device Modeling for Analog and RF CMOS Circuit Design, John Wiley & Sons Ltd, 2003.
3. B. G. Streetman and S. Banarjee, —Solid State Electronic Devices 6th edition, Prentice Hall of India Pvt. Ltd, New Delhi, India, 2005.
4. N. DasGupta and A. DasGupta, —Semiconductor Devices – Modeling and Technology, Prentice Hall

of India Pvt. Ltd, New Delhi, India, 2004.

**REFERENCE BOOKS:**

1. A. B. Bhattacharyya, —Compact MOSFET Models for VLSI Design, John Wiley & Sons Inc., 2009.
2. C. K. Maiti, N. B. Chakrabarti, S. K. Ray, "Strained silicon hetero structures: materials and devices", The Institution of Electrical Engineers, London, United Kingdom, 2001.
3. Weidong Liu and Chemming Hu, "BSIM 4 and MOSFET Modeling for IC simulation", World scientific and Publishing Co. Pte. Ltd. 2011

**WEB REFERENCE BOOKS:**

1. [www.fairchildsemi.com/products/discretes/fets/](http://www.fairchildsemi.com/products/discretes/fets/)
2. [www.mosis.com/pages/Technical/Testdata/submicron-spice-parameters](http://www.mosis.com/pages/Technical/Testdata/submicron-spice-parameters)
3. [en.wikipedia.org/wiki/Carbon\\_nanotube](http://en.wikipedia.org/wiki/Carbon_nanotube)
4. [www.nxp.com/wcm\\_documents/models/mos-models/model-9/aacd96\\_sel](http://www.nxp.com/wcm_documents/models/mos-models/model-9/aacd96_sel)
5. [web.cs.mun.ca/~paul/transistors/node3.html](http://web.cs.mun.ca/~paul/transistors/node3.html)
6. [www.elab.ntua.gr/bemos/index.html](http://www.elab.ntua.gr/bemos/index.html)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year I Semester (VLSI SYSTEM DESIGN)**  

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

  
**(17D57102) CMOS ANALOG IC DESIGN**

**Course Outcomes:**

After completion of the course the students will be able to

- Understand significance of different biasing styles and apply them for designing analog ICs.
- Analyze the functionality of Current Mirrors, Current Sinks, Differential amplifiers and Current amplifiers.
- Design basic building blocks of analog ICs like, current mirrors, current sources, current sinks, two stage CMOS Power amplifiers and comparators.

**UNIT –I**

**MOS Devices and Modeling:** The MOS Transistor, Passive Components-Capacitor & Resistor, Integrated circuit Layout, CMOS Device Modeling - Simple MOS Large-Signal Model, Other Model Parameters, Small-Signal Model for the MOS Transistor, Computer Simulation Models, Sub-threshold MOS Model.

**UNIT –II**

**Analog CMOS Sub-Circuits:** MOS Switch, MOS Diode, MOS Active Resistor, Current Sinks and Sources, Current Mirrors-Current mirror with Beta Helper, Degeneration, Cascode current Mirror and Wilson Current Mirror, Current and Voltage REFERENCE BOOKS, Band gap Reference.

**UNIT –III**

**CMOS Amplifiers:** Inverters, Differential Amplifiers, Cascode Amplifiers, Current Amplifiers, Output Amplifiers, High Gain Amplifiers Architectures, Mismatch-offset cancellation techniques, Reduction of Noise by offset cancellation techniques, Alternative definition of CMRR.

**UNIT –IV**

**CMOS Operational Amplifiers:** Design of CMOS Op Amps, Compensation of Op Amps, Design of Two-Stage Op Amps, Power- Supply Rejection Ratio of Two-Stage Op Amps, Cascode Op Amps, Measurement Techniques of OP Amp.

**UNIT –V**

**Comparators:** Characterization of Comparator, Two-Stage, Open-Loop Comparators, Other Open-Loop Comparators, Improving the Performance of Open-Loop Comparators, Discrete-Time Comparators.

**TEXT BOOKS:**

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition.
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.

**REFERENCE BOOKS:**

1. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edn, 2013.
2. CMOS: Circuit Design, Layout and Simulation- Baker, Li and Boyce,
3. Analysis and Design of Analog Integrated Circuits- Paul R. Gray, Paul J. Hurst, S. Lewis and R. G. Meyer, Wiley India, Fifth Edition, 2010.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year I Semester (VLSI SYSTEM DESIGN)**  

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

  
**(17D57103) CMOS DIGITAL IC DESIGN**

**Course Outcomes:**

After completion of the course the students will be able to

- Design CMOS inverters with specified noise margins and propagation
- Complete knowledge regarding the different issues associated with organization and design of semiconductor memories
- Realize and implement basic combinational and sequential elements that are commonly observed in digital ICs.
- Design basic combinational and sequential elements using NMOS and CMOS design strategies.
- Analyze the dynamic performance of CMOS circuits

**UNIT-I**

**MOS Design Pseudo NMOS Logic:** Inverter, Inverter threshold voltage, Output high voltage, Output Low voltage, Gain at gate threshold voltage, Transient response, Rise time, Fall time, Pseudo NMOS logic gates, Transistor equivalency, CMOS Inverter logic.

**UNIT-II**

**Combinational MOS Logic Circuits:** MOS logic circuits with NMOS loads, Primitive CMOS logic gates – NOR & NAND gate, Complex Logic circuits design – Realizing Boolean expressions using NMOS gates and CMOS gates, AOI and OIA gates, CMOS full adder, CMOS transmission gates, Designing with Transmission gates.

**UNIT-III**

**Sequential MOS Logic Circuits:** Behaviour of bistable elements, SR Latch, Clocked latch and flip flop circuits, CMOS D latch and edge triggered flip-flop.

**UNIT-IV**

**Dynamic Logic Circuits:** Basic principle, Voltage Bootstrapping, Synchronous dynamic pass transistor circuits, Dynamic CMOS transmission gate logic, High performance Dynamic CMOS circuits.

**UNIT-V**

**Semiconductor Memories:** Types, RAM array organization, DRAM – Types, Operation, Leakage currents in DRAM cell and refresh operation, SRAM operation Leakage currents in SRAM cells, Flash Memory-NOR flash and NAND flash

**TEXT BOOKS:**

1. Digital Integrated Circuit Design – Ken Martin, Oxford University Press, 2011.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3rd Ed., 2011.

**REFERENCE BOOKS:**

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
2. Digital Integrated Circuits – A Design Perspective, Jan M. Rabaey, AnanthaChandrakasan, BorivojeNikolic, 2nd Ed., PHI.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year I Semester (VLSI SYSTEM DESIGN)**  

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**(17D57104) VLSI SIGNAL PROCESSING**  
**Elective-I**

**Course Outcomes:**

After completion of the course the students will be able to

- Get in depth knowledge on signal processing system and various techniques of power reduction.
- Realize various adders, multipliers and filters and optimize their operation of by reducing the redundant operations
- Apply concept of pipelined architecture for various combinational and sequential circuit modules like adders, multipliers, filters
- Design Low Power IIR filters

**UNIT-I**

Transformations for retiming. Folding and unfolding DSP programs.

**UNIT-II**

Bit level arithmetic structures- parallel multipliers, interleaved floor plan and bit plan based digital filters. Bit serial multipliers. Bit serial filter design and implementation . Canonic signed digit arithmetic, Distributed arithmetic.

**UNIT-III**

Redundant arithmetic, redundant number representations , carry free radix 2 addition and subtraction . Hybrid radix 4 addition. Radix 2 hybrid redundant multiplication architectures , data format conversion. Redundant to nonredundant converter. Numerical strength reduction.

**UNIT-IV**

Synchronous pipelining and clocking styles, clock skew and clock distribution in bit level pipelined VLSI designs. Wave pipelining, constraint space diagram and degree of wave pipelining. Implementation of wave-pipelined systems. Asynchronous pipelining.

**UNIT-V**

Scaling versus power consumption. Power analysis, power reduction techniques, power estimation techniques. Low power IIR filter design . Low power CMOS lattice IIR filter.

**TEXT BOOKS:**

1. K.K. Parhi : VLSI Digital Signal Processing systems, John Wiley, 1999.
2. VLSI and Modern Signal Processing – Kung S. Y, H. J. While House, T. Kailath, 1985, Prentice Hall.

**REFERENCE BOOKS:**

1. Design of Analog – Digital VLSI Circuits for Telecommunications and Signal Processing – Jose E. France, Yannis Tsividis, 1994, Prentice Hall.
2. VLSI Digital Signal Processing – Medisetti V. K, 1995, IEEE Press (NY), USA.



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### (17D06103) ADVANCED COMPUTER ARCHITECTURE

#### Elective-I

#### Course Outcomes:

After completion of the course the students will be able to

- Know about different parallel computer models and their network properties.
- Understand about different concepts related to pipelining and super scalar techniques.
- Get complete knowledge regarding multi processors and multi computers.

#### UNIT - I

**Parallel Computer Models** – System attributes to performance, Multiprocessors and Multicomputers, Classifications of Architectures, Multivector and SIMD Computers, Architecture development tracks

#### UNIT - II

**Program and Network Properties-** Conditions for parallelism, Program partitioning and Scheduling, Program flow mechanisms, System interconnect architectures, Performance metrics and measures, Parallel Processing Applications

#### UNIT-III

**Processors and Memory Hierarchy-** Advanced Processor Technology, Superscalar and Vector processors, Memory hierarchy technology, Virtual Memory, Backplane bus systems, Cache memory organizations, Shared memory organizations

#### UNIT - IV

**Pipelining and Superscalar Techniques** Linear Pipeline processors, Nonlinear pipeline processors, Instruction pipeline design, Arithmetic pipeline design, Superscalar and Super Pipeline Design

#### UNIT- V

**Multiprocessors and Multicomputers** Multiprocessor System Interconnects, Cache Coherence and Synchronization mechanisms, Three generations of Multicomputers, Message passing mechanisms, Vector Processing principles, Principles of Multithreading

#### TEXT BOOKS:

1. Hwang kai, “Advanced Computer Architecture”, McGraw-Hill, 2001.
2. Patterson, Morgan Kaufmann, “Computer Architecture”, 2001.

#### REFERENCE BOOKS:

1. William Stallings, Computer Organization and Architecture, 8th Edition, Prentice-Hall India, 2010.
2. David A Patterson and John L. Hennessey, Computer Organization and Design, 4th Edition, Elsevier India, 2011.
3. Andrew S Tanenbaum and James R Goodman, Structured Computer Organization, 5th Edition PrenticeHall India, 2009.

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**M.Tech I year I Semester (VLSI SYSTEM DESIGN)**  

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**(17D57105) CAD FOR VLSI**  
**Elective-I**

**Course Outcomes:**

After completion of the course the students will be able to

- Establish comprehensive understanding of the various phases of CAD for digital electronic systems, from digital logic simulation to physical design, including test and verification.
- Demonstrate knowledge and understanding of fundamental concepts in CAD and to establish capability for CAD tool development and enhancement.
- Practice the application of fundamentals of VLSI technologies
- Optimize the implemented design for area, timing and power by applying suitable constraints.
- Gain knowledge on the methodologies involved in design, verification and implementation of digital designs on reconfigurable hardware platform (FPGA)
- Gain knowledge on the methodologies involved in design, verification and implementation of digital designs on MCMs.
- Develop various algorithms at various levels of physical design.

**UNIT-I**

**VLSI Physical Design Automation :** VLSI Design Cycle, New Trends in VLSI Design Cycle, Physical Design Cycle, New Trends in Physical Design Cycle, Design Styles, System Packaging Styles.

**UNIT-II**

**Partitioning, Floor Planning, Pin Assignment and Placement :** Partitioning – Problem formulation, Classification of Partitioning algorithms, Kernighan-Lin Algorithm, Simulated Annealing.

Floor Planning – Problem formulation, Classification of floor planning algorithms, constraint based floor planning, Rectangular Dualization, Pin Assignment – Problem formulation, Classification of pin assignment algorithms, General and channel Pin assignments. Placement – Problem formulation, Classification of placement algorithms, Partitioning based placement algorithms.

**UNIT-III**

**Global Routing and Detailed Routing :** Global Routing – Problem formulation, Classification of global routing algorithms, Maze routing algorithms, Detailed Routing – Problem formulation, Classification of routing algorithms, Single layer routing algorithms.

**UNIT-IV**

**Physical Design Automation of FPGAs and MCMs :** FPGA Technologies, Physical Design cycle for FPGAs, Partitioning, Routing – Routing Algorithm for the Non-Segmented model, Routing Algorithms for the Segmented Model; Introduction to MCM Technologies, MCM Physical Design Cycle.

**UNIT –V**

**Chip Input and Output Circuits :** ESD Protection, Input Circuits, Output Circuits, Noise in Circuits, On Chip Clock Generation and Distribution, Latch – Up and its prevention.

**TEXT BOOKS:**

1. Algorithms for VLSI Physical Design Automation by Naveed Shervani, 3<sup>rd</sup> Edition, 2005, Springer International Edition.
2. CMOS Digital Integrated Circuits Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 3<sup>rd</sup> Ed., 2011.

**REFERENCE BOOKS:**

1. VLSI Physical Design Automation-Theory and Practice by Sadiq M Sait, Habib Youssef, World Scientific.
2. Algorithms for VLSI Design Automation, S. H. Gerez, 1999, Wiley student Edition, John Wiley and Sons (Asia) Pvt. Ltd.
3. VLSI Physical Design Automation by Sung Kyu Lim, Springer International Edition

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year I Semester (VLSI SYSTEM DESIGN)**

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**(17D06202) CPLD AND FPGA ARCHITECTURES AND APPLICATIONS**  
**Elective-II**

**Course Outcomes:**

After completion of the course the students will be able to

- Acquire knowledge about various architectures and device technologies of PLD's
- Comprehend FPGA Architectures
- Analyze System level Design and their application for Combinational and Sequential Circuits
- Get familiar with Anti-Fuse Programmed FPGAs
- Apply knowledge of this subject for various design applications

**UNIT-I**

**Introduction to Programmable Logic Devices** Introduction, Simple Programmable Logic Devices – Read Only Memories, Programmable Logic Arrays, Programmable Array Logic, Programmable Logic Devices/ Generic Array Logic; Complex Programmable Logic Devices – Architecture of Xilinx Cool Runner XCR3064XL CPLD, CPLD Implementation of a Parallel Adder with Accumulation.

**UNIT-II**

**Field Programmable Gate Arrays** Organization of FPGAs, FPGA Programming Technologies, Programmable Logic Block Architectures, Programmable Interconnects, Programmable I/O blocks in FPGAs, Dedicated Specialized Components of FPGAs, Applications of FPGAs.

**UNIT-III**

**SRAM Programmable FPGAs** Introduction, Programming Technology, Device Architecture, The Xilinx XC2000, XC3000 and XC4000 Architectures.

**UNIT-IV**

**Anti-Fuse Programmed FPGAs** Introduction, Programming Technology, Device Architecture, The Actel ACT1, ACT2 and ACT3 Architectures.

**UNIT-V**

**Design Applications** General Design Issues, Counter Examples, A Fast Video Controller, A Position Tracker for a Robot Manipulator, A Fast DMA Controller, Designing Counters with ACT devices, Designing Adders and Accumulators with the ACT Architecture.

**TEXT BOOKS:**

1. Field Programmable Gate Array Technology - Stephen M. Trimberger, Springer International Edition.
2. Digital Systems Design - Charles H. Roth Jr, LizyKurian John, Cengage Learning.

**REFERENCE BOOKS:**

1. Field Programmable Gate Arrays - John V. Oldfield, Richard C. Dorf, Wiley India.
2. Digital Design Using Field Programmable Gate Arrays - Pak K. Chan/Samiha Mourad, Pearson Low Price Edition.
3. Digital Systems Design with FPGAs and CPLDs - Ian Grout, Elsevier, Newnes.
4. FPGA based System Design - Wayne Wolf, Prentice Hall Modern Semiconductor Design Series.

**(17D55206) ASIC DESIGN**  
**Elective-II**

**Course Outcomes:**

After completion of the course the student will be able to

- Understand different types of ASICs and their libraries.
- Understands about programmable Asics, I/O modules and their interconnects.
- Gets complete knowledge regarding different methods of software ASIC design their simulation, testing and construction of ASICs.

**UNIT I**

**INTRODUCTION TO ASICs:**

Types of ASICs, Design Flow, Case Study, Economics of ASICs, ASIC Cell Libraries, Transistors as resistors, Transistor Parasitic Capacitance, Logical Effort, Library Cell Design, Library Architecture, Gate-Array Design, Standard Cell Design, Data Path Cell Design.

**UNIT II**

**PROGRAMMABLE ASICs AND PROGRAMMABLE ASIC LOGIC CELLS:**

The Anti fuse, Static Ram, EPROM and EEPROM Technology, Practical Issues, Specifications, PREDP Benchmarks, FPGA Economics, Actel ACT, Xilinx LCA, Altera Flex, Altera Max.

**UNIT-III**

**I/O CELLS AND INTERCONNECTS & PROGRAMMABLE ASIC DESIGN SOFTWARE:**

DC Output, AC Output, DC input, AC input, Clock input, Power input, Xilinx I/O block, Other I/O Cells, Actel ACT, Xilinx LCA, Xilinx EPLD, Altera Max 5000 and 7000, Altera Max 9000, Altera FLEX, Design Systems, Logic Synthesis, The Half gate ASIC.

**UNIT IV**

**LOW LEVEL DESIGN ENTRY AND LOGIC SYNTHESIS:**

Schematic Entry, Low level Design Languages, PLA Tools, EDIF, A logic synthesis example, A Comparator/MUX, Inside a Logic Synthesizer, Synthesis of Viterbi Decoder, Verilog and Logic synthesis, VHDL and Logic Synthesis, Finite State Machine Synthesis, Memory Synthesis, The Engine Controller, Performance Driven Synthesis, Optimization of the viterbi decoder.

**UNIT V**

**SIMULATION, TEST AND ASIC CONSTRUCTION:**

Types of Simulation, The Comparator/MUX Example, Logic Systems, How Logic Simulation Works, Cell Models, Delay Models, Static Timing Analysis, Formal Verification, Switch Level Simulation, Transistor Level Simulation, The importance of test, Boundary Scan Test, Faults, Faults Simulation, Automatic Test Pattern Generator, Scan Test, Built in Self Test, A simple test Example, Physical Design, CAD Tools, System Partitioning, Estimating ASIC Size, Power Dissipation, FPGA Partitioning, Partitioning Methods

**TEXT BOOKS:**

1. Michael John Sebastian Smith, "Application Specific Integrated Circuits", Pearson Education, 2003.
2. L.J.Herbst, "Integrated Circuit Engineering", Oxford Science Publications, 1996.

**REFERENCE BOOKS:**

3. HimanshuBhatnagar, "Advanced ASIC Chip Synthesis using Synopsis Design compiler", 2nd Edition, Kluwer Academic, 2001.

**(17D57106) OPTIMIZATION TECHNIQUES IN VLSI DESIGN**

**Elective-II**

**Course Outcomes:**

After completion of the course the students will be able to

- Understand basics of statistical modeling
- Analyze performance of CMOS circuits with respect to power, area and speed
- Gets complete knowledge regarding the various algorithms used for optimization of power and area.

**UNIT-I**

**Statistical Modeling:** Modeling sources of variations, Monte Carlo techniques, Process variation modeling- Pelgrom's model, Principle component based modeling, Quad tree based modeling, Performance modeling- Response surface methodology, delay modeling, interconnect delay models.

**UNIT-II**

**Statistical Performance, Power and Yield Analysis** Statistical timing analysis, parameter space techniques, Bayesian networks Leakage models, High level statistical analysis, Gate level statistical analysis, dynamic power, leakage power, temperature and power supply variations, High level yield estimation and gate level yield estimation.

**UNIT-III**

**Convex Optimization** Convex sets, convex functions, geometric programming, trade-off and sensitivity analysis, Generalized geometric programming, geometric programming applied to digital circuit gate sizing, Floor planning, wire sizing, Approximation and fitting- Monomial fitting, Maxmonomial fitting, Polynomial fitting.

**UNIT-IV**

**Genetic Algorithm** Introduction, GA Technology-Steady State Algorithm-Fitness Scaling-Inversion GA for VLSI Design, Layout and Test automation- partitioning-automatic placement, routing technology, Mapping for FPGA- Automatic test generation- Partitioning algorithm Taxonomy-Multi-way Partitioning Hybrid genetic-encoding-local improvement-WDFR Comparison of CAS-Standard cell placement GASP algorithm-unified algorithm.

**UNIT-V**

**GA Routing Procedures and Power Estimation** Global routing-FPGA technology mapping-circuit generation-test generation in a GA frame work-test generation procedures, Power estimation-application of GA Standard cell placement-GA for ATG-problem encoding- fitness function-GA Vs Conventional algorithm.

**TEXT BOOKS:**

1. Statistical Analysis and Optimization for VLSI: Timing and Power -AshishSrivastava, Dennis Sylvester, David Blaauw, Springer, 2005.
2. Genetic Algorithm for VLSI Design, Layout and Test Automation -PinakiMazumder, E.Mrudnick, Prentice Hall,1998.

**REFERENCE BOOKS:**

1. Convex Optimization - Stephen Boyd, LievenVandenberghe, Cambridge University Press,2004.

**(17D38107) STRUCTURAL DIGITAL SYSTEM DESIGN LAB**

**Course Objective:**

- To understand about VHDL and Verilog Programming in all available styles.
- To understand differences between Verilog and VHDL.
- To represent the different digital blocks in verilog and VHDL in all available styles of modelling

**Course Outcome:**

After completion of this course the students will be able to understand

- Different modeling styles available in VHDL and Verilog and difference between them
- Difference between verilog and VHDL
- Representation of different digital modules in different modelling styles available in VHDL and Verilog

Using VHDL or Verilog do the following experiments

1. Design of 4-bit adder / subtractor
2. Design of Booth Multiplier
3. Design of 4-bit ALU
4. Design SISO, SIPO, PISO, PIPO Registers
5. Design of Ripple, Johnson and Ring counters
6. Design of MIPS processor
7. Design of Washing machine controller
8. Design of Traffic Light Controller
9. Design “1010” pattern detector using Mealy state Machine
10. Design “1100” recursive pattern detector using Moore state Machine
11. Design simple Security System Using FSM/ASM
12. Mini Project

**Tools Required:**

VHDL or VERILOG

**Hardware Required:**

Computers with latest Configuration.

**(17D57107) VLSI SYSTEM DESIGN LAB - I****Learning Outcomes:**

After completion of this course the students will be able to

- Understand syntax of various commands available with verilog and fundamental associated with design of digital systems
- To design and simulate and implement various digital system like traffic light controller, UART.
- Able develop problem solving skills and adapt them to solve real world problems
- Write scripts using perl for building digital blocks

The students are required to design the logic circuit to perform the following experiments using necessary simulator (Xilinx ISE Simulator/Mentor Graphics Questa Simulator) to verify the logical /functional operation and to perform the analysis with appropriate synthesizer (Xilinx ISE Synthesizer/Mentor Graphics Precision RTL) and then verify the implemented logic with different hardware modules/kits (CPLD/FPGA kits).

The students are required to design and implement the Layout of the following experiments of any SIX using CMOS 130nm Technology.

**List of Experiments:**

1. Inverter Characteristics.
2. Full Adder.
3. RS-Latch, D-Latch and Clock Divider.
4. Synchronous Counter and Asynchronous Counter.
5. Static RAM Cell.
6. Dynamic RAM Cell.
7. ROM
8. Digital-to-Analog-Converter.
9. Analog-to-Digital Converter.
10. "10101" pattern detector using Mealy FSM
11. Analytical Comparator.
12. Mini Project

**Lab Requirements:****Software:**

Xilinx ISE Suite, Mentor Graphics-Questa Simulator, Mentor Graphics-Precision RTL, Perl Software.

**Hardware:**

Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.



**(17D57201) LOW POWER VLSI DESIGN**

**Course Outcomes:**

**After completion of this subject, students will be able to**

- Understand the concepts of velocity saturation, Impact Ionization and Hot Electron Effect
- Implement Low power design approaches for system level and circuit level measures.
- Design low power adders, multipliers and memories for efficient design of systems.

**UNIT –I:**

**Fundamentals:**

Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects – Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

**UNIT –II:**

**Low-Power Design Approaches:**

Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach – Pipelining and Parallel Processing Approaches. Switched Capacitance Minimization Approaches: System Level Measures, Circuit Level Measures, Mask level Measures.

**UNIT –III:**

**Low-Voltage Low-Power Adders:**

Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques – Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

**UNIT –IV:**

**Low-Voltage Low-Power Multipliers:**

Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

**UNIT –V:**

**Low-Voltage Low-Power Memories:**

Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

**TEXT BOOKS:**

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

**REFERENCE BOOKS:**

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Low Power CMOS Design – AnanthaChandrasekaran, IEEE Press/Wiley International, 1998.
3. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year II Semester (VLSI SYSTEM DESIGN)**

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**(17D57202) CMOS MIXED SIGNAL DESIGN**

**Course outcomes:**

After the Completion of the course the students will be able to

- Demonstrate first order filter with least interference
- Extend the concept of phase locked loop for designing PLL application with minimum jitter by considering non ideal effects.
- Design different A/D, D/A, modulators, demodulators and different filter for real time applications

**UNIT-I**

Switched Capacitor Circuits Introduction to Switched Capacitor circuits- basic building blocks, Operation and Analysis, Non-ideal effects in switched capacitor circuits, Switched capacitor integrators first order filters, Switch sharing, biquad filters.

**UNIT-II**

Phased Lock Loop (PLL) Basic PLL topology, Dynamics of simple PLL, Charge pump PLLs-Lock acquisition, Phase/Frequency detector and charge pump, Basic charge pump PLL, Non-ideal effects in PLLs- PFD/CP non-idealities, Jitter in PLLs, Delay locked loops, applications.

**UNIT-III**

Data Converter Fundamentals DC and dynamic specifications, Quantization noise, Nyquist rate D/A converters- Decoder based converters, Binary-Scaled converters, Thermometer-code converters, Hybrid converters

**UNIT-IV**

Nyquist Rate A/D Converters Successive approximation converters, Flash converter, Two-step A/D converters, Interpolating A/D converters, Folding A/D converters, Pipelined A/D converters, Time-interleaved converters.

**UNIT-V**

Oversampling Converters Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta sigma modulators with multibit quantizers, Delta sigma D/A

**TEXT BOOKS:**

1. Design of Analog CMOS Integrated Circuits- Behzad Razavi, TMH Edition, 2002
2. CMOS Analog Circuit Design - Philip E. Allen and Douglas R. Holberg, Oxford University Press, International Second Edition/Indian Edition, 2010.
3. Analog Integrated Circuit Design- David A. Johns, Ken Martin, Wiley Student Edition, 2013

**REFERENCE BOOKS:**

1. CMOS Integrated Analog-to- Digital and Digital-to-Analog converters- Rudy Van De Plassche, Kluwer Academic Publishers, 2003
2. Understanding Delta-Sigma Data converters-Richard Schreier, Wiley Interscience, 2005.
3. CMOS Mixed-Signal Circuit Design - R. Jacob Baker, Wiley Interscience, 2009

**(17D06201) EMBEDDED SYSTEM DESIGN**

**Course Outcomes:**

After completion of this course the students will be able to understand

- The issues relating to hardware and software design concepts associated with processor in Embedded Systems.
- The concept of low power microcontrollers.
- The hardware software co- design issues pertaining to design of an Embedded System using low power microcontrollers.

**UNIT – I**

**Introduction to Embedded Electronic Systems and Microcontrollers:**

An Embedded System-Definition, Embedded System Design and Development Life Cycle, An Introduction to Embedded system Architecture, The Embedded Systems Model, Embedded Hardware: The Embedded Board and the von Neumann Model, Embedded Processors: ISA Architecture Models, Internal Processor Design, Processor Performance, Board Memory: Read-Only Memory (ROM), Random-Access Memory (RAM), Auxiliary Memory, Memory Management of External Memory and Performance, Approaches to Embedded Systems, Small Microcontrollers, Anatomy of a Typical Small Microcontroller, Small Microcontrollers Memory, Embedded Software, Introduction to small microcontroller (MSP430).

**UNIT-II**

**MSP430 – I:**

**Architecture of the MSP430 Processor:** Central Processing Unit, Addressing Modes, Constant Generator and Emulated Instructions, Instruction Set, Examples, Reflections on the CPU and Instruction Set, Resets, Clock System, Memory and Memory Organization.

**Functions, Interrupts, and Low-Power Mode:** Functions and Subroutines, Storage for Local Variables, Passing Parameters to a Subroutine and Returning a Result, Mixing C and Assembly Language, Interrupts, Interrupt Service Routines, Issues Associated with Interrupts, Low-Power Modes of Operation.

**UNIT – III**

**MSP430 – II:**

**Digital Input, Output, and Displays:** Parallel Ports, Digital Inputs, Switch Debounce, Digital Outputs, Interface between Systems, Driving Heavier Loads, Liquid Crystal Displays, Simple Applications of the LCD.

**Timers:** Watchdog Timer, Timer\_A, Timer\_A Modes, Timer\_B, Timer\_B Modes, Setting the Real-Time Clock, State Machines.

**UNIT – IV**

**MSP430 Communication:**

Communication Peripherals in the MSP430, Serial Peripheral Interface, SPI with the USI, SPI with the USCI, A Thermometer Using SPI Modes, Inter-integrated Circuit Bus (I<sup>2</sup>C) and its operations, State Machines for I<sup>2</sup>C Communication, A Thermometer Using I<sup>2</sup>C, Asynchronous Serial Communication, Asynchronous Communication with the USCI\_A, A Software UART Using Timer\_A, Other Types of Communication.

**UNIT – V**

**MSP430 Case Studies:**

Introduction to Code Composer studio (CC Studio Ver. 6.1) a tutorial, A Study of blinking LED, Enabling LED using Switches, UART Communication, LCD interfacing, Interrupts, Analog to Digital Conversion, General Purpose input and output ports, I<sup>2</sup>C.

**TEXT BOOKS:**

1. Tammy Noergaard “Embedded Systems Architecture: A Comprehensive Guide for Engineers and Programmers”, Elsevier(Singapore) Pvt.Ltd.Publications, 2005.
2. John H. Davies “MSP430 Microcontroller Basics”,Elsevier Ltd Publications, Copyright 2008.

**REFERENCE BOOKS**

1. Manuel Jiménez Rogelio,PalomeraIsidoroCouvertier “Introduction to Embedded SystemsUsing Microcontrollers and the MSP430” Springer Publications, 2014.
2. Frank Vahid, Tony D. Givargis, “Embedded system Design: A Unified Hardware/Software Introduction”, John Wily & Sons Inc.2002.
3. Peter Marwedel, “Embedded System Design”, Science Publishers, 2007.
4. Arnold S Burger, “Embedded System Design”, CMP Books, 2002.
5. Rajkamal, “Embedded Systems: Architecture, Programming and Design”, TMH Publications,Second Edition, 2008.

### **(17D06109) TEST AND TESTABILITY**

#### **Course Outcomes:**

After completion of this course the students will be able to

- Understand different types of faults associated with logic circuits and types of testing by employing fault models to the logic circuits.
- Study about different methods of simulation and algorithms associated with testing.
- Get complete knowledge about different methods of simulation and algorithms associated with testing.

#### **UNIT-I: Introduction to Testing**

Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing, Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault.

#### **UNIT-II: Logic and Fault Simulation**

Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation, Algorithms for Fault Simulation.

#### **UNIT -III: Testability Measures**

SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

#### **UNIT-IV: Built-In Self-Test**

The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per-Scan BIST Systems, Circular Self Test Path System, Memory BIST, Delay Fault BIST.

#### **UNIT-V: Boundary Scan Standard**

Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BSDL Description Components, Pin Descriptions.

#### **TEXT BOOKS:**

1. M.L. Bushnell, V. D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits", Kluwer Academic Publishers.
2. M. Abramovici, M.A. Breuer and A.D. Friedman, "Digital Systems and Testable Design", Jaico Publishing House.

#### **REFERENCE BOOKS:**

3. P.K. Lala, "Digital Circuits Testing and Testability", Academic Press.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR				
M.Tech I year II Semester (VLSI SYSTEM DESIGN)				
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### (17D55201) SYSTEM ON CHIP ARCHITECTURE

#### Elective-III

#### Course Outcomes:

After completion of this course the students will be able to

- Get complete basics related to SoC architecture and different approaches related to SoC Design.
- Able to select an appropriated robust processor for SoC Design
- Able to Select an appropriate memory for SoC Design.
- Design SoC
- Realize real time case studies

#### UNIT I:

Introduction to the System Approach: System Architecture, Components of the system, Hardware & Software, Processor Architectures, Memory and Addressing. System level interconnection, An approach for SOC Design, System Architecture and Complexity.

#### UNIT II:

Processors: Introduction, Processor Selection for SOC, Basic concepts in Processor Architecture, Basic concepts in Processor Micro Architecture, Basic elements in Instruction handling. Buffers: minimizing Pipeline Delays, Branches, More Robust Processors, Vector Processors and Vector Instructions extensions, VLIW Processors, Superscalar Processors.

#### UNIT III:

Memory Design for SOC: Overview of SOC external memory, Internal Memory, Size, Scratchpads and Cache memory, Cache Organization, Cache data, Write Policies, Strategies for line replacement at miss time, Types of Cache, Split – I, and D – Caches, Multilevel Caches, Virtual to real translation , SOC Memory System, Models of Simple Processor – memory interaction.

#### UNIT IV:

Interconnect Customization and Configuration: Inter Connect Architectures, Bus: Basic Architectures, SOC Standard Buses , Analytic Bus Models, Using the Bus model, Effects of Bus transactions and contention time. SOC Customization: An overview, Customizing Instruction Processor, Reconfiguration Technologies, Mapping design onto Reconfigurable devices, Instance- Specific design, Customizable Soft Processor, Reconfiguration - overhead analysis and trade-off analysis on reconfigurable Parallelism.

#### UNIT V:

Application Studies / Case Studies: SOC Design approach, AES algorithms, Design and evaluation, Image compression – JPEG compression.

#### TEXT BOOKS:

1. Computer System Design System-on-Chip - Michael J. Flynn and Wayne Luk, Wiely India Pvt. Ltd.
2. ARM System on Chip Architecture – Steve Furber –2nd Ed., 2000, Addison Wesley Professional.

#### REFERENCE BOOKS:

1. Design of System on a Chip: Devices and Components – Ricardo Reis, 1st Ed., 2004, Springer
2. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM.
3. System on Chip Verification – Methodologies and Techniques –PrakashRashinkar, Peter Paterson and Leena Singh L, 2001, Kluwer Academic Publishers

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year II Semester (VLSI SYSTEM DESIGN)**  

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**(17D57203) SEMICONDUCTOR MEMORY DESIGN AND TESTING**  
**Elective-III**

**Course Outcomes:**

After completion of the course the students will be able to

- Get complete knowledge regarding different types of memories, their architectural and different packing techniques of memories.
- Able to build fault models for memory testing.
- Analyze different parameters that leads malfunctioning of memories.
- Design reliable memories with efficient architecture to improve processes times and power

**UNIT-I Random Access Memory Technologies** SRAM – SRAM Cell structures, MOS SRAM Architecture, MOS SRAM cell and peripheral circuit operation, Bipolar SRAM technologies, SOI technology, Advanced SRAM architectures and technologies, Application specific SRAMs, DRAM – DRAM technology development, CMOS DRAM, DRAM cell theory and advanced cell structures, BICMOS DRAM, soft error failure in DRAM, Advanced DRAM design and architecture, Application specific DRAM.

**UNIT-II Non-volatile Memories** Masked ROMs, High density ROM, PROM, Bipolar ROM, CMOS PROMS, EPROM, Floating gate EPROM cell, One time programmable EPROM, EEPROM, EEPROM technology and architecture, Non-volatile SRAM, Flash Memories (EPROM or EEPROM), advanced Flash memory architecture

**UNIT-III Memory Fault Modeling Testing and Memory Design for Testability and Fault Tolerance** RAM fault modeling, Electrical testing, Pseudo Random testing, Megabit DRAM Testing, non-volatile memory modeling and testing, IDDQ fault modeling and testing, Application specific memory testing, RAM fault modeling, BIST techniques for memory

**UNIT-IV Semiconductor Memory Reliability and Radiation Effects** General reliability issues RAM failure modes and mechanism, Non-volatile memory reliability, reliability modeling and failure rate prediction, Design for Reliability, Reliability Test Structures, Reliability Screening and qualification, Radiation effects, Single Event Phenomenon (SEP), Radiation Hardening techniques, Radiation Hardening Process and Design Issues, Radiation Hardened Memory characteristics, Radiation Hardness Assurance and Testing, Radiation Dosimetry, Water Level Radiation Testing and Test structures

**UNIT-V Advanced Memory Technologies and High-density Memory Packing Technologies** Ferroelectric RAMs (FRAMs), GaAs FRAMs, Analog memories, magneto resistive RAMs (MRAMs), Experimental memory devices, Memory Hybrids and MCMs (2D), Memory Stacks and MCMs (3D), Memory MCM testing and reliability issues, Memory cards, High Density Memory Packaging Future Directions.

**TEXT BOOKS:**

1. Semiconductor Memories Technology – Ashok K. Sharma, 2002, Wiley.
2. Advanced Semiconductor Memories – Architecture, Design and Applications - Ashok K. Sharma-2002, Wiley.

**REFERENCE BOOKS:**

1. Modern Semiconductor Devices for Integrated Circuits – Chenming C Hu, 1st Ed., Prentice all.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR				
M.Tech I year II Semester (VLSI SYSTEM DESIGN)				
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### (17D57204) RF IC DESIGN

#### Course outcomes:

After completion of the course the students will be able to

- Demonstrate in-depth knowledge in Radio Frequency Integrated Circuits.
- Analyze complex engineering problems critically for conducting research in RF systems.
- Solve engineering problems with wide range of solutions in Radio Frequency Integrated circuits.
- Apply appropriate techniques to engineering activities in the field of RFIC Design.

#### UNIT – I: BASIC CONCEPTS IN RF DESIGN

Introduction to RF Design, Units in RF design, Time Variance and Nonlinearity, Effects of nonlinearity, random processes and Noise, Definitions of sensitivity and dynamic range, Passive impedance transformation, Scattering parameters.

#### UNIT – II: TRANSCEIVER ARCHITECTURES

General considerations, Receiver Architectures-Basic Heterodyne receivers, Modern heterodyne receivers, Direct conversion receivers, Image-Reject receivers, Low-IF receivers. Transmitter Architectures-Direct Conversion transmitters, Modern direct conversion Transmitters, Heterodyne Transmitters, Other Transmitter Architectures.

#### UNIT -III: LNA AND MIXERS

General considerations, Problem of input matching, Low Noise Amplifiers design in various topologies, Gain Switching, Band Switching, Mixers-General considerations, Passive down conversion mixers, Active down conversion mixers, Up conversion mixers.

#### UNIT – IV: OSCILLATORS

Performance parameters, Basic principles, Cross coupled oscillator, Three point oscillators, Voltage Controlled Oscillators, LC VCOs with wide tuning range, phase noise, Mathematical model of VCOS, Quadrature Oscillators.

#### UNIT – V: PLL AND POWER AMPLIFIER

PLLS-Phase detector, Type-I PLLs, Type-II PLLs, PFD/CP Nonidealities, Phase noise in PLLs, Loop Bandwidth. Power Amplifiers-General considerations, Classification of power amplifiers, High-Efficiency power amplifiers, Cascode output stages, Large signal impedance matching, Linearization techniques.

#### TEXT BOOKS:

1. B.Razavi, “RF Microelectronics”, Prentice-Hall PTR, 2nd Edition, 1998.

#### REFERENCE BOOKS:

1. T.H.Lee, “The Design of CMOS Radio-Frequency Integrated Circuits”, Cambridge University Press, 2nd, 1998.
2. R.Jacob Baker, Harry W.Li, D.E. Boyce, “CMOS Circuit Design, Layout and Simulation”, Prentice-Hall of India, 1998.



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year II Semester (VLSI SYSTEM DESIGN)**  

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**(17D38202) INTERNET OF THINGS**  
**Elective-IV**

**Course Outcomes:**

After completion of the course the student will be able to

- Able to understand the application areas of IOT
- Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks
- Able to understand building blocks of Internet of Things and characteristics.

**Unit I**

**Introduction & Concepts:** Introduction to Internet of Things, Physical Design of IOT, Logical Design of IOT, IOT Enabling Technologies, IOT Levels.

**Unit II**

**Domain Specific IOTs:** Home Automation, Cities, Environment, Energy, Retail, Logistics, Agriculture, Industry, Health & Life Style.

**Unit III**

**M2M & System Management with NETCONF-YANG:** M2M, Difference between IOT and M2M, SDN and NFV for IOT, Software defined Networking, Network Function Virtualization, Need for IOT Systems Management, Simple Network Management Protocol, Limitations of SNMP, Network Operator Requirements, NETCONF, YANG, IOT Systems management with NETCONF-YANG.

**Unit IV**

**Developing Internet of Things & Logical Design using Python:** Introduction, IOT Design Methodology, Installing Python, Python Data Types & Data Structures, Control Flow, Functions, Modules, Packages, File Handling, Date/ Time Operations, Classes, Python Packages.

**Unit V**

**IOT Physical Devices & Endpoints:** What is an IOT Device, Exemplary Device, Board, Linux on Raspberry Pi, Interfaces, and Programming & IOT Devices.

**TEXT BOOKS:**

1. VijayMadiseti, ArshdeepBahga, "Internet of Things A Hands-On- Approach", 2014, ISBN:978 0996025515

**REFERENCE BOOKS:**

1. AdrianMcEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN:978-1-118-43062-0
2. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things". 2013, ISBN0989973700

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year II Semester (VLSI SYSTEM DESIGN)**  

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**(17D55204) HARDWARE AND SOFTWARE CO-DESIGN OF EMBEDDED SYSTEM**  
**Elective-IV**

**Course outcomes:**

After completion of this course the students will be able to

- Analyze and apply design methodologies.
- Appreciate the fundamental building blocks of the using hardware and software co-design and related implementation and testing environments and techniques and their interrelationships.
- Get familiar with modern hardware/software tools for building prototypes and to be able to demonstrate practical competence in these areas

**UNIT I NATURE OF HARDWARE AND SOFTWARE**

Hardware, Software, Definition of Hardware/Software Co-Design – Driving factors Platform design space – Application mapping – Dualism of Hardware design and software design – Concurrency and parallelism, Data flow modeling and Transformation – Data Flow Graph – Tokens, actors and queues, Firing rates, firing rules and Schedules – Synchronous data flow graph – control flow modeling – Adding time and resources – Transformations.

**UNIT II DATA FLOW IMPLEMENTATION IN SOFTWARE AND HARDWARE**

Software Implementation of Data Flow – Converting queues and actors into software, Dynamic Scheduler – Hardware Implementation of Data Flow – single rate SDF graphs into hardware, Pipelining – Analysis of control flow and data flow – construction of control and data flow graph – Translating C into hardware – Designing data path and controller.

**UNIT III DESIGN SPACE OF CUSTOM ARCHITECTURES**

Finite state machines with datapath – FSM design example, Limitations – Microprogrammed Architecture – Microprogrammed control, microinstruction encoding, Microprogrammed data path, microprogrammed machine – General purpose Embedded Core – RISC pipeline, Program organization – SoC interfaces for custom hardware – Design Principles in SoC Architecture

**UNIT IV HARDWARE/ SOFTWARE INTERFACES**

Principles of Hardware/software communication – synchronization schemes, communication constrained versus Computation constrained, Tight and Loose coupling - On-chip buses – Memory mapped interfaces – coprocessor interfaces – custom instruction interfaces – Coprocessor hardware interface – Data and control design, programmer's model.

**UNIT V CASE STUDIES** TriviumCrypto coprocessor – Trivium stream cipher algorithm, Trivium for 8-bit platforms – AES coprocessor, CORDIC coprocessor – algorithm and implementation.

1. Ralf Niemann, "Hardware/Software Co-Design for Data Flow Dominated Embedded Systems", Kluwer Academic Pub, 1998.
2. Jorgen Staunstrup, Wayne Wolf, "Hardware/Software Co-Design: Principles and Practice", Kluwer Academic Pub, 1997.

**REFERENCE BOOKS:**

1. Giovanni De Micheli, Rolf Ernst Morgon, "Reading in Hardware/Software Co-Design" Kaufmann Publishers, 2001.
2. Patrick Schaumont, A Practical Introduction to Hardware/Software Codesign, 2nd Edition, Springer, 2010.

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**M.Tech I year II Semester (VLSI SYSTEM DESIGN)**  

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**(17D57205) PHYSICAL DESIGN AUTOMATION**  
**Elective-IV**

**Course Outcomes:**

After completion of the course the students will be able to

- Understand relation between automation algorithms and constraints posed by VLSI technology.
- Adopt algorithms to meet critical design parameters.
- Design area efficient logics by employing different routing algorithms and shape functions
- Simulate and synthesis different combinational and sequential logics

**UNIT-I**

**VLSI design automation tools:** algorithms and system design. Structural and logic design. Transistor level design. Layout design. Verification methods. Design management tools.

**UNIT-II**

**Layout** compaction, placement and routing, Design rules, symbolic layout. Applications of compaction. Formulation methods. Algorithms for constrained graph compaction. Circuit representation. Wire length estimation. Placement algorithms. Partitioning algorithms.

**UNIT-III**

**Floor planning and routing:** floor planning concepts. Shape functions and floor planning sizing. Local routing. Area routing. Channel routing, global routing and its algorithms.

**UNIT-IV**

**Simulation and logic synthesis:** gate level and switch level modeling and simulation. Introduction to combinational logic synthesis. ROBDD principles, implementation, construction and manipulation. Two level logic synthesis.

**UNIT-V**

**High-level synthesis:** hardware model for high level synthesis. Internal representation of input algorithms. Allocation, assignment and scheduling. Scheduling algorithms. Aspects of assignment. High level transformations.

**TEXT BOOKS:**

1. S.H. Gerez, Algorithms for VLSI Design Automation, John Wiley ,1998.
2. N.A.Sherwani , Algorithms for VLSI Physical Design Automation, (3/e), Kluwer,1999.

**REFERENCE BOOKS:**

1. S.M. Sait , H. Youssef, VLSI Physical Design Automation, World scientific, 1999.
2. M.Sarrafzadeh, Introduction to VLSI Physical Design, McGraw Hill (IE), 1996

**Course Outcomes:**

**After Completion of this Lab, Students will be able to**

- Design and Implement basic circuits that are used in Embedded systems.
- Develop code using appropriate tools.
- Test the circuit performance with standard benchmark circuits.

**List of Experiments**

**PART – A**

**Using Embedded C**

*Note: Any 10 Programs form the following*

1. Write a simple program to print “hello world”
2. Write a simple program to show a delay.
3. Write a loop application to copy values from P1 to P2
4. Write a c program for counting the no of times that a switch is pressed & released.
5. Illustrate the use of port header file (port M) using an interface consisting of a keypad and liquid crystal display.
6. Write a program to create a portable hardward delay.
7. Write a c program to test loop time outs.
8. Write a c program to test hardware based timeout loops.
9. Develop a simple EOS showing traffic light sequencing.
10. Write a program to display elapsed time over RS-232 link.
11. Write a program to drive SEOS using Timer 0.
12. Develop software for milk pasteurization system.

**PART – B**

*Note. Any 6 Programs from the following (Experiment – 1 is mandatory)*

1. A Study of Code Composer Studio (CC Studio Latest Version)
2. Flashing a light by a software delay.
3. Displaying Characters on LCD.
4. Serial Communication using UART.
5. Basic Input and Output using MSP430 UART.
6. Interrupt Handling using MSP430.
7. Analog to Digital Conversion using MSP430.
8. Interfacing external Devices to GPIO Ports

**Equipments Required:**

1. Computers with latest configuration.
2. Code Composer Studio v6.1 (Preferably Latest version)
3. MSP430/ARM based Hardware kits and add-on boards.

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech I year II Semester (VLSI SYSTEM DESIGN)**  

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**(17D57206) VLSI SYSTEM DESIGN LAB - II**

**Course Outcomes:**

The students are required to perform any Six of the following experimental concepts with suitable complexity mixed-signal application based circuits o (circuits consisting of both analog and digital parts) using necessary software tools.

**List of experimental Concepts:**

1. Analog circuit simulation.
2. Digital circuit simulation.
3. Mixed signal simulation.
4. Layout Extraction.
5. Parasitic values estimation from layout
6. Layout Vs Schematic.
7. Net List Extraction.
8. Design Rule Checks.

**Lab Requirements:**

**Software:** Xilinx ISE Suite 13.2 Version, Mentor Graphics-Quarta Simulator, Mentor Graphics-Precision RTL, Mentor Graphics Back End/Tanner Software tool, Mixed Signal simulator

**Hardware:** Personal Computer with necessary peripherals, configuration and operating System and relevant VLSI (CPLD/FPGA) hardware Kits.

**(17D20301) RESEARCH METHODOLOGY**  
**(Elective V-OPEN ELECTIVE )**

**UNIT I**

Meaning of Research – Objectives of Research – Types of Research – Research Approaches – Guidelines for Selecting and Defining a Research Problem – research Design – Concepts related to Research Design – Basic Principles of Experimental Design.

**UNIT II**

Sampling Design – steps in Sampling Design –Characteristics of a Good Sample Design – Random Sampling Design.  
Measurement and Scaling Techniques-Errors in Measurement – Tests of Sound Measurement – Scaling and Scale Construction Techniques – Time Series Analysis – Interpolation and Extrapolation.  
Data Collection Methods – Primary Data – Secondary data – Questionnaire Survey and Interviews.

**UNIT III**

Correlation and Regression Analysis – Method of Least Squares – Regression vs Correlation – Correlation vs Determination – Types of Correlations and Their Applications

**UNIT IV**

Statistical Inference: Tests of Hypothesis – Parametric vs Non-parametric Tests – Hypothesis Testing Procedure – Sampling Theory – Sampling Distribution – Chi-square Test – Analysis of variance and Co-variance – Multi-variate Analysis.

**UNIT V**

Report Writing and Professional Ethics: Interpretation of Data – Report Writing – Layout of a Research Paper – Techniques of Interpretation- Making Scientific Presentations in Conferences and Seminars – Professional Ethics in Research.

**Text Books:**

Research Methodology:Methods And Techniques – C.R.Kothari, 2<sup>nd</sup> Edition,New Age International Publishers.  
Research Methodology: A Step By Step Guide For Beginners- Ranjit Kumar, Sage Publications (Available As Pdf On Internet)  
Research Methodology And Statistical Tools – P.Narayana Reddy And G.V.R.K.Acharyulu, 1<sup>st</sup> Edition,Excel Books,New Delhi.

## REFERENCES:

1. Scientists Must Write - Robert Barrass (Available As Pdf On Internet)
2. Crafting Your Research Future –Charles X. Ling And Quiang Yang (Available As Pdf On Internet)

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR**  
**M.Tech III semester (VLSI SYSTEM DESIGN)**

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**(17D20302) HUMAN VALUES AND PROFESSIONAL ETHICS**  
**(Elective V-OPEN ELECTIVE )**

**Unit I:**

**HUMAN VALUES:** Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty - Courage- Co Operation – Commitment – Empathy –Self Confidence Character – Spirituality.

**Unit II:**

**ENGINEERING ETHICS:** Senses of Engineering Ethics- Variety of moral issues – Types of inquiry – Moral dilemmas – Moral autonomy –Kohlberg’s theory- Gilligan’s theory- Consensus and controversy – Models of professional roles- Theories about right action- Self interest - Customs and religion –Uses of Ethical theories – Valuing time –Co operation – Commitment.

**Unit III :**

**ENGINEERING AS SOCIAL EXPERIMENTATION:** Engineering As Social Experimentation – Framing the problem – Determining the facts – Codes of Ethics – Clarifying Concepts – Application issues – Common Ground - General Principles – Utilitarian thinking respect for persons.

**UNIT IV:**

**ENGINEERS RESPONSIBILITY FOR SAFETY AND RISK:** Safety and risk – Assessment of safety and risk – Risk benefit analysis and reducing riskSafety and the Engineer- Designing for the safety- Intellectual Property rights(IPR).

**UNIT V:**

**GLOBAL ISSUES:** Globalization – Cross culture issues- Environmental Ethics – Computer Ethics – Computers as the instrument of Unethical behavior – Computers as the object of Unethical acts – Autonomous Computers- Computer codes of Ethics – Weapons Development - Ethics .

**Text Books :**

1. “Engineering Ethics includes Human Values” by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
2. “Engineering Ethics” by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. “Ethics in Engineering” by Mike W. Martin and Roland Schinzinger – Tata McGrawHill– 2003.
4. “Professional Ethics and Morals” by Prof.A.R.Aryasri, Dharanikota Suyodhana-Maruthi Publications.
5. “Professional Ethics and Human Values” by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran , Laxmi Publications.



**(17D20303) INTELLECTUAL PROPERTY RIGHTS**  
**(Elective V-OPEN ELECTIVE )**

**UNIT – I**

Introduction To Intellectual Property: Introduction, Types Of Intellectual Property, International Organizations, Agencies And Treaties, Importance Of Intellectual Property Rights.

**UNIT – II**

Trade Marks : Purpose And Function Of Trade Marks, Acquisition Of Trade Mark Rights, Protectable Matter, Selecting And Evaluating Trade Mark, Trade Mark Registration Processes.

**UNIT – III**

Law Of Copy Rights : Fundamental Of Copy Right Law, Originality Of Material, Rights Of Reproduction, Rights To Perform The Work Publicly, Copy Right Ownership Issues, Copy Right Registration, Notice Of Copy Right, International Copy Right Law.

Law Of Patents : Foundation Of Patent Law, Patent Searching Process, Ownership Rights And Transfer

**UNIT – IV**

Trade Secrets : Trade Secrete Law, Determination Of Trade Secrete Status, Liability For Misappropriations Of Trade Secrets, Protection For Submission, Trade Secrete Litigation.

Unfair Competition : Misappropriation Right Of Publicity, False Advertising.

**UNIT – V**

New Development Of Intellectual Property: New Developments In Trade Mark Law ; Copy Right Law, Patent Law, Intellectual Property Audits.

International Overview On Intellectual Property, International – Trade Mark Law, Copy Right Law, International Patent Law, International Development In Trade Secrets Law.

**TEXT BOOKS & REFERENCES:**

1. Intellectual Property Right, Deborah. E. Bouchoux, Cengage Learning.
2. Intellectual Property Right – Nleashmy The Knowledge Economy, Prabuddha Ganguli, Tate Mc Graw Hill Publishing Company Ltd.,