



ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES

(AUTONOMOUS)

UTUKUR, C.K. DINNE (V&M), KADAPA, YSR DIST.

**Approved by AICTE, New Delhi & Affiliation to JNTUA, Anantapuramu.
Accredited by NAAC with 'A' Grade, Bangalore and NBA (EEE, ECE & CSE).**

B. Tech (Regular-Full time)

**(Effective for the students admitted into I B.Tech from the Academic
B.Tech 2023-24 onwards)**

COMPUTER SCIENCE & ENGINEERING

COMPUTER SCIENCE & ENGINEERING

COURSE STRUCTURE & SYLLABUS

FOR

III YEAR (only)

III B.Tech I Semester (CSE)

S.No	Course Code	Title	L	T	P	Credits
1	23HPC0511	Artificial Intelligence	3	0	0	3
2	23HPC0512	Computer Networks & Internet Protocols	3	0	0	3
3	23HPC0513	Automata Theory and Compiler Design	3	0	0	3
4	23HMC0501	Introduction To Quantum Technologies And Applications	3	0	0	3
5	23HPE051a 23HPE051b 23HPE051c 23HPE051d	Professional Elective-I 1. Object Oriented Analysis and Design 2. Soft Computing 3. Microprocessors & Microcontrollers 4. Data Warehousing & Data Mining	3	0	0	3
6		Open Elective-I	3	0	0	3
7	23HPC0514	Artificial Intelligence Lab	0	0	3	1.5
8	23HPC0515	Computer Networks & Internet Protocols Lab	0	0	3	1.5
9	23HSC0504	Skill Enhancement course Full Stack Development - II	0	1	2	2
10	23HSC0402	Tinkering Lab	0	0	2	1
11	23HCSP05I	Evaluation of Community Service Internship	-	-	-	2
Total			18	1	10	26

Open Elective – I

S.No.	Course Code	Course Name	Offered by the Dept.
1.	23HOE011a	Green Buildings	CIVIL
2.	23HOE011b	Construction Technology and Management	
3.	23HOE0201	Electrical Safety Practices and Standards	EEE
4.	23HOE0301	Sustainable Energy Technologies	ME
5.	23HOE0401	Electronic Circuits	ECE
6.	23HOE051a	Java Programming	CSE & Allied
7.	23HOE051b	Introduction to Artificial Intelligence	
8.	23HOE051c	Quantum Technologies and Applications	
9.	23HOE991a	Mathematics for Machine Learning and AI	Mathematics
10.	23HOE991b	Materials Characterization Techniques	Physics
11.	23HOE991c	Chemistry of Energy Systems	Chemistry
12.	23HOE991d	English for Competitive Examinations	Humanities
13.	23HOE991e	Entrepreneurship and New Venture Creation	

Note:

1. A student is permitted to register for Honours or a Minor in IV semester after the results of III Semester are declared and students may be allowed to take maximum two subjects per semester pertaining to their Minor from V Semester onwards.
2. A student shall not be permitted to take courses as Open Electives/Minor/Honours with content substantially equivalent to the courses pursued in the student's primary major.
3. A student is permitted to select a Minor program only if the institution is already offering a Major degree program in that discipline.

III B.Tech II Semester (CSE)

S.No	Course Code	Title	L	T	P	Credits
1	23HPC0516	Machine Learning	3	0	0	3
2	23HPC0517	Cloud Computing	3	0	0	3
3	23HPC0518	Cryptography & Network Security	3	0	0	3
4	23HPE052a 23HPE052b 23HPE052c 23HPE052d	Professional Elective-II 1. Software Testing Methodologies 2. Cyber Security 3. DevOps 4. Embedded Systems Design	3	0	0	3
5	23HPE053a 23HPE053b 23HPE053c 23HPE053d	Professional Elective-III 1. Software Project Management 2. Mobile Adhoc Networks 3. Natural Language Processing 4. Distributed Operating System	3	0	0	3
6		Open Elective – II	3	0	0	3
7	23HPC0519	Machine Learning Lab	0	0	3	1.5
8	23HPC0520	Cryptography & Network Security Lab	0	0	3	1.5
9	23HSC1E01	Skill Enhancement course Soft skills	0	1	2	2
10	23HAC9902	Audit Course Technical Paper Writing & IPR	2	0	0	-
11		Workshop	0	0	0	0
Total			20	1	08	23
Mandatory Industry Internship of 6 to 8 weeks duration during summer vacation						

Open Elective – II

S.No.	Course Code	Course Name	Offered by the Dept.
1.	23HOE012a	Disaster Management	CIVIL
2.	23HOE012b	Sustainability In Engineering Practices	
3.	23HOE0202	Renewable Energy Sources	EEE
4.	23HOE0302	Automation and Robotics	ME
5.	23HOE0402	Digital Electronics	ECE
6.	23HOE052a	Operating Systems	CSE & Allied
7.	23HOE052b	Introduction to Machine Learning	
8.	23HOE992a	Optimization Techniques for Engineers	Mathematics
9.	23HOE992b	Mathematical Foundation Of Quantum Technologies	
10.	23HOE992c	Physics Of Electronic Materials And Devices	Physics
11.	23HOE992d	Chemistry Of Polymers And Applications	Chemistry
12.	23HOE992e	Academic Writing and Public Speaking	Humanities

III B.Tech I Semester

23HPC0511	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

Pre-requisite:

- Knowledge in Computer Programming.
- A course on —Mathematical Foundations of Computer Sciencell.
- Background in linear algebra, data structures and algorithms, and probability.

Course Objectives:

- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.
- To learn different knowledge representation techniques

UNIT - I

Introduction: AI problems, foundation of AI and history of AI intelligent agents: Agents and Environments, the concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation.

UNIT - II

Searching- Searching for solutions, uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A* ,AO* Algorithms, Problem reduction, Game Playing-Adversial search, Games, mini-max algorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Beta pruning, Evaluation functions.

UNIT - III

Representation of Knowledge: Knowledge representation issues, predicate logic- logic programming, semantic nets- frames and inheritance, constraint propagation, representing knowledge using rules, rules based deduction systems. Reasoning under uncertainty, review of probability, Bayes' probabilistic interferences and dempstershafer theory.

UNIT - IV

Logic concepts: First order logic. Inference in first order logic, propositional vs. first order inference, unification & lifts forward chaining, Backward chaining, Resolution, Learning from observation Inductive learning, Decision trees, Explanation based learning, Statistical Learning methods, Reinforcement Learning.

UNIT - V

Expert Systems: Architecture of expert systems, Roles of expert systems – Knowledge Acquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON: Expert systems shells.

Textbooks:

1. S. Russel and P. Norvig, —Artificial Intelligence – A Modern Approach, Second Edition, Pearson Education.
2. Kevin Night and Elaine Rich, Nair B., —Artificial Intelligence (SIE), Mc Graw Hill

Reference Books:

1. David Poole, Alan Mack worth, Randy Goebel, Computational Intelligence: a logical approach, Oxford University Press.
2. G. Luger, —Artificial Intelligence: Structures and Strategies for complex problemsolving, Fourth Edition, Pearson Education.
3. J. Nilsson, —Artificial Intelligence: A new Synthesis, Elsevier Publishers.
4. Artificial Intelligence, SarojKaushik, CENGAGE Learning.

Online Learning Resources:

1. <https://ai.google/>
2. https://swayam.gov.in/nd1_noc19_me71/preview

III B.Tech I Semester

23HPC0512	COMPUTER NETWORKS & INTERNET PROTOCOLS	L	T	P	C
		3	0	0	3

Course Objectives:

The course is designed to:

- Understand the basic concepts of Computer Networks.
- Introduce the layered approach for design of computer networks
- Expose the network protocols used in Internet environment
- Explain the format of headers of IP, TCP and UDP
- Familiarize with the applications of Internet
- Elucidate the design issues for a computer network

Course Outcomes:

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

- Identify the software and hardware components of a computer network
- Design software for a computer network
- Develop error, routing, and congestion control algorithms
- Assess critically the existing routing protocols
- Explain the functionality of each layer of a computer network
- Choose the appropriate transport protocol based on the application requirements

UNIT I:**Computer Networks and the Internet****Lecture: 8 Hrs**

What Is the Internet? Network Edge, The Network Core, Delay, Loss, and Throughput in Packet Switched Networks (Textbook 2), Reference Models, Multimedia Networks, Guided Transmission Media, Wireless Transmission (Textbook 1)

UNIT II:**The Data Link Layer, Access Networks, and LANs****Lecture: 10 Hrs**

Data Link Layer Design Issues, Error Detection and Correction, Elementary Data Link Protocols, Sliding Window Protocols(Textbook 1) Introduction to the Link Layer, Error-Detection and -Correction Techniques, Multiple Access Links and Protocols, Switched Local Area Networks, Link Virtualization: A Network as a Link Layer, Data Center Networking, Retrospective: A Day in the Life of a Web Page (Packet) (Textbook 2)

UNIT III:**The Network Layer****Lecture: 8 Hrs**

Routing Algorithms, Internetworking, The Network Layer in The Internet (Textbook 1)

UNIT IV:**The Transport Layer****Lecture: 9 Hrs**

Connectionless Transport: UDP (Textbook 2), The Internet Transport Protocols: TCP, Congestion Control (Textbook 1)

UNIT V:**The Application Layer****Lecture: 8 Hrs**

Principles of Network Applications, The Web and HTTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications, Video Streaming and Content Distribution Networks (Textbook 2)

Textbooks:

1. Andrew S. Tanenbaum, David J. Wetherall, *Computer Networks*, 6th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, *Computer Networking: A Top-Down Approach*, 6th Edition, Pearson, 2019.

Reference Books:

1. Forouzan, *Data Communications and Networking*, 5th Edition, McGraw Hill Publication.
2. Youlu Zheng, Shakil Akhtar, *Networks for Computer Scientists and Engineers*, Oxford Publishers, 2016.

Online Learning Resources:

1. <https://nptel.ac.in/courses/106105183/25>
2. <https://www.nptelvideos.in/2012/11/computer-networks.html>
3. <https://nptel.ac.in/courses/106105183/3>

III B.Tech I Semester

23HPC0513	AUTOMATA THEORY AND COMPILER DESIGN	L	T	P	C
		3	0	0	3

Course Objectives:

1. Able to understand the concept of abstract machines, construct FA, Regular Expressions for the regular languages and equivalent FSMs.
2. Able to construct pushdown automata equivalent to Context free Grammars, construct Turing Machines and understand undecidability.
3. Emphasize the concepts learnt in phases of compiler, lexical analyser and Top-down parser.
4. Able to understand the concepts of Bottom-up parser, Intermediate Code Generation.
5. Able to understand the concepts of Code optimizer and Code Generation.

Course Outcomes:

1. Demonstrate knowledge on Automata Theory, Regular Expression and Analyze and Design of finite automata, and prove equivalence of various finite automata.
2. Demonstrate knowledge on context free grammar, Analyze and design of PDA and TM.
3. Understand the basic concept of compiler design, and its different phases which will be helpful to construct new tools like LEX, YACC, etc.
4. Ability to implement semantic rules into a parser that performs attribution while parsing and apply error detection and correction methods.
5. Apply the code optimization techniques to improve the space and time complexity of programs while programming and Ability to design a compiler.

Unit-I: Introduction to Automata and Regular Expressions**12 Hrs**

Introduction, Alphabets, Strings and Languages, Chomsky Hierarchy, Automata and Grammars, Regular Grammar and Language, Finite Automata, Deterministic finite Automata (DFA), Nondeterministic finite Automata (NFA), Equivalence of NFA and DFA, Minimization of Finite Automata, Regular Expressions, Converting Regular Grammar and Expression into Finite Automata, Pumping lemma for regular sets, Closure properties of regular sets (Without proof).

UNIT-II: Context Free Grammars and Pushdown Automata**12 Hrs**

Context Free Language, Context Free Grammar, Derivation and Parse tree, Ambiguity, Simplification of CFG's, Chomsky Normal Form, Greibach Normal Form, Push Down Automata (PDA), Design of PDA, Equivalence of PDA and CFL/CFG

UNIT-III: Turing Machines and Introduction to Compilers**12 Hrs**

Turing Machine, TM Model, Language acceptance, Design of Turing Machine, Compilers, Phases of Compiler, The role of Lexical Analyzer, Input Buffering.

UNIT-IV: Parsers and Intermediate Code Generation**12 Hrs**

Parser, Top-Down parsers: Recursive Descent Parsers, Predictive Parsers
Bottom-up Parsers: Shift-Reduce Parsing, LR parsers, Intermediate Code Generation: Three address codes.

UNIT-V: Code Optimization and Code Generation**12 Hrs**

Code Optimization: Peephole optimization, Basic blocks and flow graphs, DAG, Principles of Source Code Optimization, Code Generation: Issues in Design of Code Generation, Simple Code Generator.

Text Books:

1. Introduction to Automata theory languages and Computation, Hopcroft H.E. and Ullman Jeffrey.D, 3/e, 2006, Pearson Education, New Delhi, India.
2. Mishra K L P and Chandrasekaran N, —Theory of Computer Science - Automata, Languages and Computationl, 2/e, 2007, PHI, New Delhi, India.
3. Compilers: Principles, Techniques, and Tools, Updated 2e July 2023 Alfred V. Aho , Monica S. Lam, Ravi Sethi , Jeffrey D. Ullman , Sorav Bansal

Reference Books:

1. Introduction to Languages and Theory of Computation, John C Martin, 1/e, 2009, Tata McGraw Hill Education, Hyderabad, India.
2. Introduction to Theory of Computation, Sipser, 2/e, 2005, Thomson, Australia.
3. Compiler Construction: Principles And Practice, Kenneth C. Loudon, Thomson/ Delmar Cengage Learning, 2006.
4. Lex &yacc, Doug Brown, John Levine and Tony Mason, 2 nd Edition, O'reilly Media
5. Engineering a compiler, Keith Cooper and Linda Torczon, 2 nd Edition, Morgan Kaufmann, 2011.

23HMC0501	INTRODUCTION TO QUANTUM TECHNOLOGIES AND APPLICATIONS (Qualitative Treatment)	L	T	P	C
		3	0	0	3

Course Objectives (COBJ):

- Introduce fundamental quantum concepts like superposition and entanglement.
- Understand theoretical structure of qubits and quantum information.
- Explore conceptual challenges in building quantum computers.
- Explain principles of quantum communication and computing.
- Examine real-world applications and the future of quantum technologies.

Course Outcomes (CO):

- Explain core quantum principles in a non-mathematical manner.
- Compare classical and quantum information systems.
- Identify theoretical issues in building quantum computers.
- Discuss quantum communication and computing concepts.
- Recognize applications, industry trends, and career paths in quantum technology.

Unit 1: Introduction to Quantum Theory and Technologies

The transition from classical to quantum physics, Fundamental principles explained conceptually: Superposition, Entanglement, Uncertainty Principle, Wave-particle duality, Classical vs Quantum mechanics – theoretical comparison, Quantum states and measurement: nature of observation, Overview of quantum systems: electrons, photons, atoms, The concept of quantization: discrete energy levels, Why quantum? Strategic, scientific, and technological significance, A snapshot of quantum technologies: Computing, Communication, and Sensing, National and global quantum missions: India's Quantum Mission, EU, USA, China

Unit 2: Theoretical Structure of Quantum Information Systems

What is a qubit? Conceptual understanding using spin and polarization, Comparison: classical bits vs quantum bits, Quantum systems: trapped ions, superconducting circuits, photons (non-engineering view), Quantum coherence and decoherence – intuitive explanation, Theoretical concepts: Hilbert spaces, quantum states, operators – only interpreted in abstract, The role of entanglement and non-locality in systems, Quantum information vs classical information: principles and differences, Philosophical implications: randomness, determinism, and observer role

Unit 3: Building a Quantum Computer – Theoretical Challenges and Requirements

What is required to build a quantum computer (conceptual overview)?, Fragility of quantum systems: decoherence, noise, and control, Conditions for a functional quantum system: Isolation, Error management, Scalability, Stability, Theoretical barriers:

Why maintaining entanglement is difficult, Error correction as a theoretical necessity, Quantum hardware platforms (brief conceptual comparison), Superconducting circuits, Trapped ions, Photonics, Vision vs reality: what's working and what remains elusive, The role of quantum software in managing theoretical complexities

Unit 4: Quantum Communication and Computing – Theoretical Perspective

Quantum vs Classical Information, Basics of Quantum Communication, Quantum Key Distribution (QKD), Role of Entanglement in Communication, The Idea of the Quantum Internet – Secure Global Networking, Introduction to Quantum Computing, Quantum Parallelism (Many States at Once), Classical vs Quantum Gates, Challenges: Decoherence and Error Correction, Real-World Importance and Future Potential

Unit 5: Applications, Use Cases, and the Quantum Future

Real-world application domains: Healthcare (drug discovery), Material science, Logistics and optimization, Quantum sensing and precision timing, Industrial case studies: IBM, Google, Microsoft, PsiQuantum, Ethical, societal, and policy considerations, Challenges to adoption: cost, skills, standardization, Emerging careers in quantum: roles, skillsets, and preparation pathways, Educational and research landscape – India's opportunity in the global quantum race

Textbooks:

1. Michael A. Nielsen, Isaac L. Chuang, *Quantum Computation and Quantum Information*, Cambridge University Press, 10th Anniversary Edition, 2010.
2. Eleanor Rieffel and Wolfgang Polak, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
3. Chris Bernhardt, *Quantum Computing for Everyone*, MIT Press, 2019.

Reference Books:

1. David McMahon, *Quantum Computing Explained*, Wiley, 2008.
2. Phillip Kaye, Raymond Laflamme, Michele Mosca, *An Introduction to Quantum Computing*, Oxford University Press, 2007.
3. Scott Aaronson, *Quantum Computing Since Democritus*, Cambridge University Press, 2013.
4. **Alastair I.M. Rae**, *Quantum Physics: A Beginner's Guide*, Oneworld Publications, Revised Edition, 2005.
5. **Eleanor G. Rieffel, Wolfgang H. Polak**, *Quantum Computing: A Gentle Introduction*, MIT Press, 2011.
6. **Leonard Susskind, Art Friedman**, *Quantum Mechanics: The Theoretical Minimum*, Basic Books, 2014.
7. **Bruce Rosenblum, Fred Kuttner**, *Quantum Enigma: Physics Encounters Consciousness*, Oxford University Press, 2nd Edition, 2011.
8. **Giuliano Benenti, Giulio Casati, Giuliano Strini**, *Principles of Quantum Computation and Information, Volume I: Basic Concepts*, World Scientific Publishing, 2004.
9. **K.B. Whaley et al.**, *Quantum Technologies and Industrial Applications: European Roadmap and Strategy Document*, Quantum Flagship, European Commission, 2020.
10. **Department of Science & Technology (DST), Government of India**, *National Mission on Quantum Technologies & Applications – Official Reports and Whitepapers*, MeitY/DST Publications, 2020 onward.

Online Learning Resources:

- [IBM Quantum Experience and Qiskit Tutorials](#)
- [Coursera – Quantum Mechanics and Quantum Computation by UC Berkeley](#)
- [edX – The Quantum Internet and Quantum Computers](#)
- [YouTube – Quantum Computing for the Determined by Michael Nielsen](#)
- Qiskit Textbook – IBM Quantum

III B.Tech I Semester

23HPE051a	OBJECT ORIENTED ANALYSIS AND DESIGN (Professional Elective –I)	L	T	P	C
		3	0	0	3

Course Objectives:

1. Describe the activities in the different phases of the object-oriented development lifecycle.
2. Understand the concepts of object-oriented model with the E-R and EER models.
3. Model a real-world application by using UML diagram.
4. Design architectural modelling.
5. Describing an application of UML.

Course Outcomes:

At the end of the course, student will be able to

1. The importance of modelling in UML.
2. Compare and contrast the object-oriented model with the E-R and EER models.
3. Design use case diagram. Design an application using deployment diagram.
4. Apply UML diagrams to build library application.

UNIT – I**9 Hrs**

Introduction to UML: Importance of modelling, principles of modelling, object-oriented modelling, conceptual model of the UML, Architecture, Software Development Life Cycle.

UNIT – II**9 Hrs**

Basic Structural Modelling: Classes, Relationships, common Mechanisms, and diagrams. Advanced Structural Modelling: Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages. Class & Object Diagrams: Terms, concepts, modelling techniques for Class & Object Diagrams.

UNIT – III**9 Hrs**

Basic Behavioural Modelling-I: Interactions, Interaction diagrams. Basic Behavioural Modelling-II: Use cases, Use case Diagrams, Activity Diagrams.

UNIT – IV**9 Hrs**

Advanced Behavioral Modelling: Events and signals, state machines, processes and Threads, time and space, state chart diagrams. Architectural Modelling: Component, Deployment, Component diagrams and Deployment diagrams.

UNIT – V**9 Hrs**

Patterns and Frameworks, Artifact Diagrams. Case Study: The Unified Library application.

Text Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson: The Unified Modelling Language User Guide, Pearson Education 2nd Edition.
2. Object-Oriented Analysis and Design with the Unified Process By John W. Satzinger, Robert B Jackson and Stephen D Burd, Cengage Learning.

Reference Books:

1. Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.
2. Pascal Roques: Modelling Software Systems Using UML2, WILEY-Dreamtech India Pvt. Ltd.
3. Atul Kahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.

4. Mark Priestley: Practical Object-Oriented Design with UML, TMH.
5. Applying UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

III B.Tech I Semester

23HPE051b	SOFT COMPUTING	L	T	P	C
		3	0	0	3

Course Objectives:

- Familiarize with soft computing concepts
- Introduce and use the idea of fuzzy logic and use of heuristics based on human experience
- Familiarize the Neuro-Fuzzy modelling using Classification and Clustering techniques
- Learn the concepts of Genetic algorithm and its applications
- Acquire the knowledge of Rough Sets.

Course Outcomes:

- Identify the difference between Conventional Artificial Intelligence to Computational Intelligence.
- Understand fuzzy logic and reasoning to handle and solve engineering problems □ Apply the Classification techniques on various applications.
- Perform various operations of genetic algorithms and Rough Sets.

UNIT - I

Introduction to Soft Computing: Evolutionary Computing, "Soft" computing versus "Hard" computing, Soft Computing Methods, Recent Trends in Soft Computing, Characteristics of Soft computing, Applications of Soft Computing Techniques.

UNIT- II

Fuzzy Systems: Fuzzy Sets, Fuzzy Relations, Fuzzy Logic, Fuzzy Rule-Based Systems

UNIT- III

Fuzzy Decision Making, Particle Swarm Optimization.

UNIT- IV

Genetic Algorithms: Basic Concepts, Basic Operators for Genetic Algorithms, Crossover and Mutation Properties, Genetic Algorithm Cycle, Fitness Function, Applications of Genetic Algorithm.

UNIT- V

Rough Sets, Rule Induction, and Discernibility Matrix, Integration of Soft Computing Techniques.

TEXT BOOK:

1. Soft Computing – Advances and Applications - Jan 2015 by B.K. Tripathy and J. Anuradha – Cengage Learning

REFERENCE BOOKS:

1. S. N. Sivanandam & S. N. Deepa, —Principles of Soft Computing, 2nd edition, Wiley India, 2008.
2. David E. Goldberg, —Genetic Algorithms-In Search, optimization and Machine learning, Pearson Education.
3. J. S. R. Jang, C.T. Sun and E.Mizutani, —Neuro-Fuzzy and Soft Computing, Pearson Education, 2004.
4. G.J. Klir & B. Yuan, —Fuzzy Sets & Fuzzy Logic, PHI, 1995.
5. Melanie Mitchell, —An Introduction to Genetic Algorithms, PHI, 1998.
6. Timothy J. Ross, —Fuzzy Logic with Engineering Applications, McGraw- Hill International editions, 1995.

III B.Tech I Semester

23HPE051c	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		3	0	0	3

Course Objectives:

1. To comprehend the architecture, operation, and configurations of the 8086 microprocessors.
2. To get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. To study the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. To learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. To understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

Course Outcomes:

At the end of this course, the students will be able to

1. Gain knowledge on the architecture, operation, and configurations of the 8086 microprocessors.
2. Get familiar with 8086 programming concepts, instruction set, and assembly language development tools.
3. Know the interfacing of 8086 with memory, peripherals, and controllers for various applications.
4. Learn the architecture, instruction set, and programming of the 8051 microcontrollers.
5. Understand microcontroller interfacing techniques, peripheral programming, and processor comparisons.

UNIT-I

8086 Architecture: Main features, pin diagram/description, 8086 microprocessor family, internal architecture, bus interfacing unit, execution unit, interrupts and interrupt response, 8086 system timing, minimum mode and maximum mode configuration.

UNIT-II

8086 Programming: Program development steps, instructions, addressing modes, assembler directives, writing simple programs with an assembler, assembly language program development tools.

UNIT-III

8086 Interfacing: Semiconductor memories interfacing (RAM, ROM), Intel 8255 programmable peripheral interface, Interfacing switches and LEDs, Interfacing seven segment displays, software and hardware interrupt applications, Intel 8251 USART architecture and interfacing, Intel 8237a DMA controller, stepper motor, A/D and D/A converters, Need for 8259 programmable interrupt controllers.

UNIT-IV

Microcontroller - Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT-V

Interfacing Microcontroller - Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Textbooks:

1. Microprocessors and Interfacing – Programming and Hardware by Douglas V Hall, SSSP Rao, Tata McGraw Hill Education Private Limited, 3rdEdition,1994.
2. K M Bhurchandi, A K Ray, Advanced Microprocessors and Peripherals, 3rd edition, McGraw Hill Education, 2017.
3. Raj Kamal, Microcontrollers: Architecture, Programming, Interfacing and System Design, 2nd edition, Pearson, 2012.

References:

1. Ramesh S Gaonkar, Microprocessor Architecture Programming and Applications with the 8085, 6th edition, Penram International Publishing, 2013.
2. Kenneth J. Ayala, The 8051 Microcontroller, 3rd edition, Cengage Learning, 2004.

III B.Tech I Semester

23HPE051d	DATA WAREHOUSING & DATA MINING	L	T	P	C
		3	0	0	3

Course Objective:

- Familiarize with mathematical foundations of data mining tools.
- Introduce classical models and algorithms in data warehouses and data mining.
- Investigate the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- Explore data mining techniques in various applications like social, scientific and environmental context.

Course Outcomes:

Upon completion of the course, the students should be able to:

- Design a Data warehouse system and perform business analysis with OLAP tools (L6).
- Apply suitable pre-processing and visualization techniques for data analysis (L3)
- Apply frequent pattern and association rule mining techniques for data analysis (L3)
- Design appropriate classification and clustering techniques for data analysis (L6)
- Infer knowledge from raw data (L4)

UNIT- I:**Lecture 9Hr**

Basic Concepts – Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors – Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.

UNIT- II:**Lecture 9Hrs**

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT- III:**Lecture 8 Hrs**

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns.

UNIT- IV:**Lecture 9Hrs**

Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection-Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis-Partitioning Methods – Hierarchical Methods – Density Based Methods – Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT- V: WEKA TOOL

Lecture 8Hrs

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database – Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

TEXT BOOK:

1.Jiawei Han and Micheline Kamber, —Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.

REFERENCES:

1.Alex Berson and Stephen J.Smith, —Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, 35th Reprint 2016.

2.K.P. Soman, Shyam Diwakar and V. Ajay, —Insight into Data Mining Theory and Practice, Eastern Economy Edition, Prentice Hall of India, 2006.

3.Ian H.Witten and Eibe Frank, —Data Mining: Practical Machine Learning Tools and Techniques, Elsevier, Second Edition.

III B.Tech I Semester

23HPC0514	ARTIFICIAL INTELLIGENCE LAB	L	T	P	C
		0	0	3	1.5

Pre-requisite:

1. Knowledge in Computer Programming.
2. Background in linear algebra, data structures and algorithms, and probability

Course Objectives:

- The student should be made to study the concepts of Artificial Intelligence.
- The student should be made to learn the methods of solving problems using Artificial Intelligence.
- The student should be made to introduce the concepts of Expert Systems and machine learning.

Course Outcomes:

After completion of the course, students will be able to

- Understand the Mathematical and statistical perspectives of machine learning algorithms through python programming (L2)
- Appreciate the importance of visualization in the data analytics solution. (L5)
- Derive insights using Machine learning algorithms (L5)
- Implement and demonstrate AI and ML algorithms. (L5)
- Evaluate different algorithms. (L6)

List of Experiments

1. Write a Program to Implement Breadth First Search using Python.
2. Write a program to implement Best First Searching Algorithm
3. Write a Program to Implement Depth First Search using Python.
4. Write a program to implement the Heuristic Search
5. Write a python program to implement A* and AO* algorithm. (Ex: find the shortest path)
6. Write a Program to Implement Water-Jug problem using Python.
7. Write a Program to Implement Alpha-Beta Pruning using Python.
8. Write a Program to implement 8-Queens Problem using Python.
9. Write a program to schedule a meeting among a 5 busy people using Default Reasoning the output should give the time, place and day of the meeting.
10. Write a program to implement the Unification algorithm
11. Develop a knowledge base system consisting of facts and rules about some specialized knowledge domain
12. Write a program to implement 8 puzzle programs using different heuristics. Using it play the game Tic-Tac-Toe at the end the game the program should display the no. of nodes generated, cutoff values at each stage in the form of a table.

Textbooks:

1. PrateekJoshi, Artificial Intelligence with Python, Packt Publishing, 2017.
2. Xiao, Perry. Artificial intelligence programming with Python: from zero to hero. John Wiley & Sons, 2022.

Reference Books:

1. Stuart J. Russell and Peter Norvig, Artificial Intelligence A Modern Approach, Fourth Edition, Pearson, 2020
2. Martin C. Brown (Author), —Python: The Complete Reference| McGraw Hill Education, Fourth edition, 2018
3. R. NageswaraRao , —Core Python Programming| Dreamtech Press India Pvt Ltd 2018.

Online Learning Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs40/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs41/preview

III B.Tech I Semester

23HPC0515	COMPUTER NETWORKS & INTERNET PROTOCOLS LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance
- To analyze the traffic flow and the contents of protocol frames.
- Familiarize with the applications of Internet.

Course Outcomes:

- To understand the working principle of various communication protocols.
- To understand the network simulator environment and visualize a network topology and observe its performance.
- To analyze the traffic flow and the contents of protocol frames.
- Critique the existing routing protocols

List of Experiments:

1. Implement the data link layer framing methods such as character, character-stuffing and bit stuffing.
2. Write a program to compute CRC code for the polynomials CRC-12, CRC-16 and CRC CCIP
3. Develop a simple data link layer that performs the flow control using the sliding window protocol, and loss recovery using the Go-Back-N mechanism.
4. Implement Dijkstra's algorithm to compute the shortest path through a network
5. Take an example subnet of hosts and obtain a broadcast tree for the subnet.
6. Implement distance vector routing algorithm for obtaining routing tables at each node.
7. Implement data encryption and data decryption
8. Write a program for congestion control using Leaky bucket algorithm.
9. Write a program for frame sorting technique used in buffers.
10. Programs using Wireshark
 - i. Packet Capture Using Wire shark
 - ii. Starting Wire shark
 - iii. Viewing Captured Traffic
 - iv. Analysis and Statistics & Filters.
11. How to run Nmap scan
12. Operating System Detection using Nmap
13. Do the following using NS2 Simulator
 - i. NS2 Simulator-Introduction

- ii. Simulate to Find the Number of Packets Dropped
- iii. Simulate to Find the Number of Packets Dropped by TCP/UDP
- iv. Simulate to Find the Number of Packets Dropped due to Congestion
- v. Simulate to Compare Data Rate & Throughput.
- vi. Simulate to Plot Congestion for Different Source/Destination
- vii. Simulate to Determine the Performance with respect to transmission of Packets

Text Books:

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, 6th Edition, PEARSON.
2. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down 6th edition, Pearson, 2019.
2. Computer Networks: A Systems Approach - Bruce Davie, VMware - Larry Peterson, Princeton University - 2019.

Reference Books:

1. Computer Networks - B. K. Mathan Nagan, T. Mahalakshmi - Charulatha Publications Private Limited - 2019.
2. Computer Networks - Dr. Amol V. Dhumane Nitin N. Sakhare - Nirali Prakashan Publishers - 2024
3. Data Communications and Networking with TCP/IP Protocol Suite - Behrouz A. Forouzan - McGraw Hill - 6th Edition

III B.Tech I Semester

23HSC0504	FULL STACK DEVELOPMENT – II (Skill Enhancement Course)	L	T	P	C
		0	1	2	2

Course Objectives: The main objectives of the course are to

- Make use of Modern- day JavaScript with ES6 standards for designing Dynamic web pages
- Building robust & responsive User Interfaces using popular JavaScript library **‘React.js’**. Building robust backend APIs using **‘Express. js’**
- Establishing the connection between frontend (React) User interfaces and backend APIs (Express) with Data Bases(My SQL)
- Familiarize students with GitHub for remote repository hosting and collaborative development.

Course Outcomes:

- CO1: Building fast and interactive UIs
- CO2: Applying Declarative approach for developing web apps
- CO3: Understanding ES6 features to embrace modern JavaScript
- CO4: Building reliable APIs with Express. Js
- CO5: Create and manage Git repositories, track changes, and push code to GitHub.

Experiments covering the Topics:

- Introduction to DOM (Document Object Model), Ecma Script (ES6) standards and features like Arrow functions, Spread operator, Rest operator, Type coercion, Type hoisting, String literals, Array and Object Destructuring.
- Basics of React.js like React Components, JSX, Conditional rendering Differences between Real DOM and Virtual DOM.
- Important React.js concepts like React hooks, Props, React forms, Fetch API, Iterative rendering using JavaScript map() function.
- JavaScript runtime environment node. js and its uses, Express. js and Routing, Micro-Services architecture and MVC architecture, database connectivity using (My SQL)
- Introduction to My SQL, setting up MySQL and configuring, Databases, My SQL queries, subqueries, creating My SQL driver for database connectivity to Express. js server.
- Introduction to Git and GitHub and upload project& team collaboration

Sample Experiments:

1. Introduction to Modern JavaScript and DOM

- Write a JavaScript program to link JavaScript file with the HTML page
- Write a JavaScript program to select the elements in HTML page using selectors
- Write a JavaScript program to implement the event listeners
- Write a JavaScript program to handle the click events for the HTML button elements
- Write a JavaScript program to With three types of functions
 - Function declaration
 - Function definition
 - Arrow functions

2. Basics of React.js

- a. Write a React program to implement a counter button using react class components
- b. Write a React program to implement a counter button using react functional components
- c. Write a React program to handle the button click events in functional component
- d. Write a React program to conditionally render a component in the browser
- e. Write a React program to display text using String literals

3. Important concepts of React.js

- a. Write a React program to implement a counter button using React use State hook
- b. Write a React program to fetch the data from an API using React use Effect hook
- c. Write a React program with two react components sharing data using Props.
- d. Write a React program to implement the forms in react
- e. Write a React program to implement the iterative rendering using map() function.

4. Introduction to Git and GitHub**a. Setup**

- Install Git on local machine.
- Configure Git (user name, email).
- Create GitHub account and generate a personal access token.

b. Basic Git Workflow

- Create a local repository using `git init`
- Create and add files → `git add .`
- Commit files → `git commit -m "Initial commit"`
- Connect to GitHub remote → `git remote add origin <repo_url>`
- Push to GitHub → `git push -u origin main`

c. Branching and Collaboration

- Create a branch → `git checkout -b feature1`
- Merge branch to main → `git merge feature1`
- Resolve merge conflicts (guided)

5. Upload React Project to GitHub

- Create a new React app using `npx create-react-app myapp`
- Initialize a git repo and push to GitHub
- Use `.gitignore` to exclude `node_modules`
- Create multiple branches: `feature/navbar`, `feature/form`
- Practice merge and pull requests (can use GitHub GUI)

6. Introduction to Node.js and Express.js

- a. Write a program to implement the `'_hello world'` message in the route through the browser using Express
- b. Write a program to develop a small website with multiple routes using Express.js
- c. Write a program to print the `'_hello world'` in the browser console using Express.js
- d. Write a program to implement the CRUD operations using Express.js
- e. Write a program to establish the connection between API and Database using Express – My SQL driver

7. Introduction to My SQL

- a. Write a program to create a Database and table inside that database using My SQL Command line client
- b. Write a My SQL queries to create table, and insert the data, update the data in the table
- c. Write a My SQL queries to implement the subqueries in the My SQL command line client
- d. Write a My SQL program to create the script files in the My SQL workbench
- e. Write a My SQL program to create a database directory in Project and initialize a database. sql file to integrate the database into API

8. Team Collaboration Using GitHub

- Form groups of 2–3 students
- Create a shared GitHub repo
- Assign tasks and work in branches
- Use Issues, Pull Requests, and Code Reviews
- Document code with README.md

Textbooks:

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas
2. John Dean, Web Programming with HTML5, CSS and JavaScript, Jones & Bartlett Learning, 2019.
3. Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Vasam Subramanian, 2nd edition, APress, O'Reilly.
4. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon
5. AZAT MARDAN, Full Stack Java Script: Learn Back bone. js, Node.js and Mongo DB.2015

Reference Books:

1. Full-Stack JavaScript Development by Eric Bush.
2. Programming the World Wide Web, 7th Edition, Robert W Sebesta, Pearson, 2013.
3. Tomasz Dyl ,KamilPrzeorski , MaciejCzarnecki, Mastering Full Stack React Web Development 2017

Online Learning Resources:

1. <https://ict.iitk.ac.in/product/full-stack-developer-html5-css3-js-bootstrap-php-4/>
2. <https://www.w3schools.com/html>
3. <https://www.w3schools.com/css>
4. <https://www.w3schools.com/js/>
5. <https://www.w3schools.com/nodejs>
6. <https://www.w3schools.com/typescript>
7. <https://docs.github.com/>
8. <https://education.github.com/git-cheat-sheet-education.pdf>

III B.Tech – I semester

L T P C
0 0 2 1

(23HSC0402) TINKERING LAB

The aim of tinkering lab for engineering students is to provide a hands-on learning environment where students can explore, experiment, and innovate by building and testing prototypes. These labs are designed to demonstrate practical skills that complement theoretical knowledge.

Course objectives: The objectives of the course are to	
1	Encourage Innovation and Creativity
2	Provide Hands-on Learning and Impart Skill Development
3	Foster Collaboration and Teamwork
4	Enable Interdisciplinary Learning, Prepare for Industry and Entrepreneurship
5	Impart Problem-Solving mind-set

These labs bridge the gap between academia and industry, providing students with the practical experience. Some students may also develop entrepreneurial skills, potentially leading to start-ups or innovation-driven careers. Tinkering labs aim to cultivate the next generation of engineers by giving them the tools, space, and mind-set to experiment, innovate, and solve real-world challenges.

List of experiments:

- 1) Make your own parallel and series circuits using breadboard for any application of your choice.
- 2) Design and 3D print a Walking Robot
- 3) Design and 3D Print a Rocket.
- 4) Temperature & Humidity Monitoring System (DHT11 + LCD)
- 5) Water Level Detection and Alert System
- 6) Automatic Plant Watering System
- 7) Bluetooth-Based Door Lock System
- 8) Smart Dustbin Using Ultrasonic Sensor
- 9) Fire Detection and Alarm System
- 10) RFID-Based Attendance System
- 11) Voice-Controlled Devices via Google Assistant
- 12) Heart Rate Monitoring Using Pulse Sensor
- 13) Soil Moisture-Based Irrigation
- 14) Smart Helmet for Accident Detection
- 15) Milk Adulteration Detection System
- 16) Water Purification via Activated Carbon
- 17) Solar Dehydrator for Food Drying
- 18) Temperature-Controlled Chemical Reactor
- 19) Ethanol Mini-Plant Using Biomass
- 20) Smart Fluid Flow Control (Solenoid + pH Sensor)
- 21) Portable Water Quality Tester
- 22) AI Crop Disease Detection
- 23) AI-based Smart Irrigation
- 24) ECG Signal Acquisition and Plotting

- 25) AI-Powered Traffic Flow Prediction
- 26) Smart Grid Simulation with Load Monitoring
- 27) Smart Campus Indoor Navigator
- 28) Weather Station Prototype
- 29) Firefighting Robot with Sensor Guidance
- 30) Facial Recognition Dustbin
- 31) Barcode-Based Lab Inventory System
- 32) Growth Chamber for Plants
- 33) Biomedical Waste Alert System
- 34) Soil Classification with AI
- 35) Smart Railway Gate
- 36) Smart Bin Locator via GPS and Load Sensors
- 37) Algae-Based Water Purifier
- 38) Contactless Attendance via Face Recognition

- **Note:** The students can also design and implement their own ideas, apart from the list of experiments mentioned above.
- **Note:** A minimum of 8 to 10 experiments must be completed by the students.

III B.Tech II Semester

23HPC0516	MACHINE LEARNING	L	T	P	C
		3	0	0	3

Course Objectives: The objectives of the course are

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

Course Outcomes:

- CO1: Identify machine learning techniques suitable for a given problem. (L3)
- CO2: Solve real-world problems using various machine learning techniques. (L3)
- CO3: Apply Dimensionality reduction techniques for data preprocessing. (L3)
- CO4: Explain what is learning and why it is essential in the design of intelligent machines. (L2)
- CO5: Evaluate Advanced learning models for language, vision, speech, decision making etc. (L5)

UNIT-I: Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

UNIT-II: Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT-III: Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

UNIT-IV: Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

UNIT-V: Clustering : Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering, K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough

Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Textbooks:

1. —Machine Learning Theory and Practice, M N Murthy, V S Ananthanarayana, Universities Press (India), 2024

Reference Books:

1. —Machine Learning, Tom M. Mitchell, McGraw-Hill Publication, 2017

2. —Machine Learning in Action, Peter Harrington, DreamTech

3. —Introduction to Data Mining, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

III B.Tech II Semester

23HPC0517	CLOUD COMPUTING	L	T	P	C
		3	0	0	3

Course Objectives:

- To explain the evolving computer model called cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.

Course Out comes(CO):

After completion of the course, students will be able to

- Ability to create cloud computing environment
- Ability to design applications for Cloud environment
- Design & develop back up strategies for cloud data based on features.
- Use and Examine different cloud computing services.
- Apply different cloud programming model as per need.

UNIT I Basics of Cloud computing**Lecture 8Hrs**

Introduction to cloud computing: Introduction, Characteristics of cloud computing, Cloud Models, Cloud Services Examples, Cloud Based services and applications

Cloud concepts and Technologies: Virtualization, Load balancing, Scalability and Elasticity, Deployment, Replication, Monitoring, Software defined, Network function virtualization, Map Reduce, Identity and Access Management, services level Agreements, Billing.

Cloud Services and Plat forms: Compute Services, Storage Services, Data, base Services, Application services, Content delivery services Analytics Services, Deployment and Management Services, Identity and Access Management services, Open Source Private Cloud software.

UNIT II Hadoop and Python**Lecture 9Hrs**

Hadoop Map Reduce: Apache Hadoop, Hadoop Map Reduce Job Execution, Hadoop Schedulers, Hadoop Clusterset up.

Cloud Application Design: Reference Architecture for Cloud Applications, Cloud Application Design Methodologies, Data Storage Approaches.

Python Basics: Introduction, Installing Python, Python data Types & Data Structures, Control flow, Function, Modules, Packages, File handling, Date/Time Operations, Classes.

UNIT III Python for Cloud computing Lecture 8Hrs

Python for Cloud: Python for Amazon web services, Python for Google Cloud Platform, Python for windows Azure, Python for Map Reduce, Python packages of Interest, Python web Application Framework, Designing a REST ful web API.

Cloud Application Development in Python: Design Approaches, Image Processing APP, Document Storage App, Map Reduce App, Social Media Analytics App.

UNIT IV Big data, multimedia and Tuning**Lecture 8Hrs**

Big Data Analytics: Introduction, Clustering Big Data, Classification of Big data Recommendation of Systems.

Multimedia Cloud: Introduction, Case Study: Live video Streaming App, Streaming Protocols, case Study: Video Trans coding App.

Cloud Application Bench marking and Tuning: Introduction, Work load Character is tics,

Application Performance Metrics, Design Considerations for a Bench marking Methodology, Bench marking Tools, Deployment Prototyping, Load Testing & Bottleneck Detection case Study, Hadoop bench marking case Study.

UNIT V Applications and Issues in Cloud

Lecture 9Hrs

Cloud Security: Introduction, CSA Cloud Security Architecture, Authentication, Authorization, Identity Access Management, Data Security, Key Management, Auditing.

Cloud for Industry, Health care & Education: Cloud Computing for Health care, Cloud computing for Energy Systems, Cloud Computing for Transportation Systems, Cloud Computing for Manufacturing Industry, Cloud computing for Education.

Migrating in to a Cloud: Introduction, Broad Approaches to migrating into the cloud, the seven– step model of migration in to a cloud.

Organizational readiness and Change Management in The Cloud Age: Introduction, Basic concepts of Organizational Readiness, Drivers for changes: A frame work to comprehend the competitive environment, common change management models, change management maturity models, Organizational readiness self– assessment.

Legal Issues in Cloud Computing: Introduction, Data Privacy and security Issues, cloud contracting models, Jurisdictional issues raised by virtualization and at a location, commercial and business considerations, Special Topics.

Text books:

1. Cloud computing Ahands - on Approach ||By Arshdeep Bahga, Vijay Madiseti, Universities Press, 2016
2. Cloud Computing Principles and Paradigms: By RajKumar Buyya, James Broberg, Andrzej Goscinski, Wiley, 2016

Reference Books:

1. Masterin g Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, TMH
2. Cloud computing AHands-On Approach by Arshdeep Bahga and Vijay Madiseti.
3. Cloud Computing: A Practical Approach, Anthony T.Velte, To by J.Velte, Robert Elsenpeter, Tata Mc Graw Hill, rp 2011.
4. Enterprise Cloud Computing, Gautam Shroff, Cambridge University Press, 2010.
5. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese,O_Reilly, SPD, rp 2011.
6. Essentials of Cloud Computing by K.Chandrasekaran. CRC Press.

Online Learning Resources:

[Cloud computing – Course \(nptel.ac.in\)](https://nptel.ac.in)

III B.Tech II Semester

23HPC0518	CRYPTOGRAPHY & NETWORK SECURITY	L	T	P	C
		3	0	0	3

Course Objectives:

This course aim sat training students to master the:

- The concepts of classical encryption techniques and concepts of finite fields and number theory
- Working principles and utilities of various crypto graphic algorithms including secret key cryptography, hashes, and message digests, and public key algorithms
- Design issues and working principles of various authentication protocols, PKI standards
- Various secure communication standards including Kerberos, IP sec, TLS and email
- Concepts of crypto graphic utilities and authentication mechanisms to design secure applications

Course Out comes:

After completion of the course, students will be able to

- Identify information security goals, classical encryption techniques and acquire fundamental knowledge on the concepts off in it fields and number theory
- Compare and apply different encryption and decryption techniques to solve problems related to confidentiality and authentication
- Apply the knowledge of cryptographic check sums and evaluate the performance of different message digest algorithms for verifying the integrity of varying message sizes.
- Demonstrate the ability to apply **user authentication principles** including **Kerberos** for secure authentication
- Gain proficiency in securing web communications using **TLS** and **HTTPS**, manage secure remote access with **SSH**, and design **firewall policies**

UNIT-I**Lecture 9Hrs**

Computer and Network Security Concepts: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography, Block Ciphers: Traditional Block Cipher Structure, The Data Encryption Standard, Advanced Encryption Standard: AES Structure, AES Transformation Functions

UNIT II**Lecture 9Hrs****Number Theory:**

The Euclidean Algorithm, Modular Arithmetic, Fermat's and Euler's Theorems, The Chinese Remainder Theorem, Discrete Logarithms, Finite Fields: Finite Fields of the Form $GF(p)$, Finite Fields of the Form $GF(2^n)$.**Public Key Cryptography:** Principles, Public Key Cryptography Algorithms, RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography.

UNIT-III**Lecture 9Hrs**

Cryptographic Hash Functions: Application of Cryptographic Hash Functions, Requirements &Security, Secure Hash Algorithm, Message Authentication Functions, Requirements &Security,

HMAC & CMAC. **Digital Signatures:** NIST Digital Signature Algorithm, Distribution of Public Keys, X.509 Certificates, Public- Key Infrastructure

UNIT IV**Lecture 9Hrs**

User Authentication: Remote User Authentication Principles, Kerberos.

Electronic Mail Security: Pretty Good Privacy (PGP) And S/MIME.

IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange.

UNIT V**Lecture 8Hrs**

Transport Level Security: Web Security Requirements, Transport Layer Security (TLS), HTTPS, Secure Shell (SSH)

Fire walls: Fire wall Characteristics and Access Policy, Types of Fire walls, Fire wall Location and Configurations.

Text books:

- 1) Cryptography and Network Security – William Stallings, Pearson Education, 8th Edition.
- 2) Cryptography, Network Security and Cyber Laws–Bernard Menezes, Cengage Learning, 2010 edition.

Reference Books:

- 1) Cryptography and Network Security-Behrouz A Forouzan, Debdeep Mukhopadhyaya, Mc- Graw Hill, 3rd Edition, 2015.
- 2) Network Security Illustrated, Jason Albanese and Wes Sonnenreich, MGH Publishers, 2003.

Online Learning Resources:

- 1) <https://nptel.ac.in/courses/106/105/106105031/lecture>
- 2) [https://nptel.ac.in/courses/106/105/106105162/lecturebyDr.SouravMukhopadhyayIITKharagpur\[VideoLecture\]](https://nptel.ac.in/courses/106/105/106105162/lecturebyDr.SouravMukhopadhyayIITKharagpur[VideoLecture])
- 3) <https://www.mitel.com/articles/web-communication-cryptography-and-network-security-web-articles-by-Mitel-Power-Connections>

III B.Tech II Semester

23HPE052a	SOFTWARE TESTING METHODOLOGIES (Professional Elective-II)	L	T	P	C
		3	0	0	3

Course Objectives:

- To study the fundamental concepts of software testing which includes objectives, process, criteria, strategies, and methods.
- To discuss various software testing types and levels of testing like black and white box testing along with levels unit test, integration, regression, and system testing.
- It also helps to learn the types of bugs, testing levels with which the student can very well identify a bug and correct as when it happens.
- It provides knowledge on transaction flow testing and data flow testing techniques so that the flow of the program is tested as well.
- To learn the domain testing, path testing and logic based testing to explore the testing process easier.

Course Outcomes:

- Know the basic concepts of software testing and its essentials.
- Able to identify the various bugs and correcting them after knowing the consequences of the bug.
- Use of program's control flow as a structural model is the corner stone of testing.
- Performing functional testing using control flow and transaction flow graphs.

UNIT-I**Lecture 9Hrs**

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**Lecture 8Hrs**

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**Lecture 8Hrs**

Domain Testing:-domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

UNIT-IV**Lecture 9Hrs**

Paths, Path products and Regular expressions:- path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing:-over view, decision tables, path expressions, kv charts, specifications.

UNIT-V

Lecture 9Hrs

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.
2. Software Testing Tools – Dr. K.V.K.K. Prasad, Dreamtech.

REFERENCES BOOKS:

1. The craft of software testing – Brian Marick, Pearson Education.
2. Software Testing Techniques – SPD(Oreille)
3. Software Testing in the Real World – Edward Kit, Pearson.
4. Effective methods of Software Testing, Perry, John Wiley.
5. Art of Software Testing – Meyers, John Wiley.

III B.Tech II Semester

23HPE052b	CYBER SECURITY (Professional Elective-II)	L	T	P	C
		3	0	0	3

Course Objectives:

The course is designed to provide awareness on different cyber crimes, cyber offenses, tools and methods used in cybercrime.

Course Outcomes:

After completion of the course, students will be able to

- Classify the cybercrimes and understand the Indian ITA 2000
- Analyse the vulnerabilities in any computing system and find the solutions
- Predict the security threats of the future
- Investigate the protection mechanisms
- Design security solutions for organizations

UNIT I Introduction to Cybercrime**Lecture 8Hrs**

Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, And Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

UNIT II Cyber Offenses: How Criminals Plan Them**Lecture 9Hrs**

Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing

UNIT III Cybercrime: Mobile and Wireless Devices**Lecture 9Hrs**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones,

Mobile Devices:

Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

UNIT IV Tools and Methods Used in Cybercrime**Lecture 8Hrs**

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT V Cyber Security: Organizational Implications

Lecture 8Hrs

Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text books:

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference Books:

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan- Hwa(john) Wu,J. David Irwin.CRC Press T&F Group

Online Learning Resources:

<http://nptel.ac.in/courses/106105031/40>

<http://nptel.ac.in/courses/106105031/39>

<http://nptel.ac.in/courses/106105031/38>

III B.Tech II Semester

23HPE052c	DevOps Professional Elective-II	L	T	P	C
		3	0	0	3

Pre-requisite:

Fundamentals of software development and maintenance

Course Objectives:

- Understand collaboration and productivity by automating infrastructure and workflows
- Familiarize with continuous measuring applications performance

Course Outcomes: After completion of the course, students will be able to

- Enumerate the principles of continuous development and deployment, automation of configuration management, inter-team collaboration, and IT serviceability
- Describe Dev Ops & Dev Sec Ops methodologies and their key concepts
- Illustrate the types of version control systems, continuous integration tools, continuous monitoring tools, and cloud models
- Set up complete private infrastructure using version control systems and CI/CD tools

UNIT I**Lecture 8 Hrs**

Dev Ops: An Overview, Dev Ops: Origins, Dev Ops: Roots, Dev Ops: Practices Dev Ops: Culture.

Adopting Dev Ops: Developing the Playbook. Developing a Business Case for a Dev Ops: Developing the Business Case

UNIT II**Lecture 9 Hrs**

Completing the Business Model Canvas, Customer Segments, Value Segments, Value Propositions, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, Cost Structures. Dev Ops Plays for Optimizing the delivery Pipeline: Dev Ops as an optimization Exercise, Core Themes, The Dev Ops Plays, Specializing Core Plays

UNIT III**Lecture 8Hrs**

Dev Ops Plays for Driving Innovation: Optimize to Innovate, The Uber Syndrome, Innovation and the Role of Technology, Core Themes, play: Build a Dev Ops Platform, play: Deliver Micro services Architectures, play: DevOps an API Economy, play: Organizing for Innovation.

UNIT IV**Lecture 10 Hrs**

Scaling Dev Ops for the Enterprise: Core Themes, play: Dev Ops Center of Competency, play: Developing Culture of Innovation at Scale, play: Developing a Culture of continuous Improvement, play: Team Models for Dev Ops, play: Standardization of Tools and Process, play: Security Considerations for Dev Ops, Play: Dev Ops and Outsourcing.

UNIT V**Lecture 10 Hrs**

Leading Dev Ops Adoption in the Enterprise: Play: Dev Ops as a transformation Exercise, play: Developing a Culture of Collaboration and Trust, play: Dev Ops Thinking for the Line of Business, play: starting with Pilot Projects, Play: Rearing Unicorns on an Aircrafts Carrier. Appendix Case Study: Example Dev Ops Adoption Roadmap Organization Background, Roadmap Structure, Adoption Roadmap.

Text books:

1. Sanjeev Sharma, The Dev Ops Adoption Playbook, Published by John Wiley & Sons, Inc.2017

Reference Books:

1. Sanjeev Sharma & Bernie Coyne, Dev Ops for Dummies, Published by John Wiley & Sons, Inc.
2. Michael Huttermann, Dev Ops for Developers, Apress publishers,2012.

Online Learning Resources:

Learning Dev Ops with Terra form Infrastructure Automation Course | Udemy

III B.Tech II Semester

23HPE052d	EMBEDDED SYSTEM DESIGN Professional Elective-II	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand the history, classification, and design process of embedded systems.
2. To explore the core components of embedded systems, including processors, memory, and I/O components.
3. To introduce onboard and external communication interfaces used in embedded systems.
4. To explain different firmware design approaches and programming techniques for embedded systems.
5. To provide an understanding of real-time operating systems and task management in embedded systems.

Course Outcomes:

After completing the course, the student will be able to,

1. Classify embedded systems based on their purpose, generation, and complexity.
2. Identify and select appropriate hardware components for an embedded system design.
3. Differentiate and implement various communication protocols like I2C, SPI, and CAN.
4. Develop firmware using assembly and high-level programming languages.
5. Analyze and apply RTOS-based task scheduling and synchronization techniques.

UNIT I Introduction to Embedded Systems

History of embedded systems, Classification of embedded systems based on generation and complexity, Purpose of embedded systems, The embedded system design process-requirements, specification, architecture design, designing hardware and software, components, system integration, Applications of embedded systems, and characteristics of embedded systems.

UNIT II Typical Embedded System

Core of the embedded system-general purpose and domain specific processors, ASICs, PLDs, COTs; Memory-ROM, RAM, memory according to the type of interface, memory shadowing, memory selection for embedded systems, Sensors, actuators, I/O components: seven segment LED, relay, piezo buzzer, push button switch, other sub-systems: reset circuit, brownout protection circuit, oscillator circuit real time clock, watch dog timer.

UNIT III Communication Interface

Onboard communication interfaces-I2C, SPI, CAN, parallel interface; External communication interfaces-RS232 and RS485, USB, infrared, Bluetooth, Wi-Fi, ZigBe, GPRS, GSM.

UNIT IV Embedded Firmware Design and Development

Embedded firmware design approaches-super loop based approach, operating system based approach; embedded firmware development languages-assembly language based development, high level language based development.

UNIT V RTOS based Embedded System Design

Operating system basics, types of operating systems, tasks, process and threads, multiprocessing and multitasking, task scheduling: non-pre-emptive and pre-emptive scheduling; task communication-shared memory, message passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/ Synchronization Issues, Task Synchronization Techniques

Text books:

1. Introduction to Embedded Systems - Shibu KV, Mc Graw Hill Education.
2. Computers as Components –Wayne Wolf, Morgan Kaufmann (second edition).

References:

1. Embedded System Design -Frank Vahid, Tony Grivargis, John Wiley.
2. Embedded Systems- An integrated approach - Lyla b das, Pearson education 2012.
3. Embedded Systems – Raj Kamal, TMH

III B.Tech II Semester

23HPE053a	SOFTWARE PROJECT MANAGEMENT (Professional Elective-III)	L	T	P	C
		3	0	0	3

Course Objective:

This course is designed to enable the students to understand the fundamental principles of Software Project management & will also have a good knowledge of the responsibilities of a project manager and how to handle them.

Course Out comes:

After completion of the course, students will be able to

- Describe the fundamentals of Project Management
- Recognize and use Project Scheduling Techniques
- Familiarize with Project Control Mechanisms
- Understand Team Management
- Recognize the importance of Project Documentation and Evaluation

UNIT-I**Lecture 9Hrs**

Conventional Software Management: The water fall model, conventional software Management performance Evolution of Software Economics: software Economics. Pragmatic Software Cost Estimation Improving Software Economics: Reducing Software Product Size, Improving Software Processes, Improving Team Effectiveness, Improving Automation, Achieving Required Quality ,Peer Inspections.

UNIT-II**Lecture 9Hrs**

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.

Lifecycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts

UNIT-III**Lecture 9Hrs**

Work Flows of the process: Software process work flows, Inter Trans work flows. Check points of the Process: Major Mile Stones, Minor Milestones, Periodic status assessments. Iterative Process Planning: work break down structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning

UNIT-IV**Lecture 9Hrs**

Process Automation: Automation Building Blocks, The Project Environment.

Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators Tailoring the Process: Process discriminants. Managing people and organizing teams.

UNIT-V**Lecture 9Hrs**

Project Organizations and Responsibilities: Line - of-Business Organizations, Project Organizations, evolution of Organizations.

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,2012
2. BobHughes, MikeCotterellandRajibMall—SoftwareProjectManagement,6thEdition, Mc Graw Hill Edition, 2017

Reference Books:

1. PankajJalote,—SoftwareProjectManagementinpractice,5thEdition,PearsonEducation, 2017.
2. Murali K.Chemuturi,Thomas M.Cagley Jr.‖Mastering Software Project Management: Best Practices, Tools and Techniques‖, J.Ross Publishing, 2010
3. SanjayMohapatra,—SoftwareProjectManagement‖,CengageLearning,2011

Online Learning Resources:

<http://nptel.ac.in/courses/106101061/29>

III B.Tech II Semester

23HPE053b	MOBILE ADHOC NETWORKS (Professional Elective-III)	L	T	P	C
		3	0	0	3

Course Objective:

- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- Knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid.
- Knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless.
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.

Course Outcomes:

- Describe the unique issues in ad-hoc/sensor networks.
- Describe current technology trends for the implementation and deployment of wireless ad-hoc/sensor networks.
- Discuss the challenges in designing MAC, routing and transport protocols for wireless ad-hoc/sensor networks.
- Discuss the challenges in designing routing and transport protocols for wireless Adhoc/sensor networks.
- Comprehend the various sensor network Platforms, tools and applications

UNIT- I**Introduction to Ad Hoc Networks:**

Characteristics of MANETs, Applications of MANETs and challenges of MANETs -Routing in MANETs: Criteria for classification, Taxonomy of MANET routing algorithms, Topology based routing algorithms, Position based routing algorithms, Other routing algorithms.

UNIT -II**Data Transmission:**

Broadcast storm problem, Broadcasting, Multicasting and Geocasting -TCP over Ad Hoc: TCP protocol overview, TCP and MANETs, Solutions for TCP over Ad hoc

UNIT- III**Basics of Wireless, Sensors and Applications:**

Applications, Classification of sensor networks, Architecture of sensor network, Physical layer, MAC layer, Link layer.

UNIT- IV**Data Retrieval in Sensor Networks:**

Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs, Sensor Networks and mobile robots-Security: Security in Ad Hoc networks, Key management, Secure routing, Cooperation in MANETs, Intrusion Detection systems.

UNIT- V

Sensor Network Platforms and Tools: Sensor Network Hardware, Berkeley motes, Sensor Network Programming Challenges, Node-Level Software Platforms -Operating System: Tiny OS -Imperative Language: nesC, Data flow style language: Tiny GALs, Node Level Simulators, ns-2 and its sensor network extension.

TEXT BOOKS:

1. Ad Hoc and Sensor Networks –Theory and Applications, Carlos Corderio Dharma P. Aggarwal, World Scientific Publications, March 2006,ISBN –981-256-681-3
2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao, Leonidas Guibas, Elsevier Science, ISBN –978-1-55860-914-3 (Morgan Kaufman)

III B.Tech II Semester

23HPE053c	NATURAL LANGUAGE PROCESSING (Professional Elective-III)	L	T	P	C
		3	0	0	3

Course Objective

- Explain and apply fundamental algorithms and techniques in the area of natural language processing(NLP)
- Discuss approaches to syn tax and semantics in NLP.
- Examine current methods for statistical approach esto machine translation.
- Teach machine learning techniques used in NLP.

Course Out comes:

After completion of the course, students will be able to

- Under stand the various NLP Applications and Organization of Natural language, able to learn and implement realistic applications using Python.
- Apply the various Parsing techniques, Bayes Rule, Shannongame, Entropy and Cross Entropy.
- Under stand the fundamentals of CFG and parsers and mechan is msin ATN's.
- Apply Semantic Interpretation and Language Modelling.
- Apply the concept of Machine Translation and multilingual Information Retrieval systems and Automatic Summarization.

UNIT- I Introduction to Natural language

The Study of Language, Applications of NLP, Evaluating Language Understanding Systems, Different Levels of Language Analysis, Representations and Understanding, Organization of Natural language Under standing Systems, Linguistic Back ground: Anoutline of English Syn tax.

UNIT-II Grammars and Parsing

Grammars and Parsing – Top – Down and Bottom-Up Parsers, Transition Network Grammars, Feature Systems and Augmented Grammars, Morphological Analysis and the Lexicon, Parsing with Features, Augmented Transition Networks, Bayees Rule, Shannongame, Entropy and Cross Entropy.

UNIT-III Grammars for Natural Language

Grammars for Natural Language, Movement Phenomenon in Language, Gap Threading, Human Preferences in Parsing, Shift Reduce Parsers, Deterministic Parsers.

UNIT-IV**Semantic Interpretation**

Semantic &Logical form, Word senses &ambiguity, The basic logical form language, Encoding ambiguity in the logical Form, Verbs &States in logical form, The maticroles, Speech acts & embedded sentences, Defining semantics structure model theory.

Language Modelling

Introduction, n- Gram Models, Language model Evaluation, Parameter Estimation, Language Model Adaption, Types of Language Models, Language Specific Modelling Problems, Multilingual and Cross lingual Language Modelling.

UNIT-V

Machine Translation Survey: Introduction, Problems of Machine Translation, Is Machine Translation Possible, Brief History, Possible Approaches, Current Status.

Anusaraka or Language Accessor: Background, Cutting the Gordian Knot, The Problem, Structure of Anusaraka System, User Interface, Linguistic Area, Giving up Agreement in Anusarsaka Output, Language Bridges.

Multilingual Information Retrieval

Introduction, Document Pre-processing, Monolingual Information Retrieval, CLIR, MLIR, Evaluation in Information Retrieval, Tools, Software and Resources.

Multilingual Automatic Summarization

Introduction, Approach esto Summarization, Evaluation, How to Build a Summarizer, Competitions and Datasets.

Textbooks:

1. James Allen, Natural Language Understanding, 2nd Edition, 2003, Pearson Education.
2. Multilingual Natural Language Processing Applications: From Theory To Practice- Daniel M.Bikel and ImedZitouni, Pearson Publications.
3. Natural Language Processing, A paninian perspective, Akshar Bharathi, Vineetchaitanya, Prentice –Hall of India.

Reference Books:

1. Charniack, Eugene, Statistical Language Learning, MITPress,1993.
2. Jurafsky, Dan and Martin, James, Speech and Language Processing, 2nd Edition, Prentice Hall,2008.
3. Manning, Christopher and Hen rich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press,1999.

Online Learning Resources:

<https://nptel.ac.in/courses/106/105/106105158/http://www.nptelvideos.in/2012/11/natural-language-processing.html>

III B.Tech II Semester

23HPE053d	DISTRIBUTED OPERATING SYSTEMS (Professional Elective-III)	L	T	P	C
		3	0	0	3

Course Objectives

- To study, learn, and understand the main concepts of advanced operating systems (parallel processing systems, distributed systems, real time systems, network operating systems, and open source operating systems)
- Hardware and software features that support these systems.

Course Outcomes

- Understand the design approaches of advanced operating systems
- Analyze the design issues of distributed operating systems.
- Evaluate design issues of multi processor operating systems.
- Identify the requirements Distributed File System and Distributed Shared Memory.
- Formulate the solutions to schedule the real time applications.

UNIT - I

Architectures of Distributed Systems: System Architecture Types, Distributed Operating Systems, Issues in Distributed Operating Systems, Communication Primitives. Theoretical Foundations: Inherent Limitations of a Distributed System, Lam port's Logical Clocks, Vector Clocks, Causal Ordering of Messages, Termination Detection.

UNIT - II

Distributed Mutual Exclusion: The Classification of Mutual Exclusion Algorithms, Non-Token –Based Algorithms: Lamport's Algorithm, The Ricart-Agrawalsa Algorithm, Maekawa's Algorithm, Token-Based Algorithms: Suzuki-Kasami's Broadcast Algorithm, Singhal's Heuristic Algorithm, Raymond's Heuristic Algorithm.

UNIT - III

Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed Systems, Issues in Deadlock Detection and Resolution, Control Organizations for Distributed Deadlock Detection, Centralized- Deadlock – Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Deadlock Detection Algorithms

UNIT - IV

Multiprocessor System Architectures: Introduction, Motivation for multiprocessor Systems, Basic Multiprocessor System Architectures Multi Processor Operating Systems: Introduction, Structures of Multiprocessor Operating Systems, Operating Design Issues, Threads, Process Synchronization, Processor Scheduling. Distributed File Systems: Architecture, Mechanisms for Building Distributed File Systems, Design Issues

UNIT - V

Distributed Scheduling: Issues in Load Distributing, Components of a Load Distributed Algorithm, Stability, Load Distributing Algorithms, Requirements for Load Distributing, Task Migration, Issues in task Migration Distributed Shared Memory: Architecture and Motivation, Algorithms for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues

TEXT BOOK:

1. Advanced Concepts in Operating Systems, Mukesh Singhal, Niranjana G. Shivaratri, Tata Mc Graw-Hill Edition 2001

REFERENCE BOOK:

1. Distributed Systems: Andrew S. Tanenbaum, Maarten Van Steen, Pearson Prentice Hall, Edition – 2, 2007

III B.Tech II Semester

23HPC0519	MACHINE LEARNING LAB	L	T	P	C
		0	0	3	1.5

Course Objectives:

- To learn about computing central tendency measures and Data preprocessing techniques
- To learn about classification and regression algorithms
- To apply different clustering algorithms for a problem.

Software Required: Python/R/Weka

Lab should cover the concepts studied in the course work, sample list of Experiments:

1. Compute Central Tendency Measures: Mean, Median, Mode Measure of Dispersion: Variance, Standard Deviation.
2. Apply the following Pre-processing techniques for a given dataset.
 - a. Attribute selection
 - b. Handling Missing Values
 - c. Discretization
 - d. Elimination of Outliers
3. Apply KNN algorithm for classification and regression
4. Demonstrate decision tree algorithm for a classification problem and perform parameter tuning for better results
5. Demonstrate decision tree algorithm for a regression problem
6. Apply Random Forest algorithm for classification and regression
7. Demonstrate Naïve Bayes Classification algorithm.
8. Apply Support Vector algorithm for classification
9. Demonstrate simple linear regression algorithm for a regression problem
10. Apply Logistic regression algorithm for a classification problem
11. Demonstrate Multi-layer Perceptron algorithm for a classification problem
12. Implement the K-means algorithm and apply it to the data you selected. Evaluate performance by measuring the sum of the Euclidean distance of each example from its class center. Test the performance of the algorithm as a function of the parameters K.
13. Demonstrate the use of Fuzzy C-Means Clustering
14. Demonstrate the use of Expectation Maximization based clustering algorithm

III B.Tech II Semester

23HPC0520	CRYPTOGRAPHY AND NETWORK SECURITY LAB	L	T	P	C
		0	0	3	1.5

List of Experiments:

1. Write a C program that contains a string (char pointer) with a value `_Hello world'`. The program should XOR each character in this string with 0 and displays the result.
2. Write a C program that contains a string (char pointer) with a value `_Hello world'`. The program should AND or and XOR each character in this string with 127 and display the result.
3. Write a Java program to perform encryption and decryption using the following algorithms
 - a. Ceaser cipher b. Substitution cipher c. Hill Cipher
4. Write a C/JAVA program to implement the DES algorithm logic.
5. Write a C/JAVA program to implement the Blowfish algorithm logic.
6. Write a C/JAVA program to implement the Rijndael algorithm logic.
7. Write the RC4 logic in Java Using Java cryptography; encrypt the text `—Hello world|` using Blowfish. Create your own key using Java key tool.
8. Write a Java program to implement RSA algorithm.
9. Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.
10. Calculate the message digest of a text using the SHA-1 algorithm in JAVA.
11. Calculate the message digest of a text using the MD5 algorithm in JAVA.

III B.Tech II Semester

23HSC1E01	SOFT SKILLS	L	T	P	C
		1	0	2	2

Course Objectives:		
<ul style="list-style-type: none"> To encourage all round development of the students by focusing on soft skills To make the students aware of critical thinking and problem-solving skills To enhance healthy relationship and understanding within and outside an organization To function effectively with heterogeneous teams 		
Course Outcomes (CO):		
COs	Statements	Blooms level
CO1	List out various elements of soft skills	L1, L2,
CO2	Describe methods for building professional image	L1, L2
CO3	Apply critical thinking skills in problem solving	L3
CO4	Analyse the needs of an individual and team for well-being	L4
CO5	Assess the situation and take necessary decisions	L5
CO6	Create a productive work place atmosphere using social and work-life skills ensuring personal and emotional well-being	L6
SYLLABUS		
UNIT – I	Soft Skills & Communication Skills	Lecture Hrs
Soft Skills - Introduction, Need - Mastering Techniques of Soft Skills – Communication Skills - Significance, process, types - Barriers of communication - Improving techniques		
Activities:		
Intrapersonal Skills- Narration about self- strengths and weaknesses- clarity of thought – self-expression – articulating with felicity (The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes and literary sources)		
Interpersonal Skills- Group Discussion – Debate – Team Tasks - Book and film Reviews by groups - Group leader presenting views (non- controversial and secular) on contemporary issues or on a given topic.		
Verbal Communication- Oral Presentations- Extempore- brief addresses and speeches- convincing- negotiating- agreeing and disagreeing with professional grace.		
Non-verbal communication – Public speaking – Mock interviews – presentations with an objective to identify non- verbal clues and remedy the lapses on observation		
UNIT – II	Critical Thinking	Lecture Hrs
Active Listening – Observation – Curiosity – Introspection – Analytical Thinking – Open-mindedness – Creative Thinking - Positive thinking - Reflection		
Activities:		
Gathering information and statistics on a topic - sequencing – assorting – reasoning – critiquing issues – placing the problem – finding the root cause - seeking viable solution – judging with rationale – evaluating the views of others - Case Study, Story Analysis		
UNIT – III	Problem Solving & Decision Making	Lecture Hrs
Meaning & features of Problem Solving – Managing Conflict – Conflict resolution – Team building - Effective decision making in teams – Methods & Styles		
Activities:		

Placing a problem which involves conflict of interests, choice and views – formulating the problem – exploring solutions by proper reasoning – Discussion on important professional, career and organizational decisions and initiate debate on the appropriateness of the decision. Case Study & Group Discussion		
UNIT – IV	Emotional Intelligence & Stress Management	Lecture Hrs
<p>Managing Emotions – Thinking before Reacting – Empathy for Others – Self-awareness – Self-Regulation – Stress factors – Controlling Stress – Tips</p> <p>Activities: Providing situations for the participants to express emotions such as happiness, enthusiasm, gratitude, sympathy, and confidence, compassion in the form of written or oral presentations. Providing opportunities for the participants to narrate certain crisis and stress –ridden situations caused by failure, anger, jealousy, resentment and frustration in the form of written and oral presentation, Organizing Debates</p>		
UNIT – V	Corporate Etiquette	Lecture Hrs
<p>Etiquette- Introduction, concept, significance - Corporate etiquette - meaning, modern etiquette, benefits - Global and local culture sensitivity - Gender Sensitivity - Etiquette in interaction- Cell phone etiquette - Dining etiquette - Netiquette - Job interview etiquette -Corporate grooming tips - Overcoming challenges</p> <p>Activities Providing situations to take part in the Role Plays where the students will learn about bad and good manners and etiquette - Group Activities to showcase gender sensitivity, dining etiquette etc. - Conducting mock job interviews - Case Study - Business Etiquette Games</p> <p>NOTE:- 1. The facilitator can guide the participants before the activity citing examples from the lives of the great, anecdotes, epics, scriptures, autobiographies and literary sources which bear true relevance to the prescribed skill. 2. Case studies may be given wherever feasible for example for Decision Making- The decision of King Lear.</p>		
Prescribed Books:		
<ol style="list-style-type: none"> Mitra Barun K, <i>Personality Development and Soft Skills</i>, Oxford University Press, Pap/Cdr edition 2012 Dr Shikha Kapoor, <i>Personality Development and Soft Skills: Preparing for Tomorrow</i>, K I 2018 ,esuoH gnihsilbu PlanoitanretnI 		
Reference Books		
<ol style="list-style-type: none"> Sharma, Prashant, <i>Soft Skills: Personality Development for Life Success</i>, BPB Publications 2018. Alex K, <i>Soft Skills</i> S.Chand& Co, 2012 (Revised edition) Gajendra Singh Chauhan& Sangeetha Sharma, <i>Soft Skills: An Integrated Approach to Maximise Personality</i> Published by Wiley, 2013 Pillai, Sabina & Fernandez Agna, <i>Soft Skills and Employability Skills</i>, Cambridge University Press, 2018 Dr. Rajiv Kumar Jain, Dr. Usha Jain, <i>Life Skills</i>(Paperback English)Publisher : Vayu Education of India, 2014 		

Online Learning Resources:

- 1. https://youtu.be/DUlsNJtg2L8?list=PLLy_2iUCG87CQhELCytvXh0E_y-bOO1_q**
- 2. https://youtu.be/xBaLgJZ0t6A?list=PLzf4HHlsQFwJZel_j2PUy0pwjVUgj7Kl J**
- 3. <https://youtu.be/-Y-R9hDI7IU>**
- 4. <https://youtu.be/gkLsn4ddmTs>**
- 5. <https://youtu.be/2bf9K2rRWwo>**
- 6. <https://youtu.be/FchfE3c2jzc>**
- 7. <https://www.businesstrainingworks.com/training-resource/five-free-business-etiquette-training-games/>**
- 8. https://onlinecourses.nptel.ac.in/noc24_hs15/preview**
- 9. https://onlinecourses.nptel.ac.in/noc21_hs76/preview**

III B.Tech II Semester

23HAC9902	TECHNICAL REPORT WRITING & IPR	L	T	P	C
		2	0	0	0

Course Objectives:

1. To enable the students to practice the basic skills of research paper writing
2. To make the students understand the importance of IP and to educate them on the basic concepts of Intellectual Property Rights.
3. To practice the basic skills of performing quality literature review
4. To help them in knowing the significance of real life practice and procedure of Patents.
5. To enable them learn the procedure of obtaining Patents, Copyrights, & Trade Marks

Course Outcomes: On successful completion of this course, the students will be able to:

COURSE OUTCOMES:		Blooms Level
At the end of the course, students will be able to		
CO1	Identify key secondary literature related to their proposed technical paper writing	L1, L2
CO2	Explain various principles and styles in technical writing	L1, L2
CO3	Use the acquired knowledge in writing a research/technical paper	L3
CO4	Analyse rights and responsibilities of holder of Patent, Copyright, trade mark, International Trademark etc.	L4
CO5	Evaluate different forms of IPR available at national & international level	L5
CO6	Develop skill of making search of various forms of IPR by using modern Tools and techniques.	L3, L6

UNIT – I:

Principles of Technical Writing: styles in technical writing; clarity, precision, coherence and logical sequence in writing-avoiding ambiguity- repetition, and vague language -highlighting your findings- discussing your limitations -hedging and criticizing -plagiarism and paraphrasing .

UNIT – II:

Technical Research Paper Writing: Abstract- Objectives-Limitations-Review of Literature- Problems and Framing Research Questions- Synopsis

UNIT – III:

Process of research: publication mechanism: types of journals- indexing-seminars-conferences- proof reading – plagiarism style; seminar & conference paper writing; Methodology-discussion-results- citation rules

UNIT – IV:

Introduction to Intellectual property: Introduction, types of intellectual property, International organizations, agencies and ties, importance of intellectual property rights

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting and using trade mark, trade mark registration processes.

UNIT – V:

Law of copy rights: Fundamentals 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. Patent law, intellectual property audits.

Textbooks:

1. Deborah. E. Bouchoux, *Intellectual Property Rights*, Cengage Learning India, 2013
2. Meenakshi Raman, Sangeeta Sharma. *Technical Communication: Principles and practices*. Oxford.

Reference Books:

1. R.Myneni, *Law of Intellectual Property*, 9th Ed, Asia law House, 2019.
2. Prabuddha Ganguli, *Intellectual Property Rights* Tata Mcgraw Hill, 2001
3. P.Naryan, *Intellectual Property Law*, 3rd Ed ,Eastern Law House, 2007.
4. Adrian Wallwork. *English for Writing Research Papers* Second Edition. Springer Cham Heidelberg New York ,2016
5. Dan Jones, Sam Dragga, *Technical Writing Style*

Online Resources

1. <https://theconceptwriters.com.pk/principles-of-technical-writing/>
2. <https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html>
3. <https://www.ewh.ieee.org/soc/emcs/acstrial/newsletters/summer10/TechPaperWriting.html>
4. <https://www.manuscriptedit.com/scholar-hangout/process-publishing-research-paper-journal/>
5. <https://www.icsi.edu/media/website/IntellectualPropertyRightLaws&Practice.pdf>
6. <https://lawbhoomi.com/intellectual-property-rights-notes/>
7. <https://www.extension.purdue.edu/extmedia/ec/ec-723.pdf>

OPEN ELECTIVES

III B.Tech I Semester

Course Code	GREEN BUILDINGS (OPEN ELECTIVE - I)										L	T	P	C
23HOE011a											3	0	0	3
Course Objectives : The objectives of this course are to make the student:														
<ol style="list-style-type: none"> To understand the fundamental concepts of green buildings, their necessity, and sustainable features. To analyze green building concepts, rating systems, and their benefits in India. To apply green building design principles, energy efficiency measures, and renewable energy sources. To evaluate air conditioning systems, HVAC designs, and energy modeling for sustainable buildings. To assess material conservation strategies, waste management, and indoor environmental quality in green buildings. 														
Course Outcomes (COs) Upon successful completion of the course, students will be able to:														
<ol style="list-style-type: none"> Understand the importance of green buildings, their necessity, and sustainable features. Analyze various green building practices, rating systems, and their impact on environmental sustainability. Apply principles of green building design to enhance energy efficiency and incorporate renewable energy sources. Evaluate HVAC systems, energy-efficient air conditioning techniques, and their role in sustainable building design. Assess material conservation techniques, waste reduction strategies, and indoor air quality management in green buildings. 														
CO - PO Articulation Matrix														
Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO -1	3	-	-	-	-	2	3	-	-	-	-	-	3	3
CO -2	-	3	-	-	2	-	3	-	-	-	-	2	3	3
CO -3	-	-	3	3	3	-	3	-	-	-	-	-	3	3
CO -4	-	-	3	3	3	-	3	-	-	-	-	-	3	3

CO -5	-	-	-	-	-	3	3	3	2	-	-	-	-	3
UNIT – I														
Introduction to Green Building– Necessity of Green Buildings, Benefits of Green Buildings, Green Building Materials and Equipment in India, Key Requisites for Constructing A Green Building, Important Sustainable Features for Green Buildings.														
UNIT – II														
Green Building Concepts and Practices– Indian Green Building Council, Green Building Movement in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities and Benefits: Opportunities of Green Buildings, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy-Saving Approaches in Buildings, LEED India Rating System, and Energy Efficiency.														
UNIT – III														
Green Building Design– Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximizing System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources, Eco-Friendly Captive Power Generation for Factories, Building Requirements.														
UNIT – IV														
Air Conditioning– Introduction, CII Godrej Green Business Centre, Design Philosophy, Design Interventions, Energy Modeling, HVAC System Design, Chiller Selection, Pump Selection, Selection of Cooling towers, Selection of Air Handling Units, Pre-Cooling of Fresh Air, Interior Lighting Systems, Key Features of The Building, Eco-Friendly Captive Power Generation for Factories, Building Requirements.														
UNIT – V														
Material Conservation– Handling of Non-Process Waste, Waste Reduction During Construction, Materials With Recycled Content, Local Materials, Material Reuse, Certified Wood, Rapidly Renewable Building Materials and Furniture. Indoor Environment Quality and Occupational Health– Air Conditioning, Indoor Air Quality, Sick Building Syndrome, tobacco Smoke.														
TEXT BOOKS:														
1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and														

Air conditioning Engineers, 2009. 2. Green Building Hand Book by tom woolley and Sam kimings, 2009.
REFRENCE BOOKS:
1. Complete Guide to Green Buildings by Trish riley 2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009 3. Energy Conservation Building Code –ECBC-2020, published by BEE
Online Learning Resources:
https://archive.nptel.ac.in/courses/105/102/105102195/

III B.Tech – I Semester

Course Code	CONSTRUCTION TECHNOLOGY AND MANAGEMENT (OPEN ELECTIVE – I)									L	T	P	C
23HOE011b										3	0	0	3
Course Objectives: The objectives of this course are to make the student :													
<ol style="list-style-type: none"> 1. To understand project management fundamentals, organizational structures, and leadership principles in construction. 2. To analyze manpower planning, equipment management, and cost estimation in civil engineering projects. 3. To apply planning, scheduling, and project management techniques such as CPM and PERT. 4. To evaluate various contract types, contract formation, and legal aspects in construction management. 5. To assess safety management practices, accident prevention strategies, and quality management systems in construction. 													
Course Outcomes (COs): Upon successful completion of the course, students will be able to:													
<ol style="list-style-type: none"> 1. Understand (Cos)project management fundamentals, organizational structures, and leadership principles in construction. 2. Analyze manpower planning, equipment management, and cost estimation in civil engineering projects. 3. Apply planning, scheduling, and project management techniques such as CPM and PERT. 4. Evaluate various contract types, contract formation, and legal aspects in construction management. 5. Assess safety management practices, accident prevention strategies, and quality management systems in construction. 													
CO – PO Articulation Matrix													
Course Outcomes	PO 1	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	
CO -1	3	-	-	-	2	-	2	2	-	-	3	3	
CO -2	-	-	-	2	-	-	-	-	-	-	3	3	
CO -3	-	3	3	3	-	-	-	-	2	-	3	3	
CO -4	-	3	3	3	-	-	2	-	-	-	3	3	
CO -5	-	-	-	-	3	3	3	2	-	-	-	3	

UNIT – I		
Introduction: Project forms, Management Objectives and Functions; Organizational Chart of A Construction Company; Manager's Duties and Responsibilities; Public Relations; Leadership and Team - Work; Ethics, Morale, Delegation and Accountability.		
UNIT – II		
Man and Machine: Man-Power Planning, Training, Recruitment, Motivation, Welfare Measures and Safety Laws; Machinery for Civil Engineering., Earth Movers and Hauling Costs, Factors Affecting Purchase, Rent, and Lease of Equipment, and Cost Benefit Estimation.		
UNIT – III		
Planning, Scheduling and Project Management: Planning Stages, Construction Schedules and Project Specification, Monitoring and Evaluation; Bar-Chart, CPM, PERT, Network-formulation and Time Computation.		
UNIT – IV		
Contracts: Types of Contracts, formation of Contract – Contract Conditions – Contract for Labour, Material, Design, Construction – Drafting of Contract Documents Based On IBRD/ MORTH Standard Bidding Documents – Construction Contracts – Contract Problems – Arbitration and Legal Requirements Computer Applications in Construction Management: Software for Project Planning, Scheduling and Control.		
UNIT – V		
Safety Management – Implementation and Application of QMS in Safety Programs, ISO 9000 Series, Accident Theories, Cost of Accidents, Problem Areas in Construction Safety, Fall Protection, Incentives, Zero Accident Concepts, Planning for Safety, Occupational Health and Ergonomics.		
TEXT BOOKS:		
<ol style="list-style-type: none"> 1. Construction Project Management, SK. Sears, GA. Sears, RH. Clough, John Wiley and Sons, 6th Edition, 2016. 2. Construction Project Scheduling and Control by Saleh Mubarak, 4th Edition, 2019 3. Pandey, I.M (2021) Financial Management 12th edition. Pearson India Education Services Pvt. Ltd. 		
REFERENCE BOOKS:		
<ol style="list-style-type: none"> 1. Brien, J.O. and Plotnick, F.L., CPM in Construction Management, Mcgraw Hill, 2010. 		

2. Punmia, B.C., and Khandelwal, K.K., Project Planning and control with PERT and CPM, Laxmi Publications, 2002.
3. Construction Methods and Management: Pearson New International Edition 8 th Edition Stephens Nunnally.
4. Rhoden, M and Cato B, Construction Management and Organisational Behaviour, Wiley-Blackwell, 2016.

Online Learning Resources:

<https://archive.nptel.ac.in/courses/105/104/105104161/>

<https://archive.nptel.ac.in/courses/105/103/105103093/>

III B.Tech I Semester

23HOE0201	ELECTRICAL SAFETY PRACTICES AND STANDARDS (Open Elective-I)	L	T	P	C
		3	0	0	3

COURSE OUTCOMES:

CO1: Understanding the Fundamentals of Electrical Safety -L2

CO2: Identifying and Applying Safety Components -L3

CO3: Analyzing Grounding Practices and Electrical Bonding

CO4: Applying Safety Practices in Electrical Installations and Environments- L4

CO5:Evaluating Electrical Safety Standards and Regulatory Compliance -L5

UNIT I Introduction To Electrical Safety:

Fundamentals of Electrical safety-Electric Shock-physiological effects of electric current- Safetyrequirements–Hazardsofelectricity-Arc-Blast-Causesforelectricalfailure.

UNIT II Safety Components:

Introduction to conductors and insulators- voltage classification -safety against over voltages-safety against static electricity-Electrical safety equipment’s- Fire extinguishers for electrical safety.

UNIT III Grounding:

General requirements for grounding and bonding- Definitions- System grounding- Equipment grounding -The Earth-Earthing practices-Determining safe approach distance- Determining arc hazard category.

UNIT IV Safety Practices:

General first aid-Safety in handling hand held electrical appliances tools- Electrical safety in train stations-swimming pools, external lighting installations, medical locations- Case studies.

UNIT V Standards For Electrical Safety:

Electricity Acts- Rules & regulations- Electrical standards-NFPA 70 E-OSHA standards- IEEE standards-National Electrical Code 2005 – National Electric Safety code NESC- Statutory requirements from electrical inspectorate

TEXTBOOKS:

1. Massimo A.G.Mitolo,“Electrical Safety of Low-Voltage Systems”,McGraw Hill,USA,2009.
2. Mohamed El-Sharkawi,“Electric Safety-Practice and Standards”,CRC Press,USA,2014

REFERENCES:

1. Kenneth G.Mastrullo, Ray A .Jones,“The Electrical Safety Program Book”, Jones and Bartlett Publishers ,London, 2nd Edition, 2011.
2. Palmer Hickman,“Electrical Safety-Related Work Practices”, Jones & Bartlett Publishers, London,2009.
3. Fordham Cooper,W.,“Electrical Safety Engineering”, Butter worth and Company,London,1986.
4. John Cadick, Mary Capelli Schellpfeffer, DennisK.Neitzel, “Electrical Safety Handbook, McGraw-Hill, NewYork, USA, 4th edition, 2012.

III B.Tech – I Sem

23HOE0301	SUSTAINBLE ENERGY TECHNOLOGIES (Open Elective-I)	L	T	P	C
		3	0	0	3

Course objectives: The objectives of the course are to	
1	To demonstrate the importance the impact of solar radiation, solar PV modules
2	To understand the principles of storage in PV systems
3	To discuss solar energy storage systems and their applications.
4	To get knowledge in wind energy and bio-mass
5	To gain insights in geothermal energy, ocean energy and fuel cells.

COURSE OUTCOMES On successful completion of this course the student will be able to		
CO1	Illustrate the importance of solar radiation and solar PV modules.	L1, L2
CO2	Discuss the storage methods in PV systems	L2,L3
CO3	Explain the solar energy storage for different applications	L2,L3
CO4	Understand the principles of wind energy, and bio-mass energy.	L2, L3
CO5	Attain knowledge in geothermal energy, ocean energy and fuel cells.	L1, L2,L3, L4

UNIT – 1

SOLAR RADIATION: Role and potential of new and renewable sources, the solar energy option, Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data, numerical problems.

SOLAR PV MODULES AND PV SYSTEMS:

PV Module Circuit Design, Module Structure, Packing Density, Interconnections, Mismatch and Temperature Effects, Electrical and Mechanical Insulation, Lifetime of PV Modules, Degradation and Failure, PV Module Parameters, Efficiency of PV Module, Solar PV Systems-Design of Off Grid Solar Power Plant. Installation and Maintenance.

UNIT – 2**STORAGE IN PV SYSTEMS:**

Battery Operation, Types of Batteries, Battery Parameters, Application and Selection of Batteries for Solar PV System, Battery Maintenance and Measurements, Battery Installation for PV System.

UNIT – 3

SOLAR ENERGY COLLECTION: Flat plate and concentrating collectors, classification of concentrating collectors, orientation.

SOLAR ENERGY STORAGE AND APPLICATIONS: Different methods, sensible, latent heat and stratified storage, solar ponds, solar applications- solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney.

UNIT – 4

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, betz criteria, types of winds, wind data measurement.

BIO-MASS: Principles of bio-conversion, anaerobic/aerobic digestion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects.

UNIT – 5

GEOHERMAL ENERGY: Origin, Applications, Types of Geothermal Resources, Relative Merits

OCEAN ENERGY: Ocean Thermal Energy; Open Cycle & Closed Cycle OTEC Plants, Environmental Impacts, Challenges

FUEL CELLS: Introduction, Applications, Classification, Different Types of Fuel Cells Such as Phosphoric Acid Fuel Cell, Alkaline Fuel Cell, PEM Fuel Cell, MC Fuel Cell.

Text Books:

1. Solar Energy – Principles of Thermal Collection and Storage/Sukhatme S.P. and J.K.Nayak/TMH
2. Non-Conventional Energy Resources- Khan B.H/ Tata McGraw Hill, New Delhi, 2006

References:

1. Principles of Solar Engineering - D.Yogi Goswami, Frank Krieth& John F Kreider / Taylor &Francis
2. Non-Conventional Energy - Ashok V Desai /New Age International (P) Ltd
3. Renewable Energy Technologies -Ramesh & Kumar /Narosa
4. Non-conventional Energy Source- G.D Roy/Standard Publishers

Online Learning Resources:

<https://nptel.ac.in/courses/112106318>

<https://youtube.com/playlist?list=PLyqSpOzTE6M-ZgdjYukayF6QevPv7WE-r&si=-mwIa2X-SuSiNy13>

https://youtube.com/playlist?list=PLyqSpOzTE6M-ZgdjYukayF6QevPv7WE-r&si=Apfjx6oDfz1Rb_N3

https://youtu.be/zx04Kl8y4dE?si=VmOvp_OgqisILTAF

III B.Tech I Sem

23HOE0401	ELECTRONIC CIRCUITS (Open Elective-I)	L	T	P	C
		3	0	0	3

Course Objectives:

1. To understand semiconductor diodes, their characteristics and applications.
2. To explore the operation, configurations, and biasing of BJTs.
3. To study the operation, analysis, and coupling techniques of BJT amplifiers.
4. To learn the operation, applications and uses of feedback amplifiers and oscillators.
5. To analyze the characteristics, configurations, and applications of operational amplifiers.

Course Outcomes:

At the end of this course, the students will be able to

1. Understand semiconductor diodes, their characteristics and applications.
2. Explore the operation, configurations, and biasing of BJTs.
3. Gain knowledge about the operation, analysis, and coupling techniques of BJT amplifiers.
4. Learn the operation, applications and uses of feedback amplifiers and oscillators.
5. Analyze the characteristics, configurations, and applications of operational amplifiers.

UNIT-I

Semiconductor Diode and Applications: Introduction, PN junction diode – structure, operation and VI characteristics, Half-wave, Full-wave and Bridge Rectifiers with and without Filters, Positive and Negative Clipping and Clamping circuits (Qualitative treatment only).

Special Diodes: Zener and Avalanche Breakdowns, VI Characteristics of Zener diode, Zener diode as voltage regulator, Construction, operation and VI characteristics of Tunnel Diode, LED, Varactor Diode, Photo Diode .

UNIT-II

Bipolar Junction Transistor (BJT): Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch and Amplifier, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self Bias, Bias Stability, Bias Compensation using Diodes.

UNIT-III

Single stage amplifiers: Classification of Amplifiers - Distortion in amplifiers, Analysis of CE, CC and CB configurations with simplified hybrid model.

Multistage amplifiers: Different Coupling Schemes used in Amplifiers - RC coupled amplifiers, Transformer Coupled Amplifier, Direct Coupled Amplifier; Multistage RC coupled BJT amplifier (Qualitative treatment only).

UNIT-IV

Feedback amplifiers: Concepts of feedback, Classification of feedback amplifiers, Effect of feedback on amplifier characteristics, Voltage Series, Voltage Shunt, Current Series and Current Shunt Feedback Configurations (Qualitative treatment only).

Oscillators: Classification of oscillators, Condition for oscillations, RC Phase shift Oscillators, Generalized analysis of LC Oscillators-Hartley and Colpitts Oscillators, Wien Bridge Oscillator.

UNIT-V

Op-amp: Classification of IC'S, basic information of Op-amp, ideal and practical Op-amp, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

Applications of op-amp : Summing, scaling and averaging amplifiers, Integrator, Differentiator, phase shift oscillator and comparator.

TEXT BOOKS:

1. Electronics Devices and Circuits, J.Millman and Christos. C. Halkias, 3rd edition, Tata McGraw Hill, 2006.
2. Electronics Devices and Circuits Theory, David A. Bell, 5th Edition, Oxford University press. 2008.

REFERENCE BOOKS:

1. Electronics Devices and Circuits Theory, R.L.Boylestad, LouisNashelsky and K.Lal Kishore, 12th edition, 2006, Pearson, 2006.
2. Electronic Devices and Circuits, N.Salivahanan, and N.Suresh Kumar, 3rd Edition, TMH, 2012
3. Microelectronic Circuits, S.Sedra and K.C.Smith, 5th Edition, Oxford University Press.

III B.Tech I Sem

23HOE0501a	JAVA PROGRAMMING (Open Elective-I)	L	T	P	C
		3	0	0	3

Course Objectives: The main objective of the course is to Identify Java language components and how they work together in applications

- Learn the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries.
- Learn how to extend Java classes with inheritance and dynamic binding and how to use exception handling in Java applications
- Understand how to design applications with threads in Java
- Understand how to use Java API's for program development

Course Outcomes: After completion of the course, students will be able to

CO1: Analyze problems, design solutions using OOP principles, and implement them efficiently in Java.

CO2: Design and implement classes to model real-world entities, with a focus on attributes, behaviors, and relationships between objects

CO3: Demonstrate an understanding of inheritance hierarchies and polymorphic behaviour, including method overriding and dynamic method dispatch.

CO4: Apply Competence in handling exceptions and errors to write robust and fault-tolerant code.

CO5: Perform file input/output operations, including reading from and writing to files using Java I/O classes, graphical user interface (GUI) programming using JavaFX.

Unit – I: Object Oriented Programming: Basic concepts, Principles, Program Structure in Java: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs, Java Statements, Command Line Arguments, User Input to Programs, Escape Sequences Comments, Programming Style. Data Types, **Variables, and Operators** :Introduction, Data Types in Java, Declaration of Variables, Data Types, Type Casting, Scope of Variable Identifier, Literal Constants, Symbolic Constants, Formatted Output with printf() Method, Static Variables and Methods, Attribute Final, **Introduction to Operators**, Precedence and Associativity of Operators, Assignment Operator (=), Basic Arithmetic Operators, Increment (++) and Decrement (- -) Operators, Ternary Operator, Relational Operators, Boolean Logical Operators, Bitwise Logical Operators.

Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions, Ternary Operator?., Switch Statement, Iteration Statements, while Expression, do–while Loop, for Loop, Nested for Loop, For–Each for Loop, Break Statement, Continue Statement.

Unit II:Classes and Objects: Introduction, Class Declaration and Modifiers, Class Members, Declaration of Class Objects, Assigning One Object to Another, Access Control for Class Members, Accessing Private Members of Class, Constructor Methods for Class, Overloaded Constructor Methods, Nested Classes, Final Class and Methods, Passing Arguments by Value and by Reference, Keyword this.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded Constructor Methods, Class Objects as Parameters in Methods, Access Control, Recursive Methods, Nesting of Methods, Overriding Methods, Attributes Final and Static.

Unit III: Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array in Computer Memory, Accessing Elements of Arrays, Operations on Array Elements, Assigning Array to Another Array, Dynamic Change of Array Size, Sorting of Arrays, Search for Values in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensional Arrays, Arrays as Vectors.
Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal Super Class Object Class, Inhibiting Inheritance of Class Using Final, Access Control and Inheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method and Inheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces and Inheritance.

Interfaces: Introduction, Declaration of Interface, Implementation of Interface, Multiple Interfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, Static Methods in Interface, Functional Interfaces, Annotations.

Unit IV: Packages and Java Library: Introduction, Defining Package, Importing Packages and Classes into Programs, Path and Class Path, Access Control, Packages in Java SE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, Wrapper Classes, Auto-boxing and Auto unboxing, Java util Classes and Interfaces, Formatter Class, Random Class, Time Package, Class Instant (java.time.Instant), Formatting for Date/Time in Java, Temporal Adjusters Class, Temporal Adjusters Class.

Exception Handling: Introduction, Hierarchy of Standard Exception Classes, Keywords throws and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable, Unchecked Exceptions, Checked Exceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Character streams, Scanner class, Files in Java(Text Book 2)

Unit V: String Handling in Java: Introduction, Interface Char Sequence, Class String, Methods for Extracting Characters from Strings, Comparison, Modifying, Searching; Class String Buffer.

Multithreaded Programming: Introduction, Need for Multiple Threads Multithreaded Programming for Multi-core Processor, Thread Class, Main Thread Creation of New Threads, Thread States, Thread Priority-Synchronization, Deadlock and Race Situations, Inter thread Communication - Suspending, Resuming, and Stopping of Threads. Java Database Connectivity: Introduction, JDBC Architecture, Installing MySQL and MySQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections, ResultSet Interface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text and image, event handling, laying out nodes in scene graph, mouse events (Text Book 3)

Learning Resources:

Textbooks:

1. JAVA one step ahead, Anitha Seth, B.L.Juneja, Oxford.
2. Joy with JAVA, Fundamentals of Object Oriented Programming, Debasis Samanta, Monalisa Sarma, Cambridge, 2023.
3. JAVA 9 for Programmers, Paul Deitel, Harvey Deitel, 4th Edition, Pearson.

Reference Books:

1. The complete Reference Java, 11th edition, Herbert Schildt, TMH
2. Introduction to Java programming, 7th Edition, Y Daniel Liang, Pearson

Online Learning Resources:

1. <https://nptel.ac.in/courses/106/105/106105191/>
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816347_shared/overview

III B.Tech I Sem

23HOE0501b	FUNDAMENTALS OF ARTIFICIAL INTELLIGENCE (Open Elective-I)	L	T	P	C
		3	0	0	3

Course Objectives:

- To learn the distinction between optimal reasoning Vs. human like reasoning.
- To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- To learn different knowledge representation techniques.
- To understand the applications of AI, namely game playing, theorem proving, and machine learning.

Course Outcomes:

- Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
- Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
- Learn different knowledge representation techniques.
- Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
- Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
- Analyze Supervised Learning Vs. Learning Decision Trees

UNIT - I

Introduction to AI - Intelligent Agents, Problem-Solving Agents,

Searching for Solutions - Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

UNIT-II

Games - Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, **Logic**- Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

UNIT-III

First-Order Logic - Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution.

Knowledge Representation: Ontological Engineering, Categories and Objects, Events.

UNIT-IV

Planning - Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning.

UNIT-V**Probabilistic Reasoning:**

Acting under Uncertainty, Basic Probability Notation Bayes' Rule and Its Use, Probabilistic Reasoning, Representing Knowledge in an Uncertain Domain, The Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability.

TEXT BOOK:

1. Artificial Intelligence: A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

REFERENCE BOOKS:

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight (TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

23HOE0501c	QUANTUM TECHNOLOGIES AND APPLICATIONS Open Elective – I	L	T	P	C
		3	0	0	3
Course Objectives:					
<ul style="list-style-type: none"> To introduce the fundamentals of quantum mechanics relevant to quantum technologies. To explain key quantum phenomena and their role in enabling novel technologies. To explore applications in quantum computing, communication, and sensing. To encourage understanding of emerging quantum-based technologies and innovations. 					
Syllabus					
UNIT I: Fundamentals of Quantum Mechanics (7 Hours)					
<ul style="list-style-type: none"> Classical vs Quantum Paradigm Postulates of Quantum Mechanics Wavefunction and Schrödinger Equation (Time-independent) Quantum states, Superposition, Qubits Measurement, Operators, and Observables Entanglement and Non-locality 					
UNIT II: Quantum Computing					
<ul style="list-style-type: none"> Qubits and Bloch Sphere Quantum Logic Gates: Pauli, Hadamard, CNOT, and Universal Gates Quantum Circuits Basic Algorithms: Deutsch-Jozsa, Grover's, Shor's (conceptual) Error Correction and Decoherence 					
UNIT III: Quantum Communication and Cryptography (7 Hours)					
<ul style="list-style-type: none"> Teleportation & No-Cloning BB84 Protocol Quantum Networks & Repeaters Classical vs Quantum Cryptography Challenges in Implementation 					
UNIT IV: Quantum Sensors and Metrology					
<ul style="list-style-type: none"> Quantum Sensing: Principles and Technologies Quantum-enhanced Measurements Atomic Clocks, Gravimeters Magnetometers, NV Centers Industrial Applications 					
UNIT V: Quantum Materials and Emerging Technologies					
<ul style="list-style-type: none"> Quantum Materials: Superconductors, Topological Insulators Quantum Devices: Qubits, Josephson Junctions National Quantum Missions (India, EU, USA, China) Quantum Careers and Industry Initiatives 					

Textbooks and References
Primary Textbooks:
<ul style="list-style-type: none"> • "Quantum Computation and Quantum Information" by Michael A. Nielsen and Isaac L. Chuang (Cambridge University Press) • "Quantum Mechanics: The Theoretical Minimum" by Leonard Susskind and Art Friedman (Basic Books)
Supplementary Reading:
<ul style="list-style-type: none"> • "Quantum Computing for Everyone" by Chris Bernhardt (MIT Press) • "Quantum Physics: A Beginner's Guide" by Alastair I.M. Rae • "An Introduction to Quantum Computing" by Phillip Kaye, Raymond Laflamme, and Michele Mosca • IBM Quantum Experience and Qiskit Documentation (https://qiskit.org/)
Course Outcomes
<ul style="list-style-type: none"> • Understand key quantum mechanical concepts and phenomena. • Comprehend the structure and function of quantum algorithms and circuits. • Explore applications in quantum communication and cryptography. • Appreciate the role of quantum technologies in modern engineering systems.

III B.Tech I Sem

L	T	P	C
3	0	0	3

**(23HOE991a) MATHEMATICS FOR MACHINE LEARNING AND AI
(Open Elective 1)**

Course Objectives:

- To provide a strong mathematical foundation for understanding and developing AI/ML algorithms.
- To enhance the ability to apply linear algebra, probability, and calculus in AI/ML models.
- To equip students with optimization techniques and graph-based methods used in AI applications.
- To develop critical problem-solving skills for analysing mathematical formulations in AI/ML.

Course Outcomes:

After successful completion of this course, the students should be able to:

COs	Statements	Blooms level
CO1	Apply linear algebra concepts to ML techniques like PCA and regression.	L3 (Apply)
CO2	Analyze probabilistic models and statistical methods for AI applications.	L4 (Analyze)
CO3	Implement optimization techniques for machine learning algorithms.	L3 (Apply)
CO4	Utilize vector calculus and transformations in AI-based models.	L3 (Apply)
CO5	Develop graph-based AI models using mathematical representations.	L5 (Evaluate)

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	3	2	-	-	-	-	-	-	2
CO3	3	3	3	3	2	1	-	-	-	-	-	2
CO4	3	3	2	2	1	-	-	-	-	-	-	1
CO5	3	3	3	3	2	-	-	-	-	-	-	2

• 3 = Strong Mapping, 2 = Moderate Mapping, 1 = Slight Mapping, - = No Mapping

UNIT I: Linear Algebra for Machine Learning**(08)**

Review of Vector spaces, basis, linear independence, Vector and matrix norms, Matrix factorization techniques, Eigenvalues, eigenvectors, diagonalization, Singular Value Decomposition (SVD) and Principal Component Analysis (PCA).

UNIT II: Probability and Statistics for AI (08)

Probability distributions: Gaussian, Binomial, Poisson. Bayes' Theorem, Maximum Likelihood Estimation (MLE), and Maximum a Posteriori (MAP). Entropy and Kullback-Leibler (KL) Divergence in AI, Cross entropy loss, Markov chains.

UNIT III: Optimization Techniques for ML (08)

Multivariable calculus: Gradients, Hessians, Jacobians. Constrained optimization: Lagrange multipliers and KKT conditions. Gradient Descent and its variants (Momentum, Adam) Newton's method, BFGS method.

UNIT IV: Vector Calculus & Transformations (08)

Vector calculus: Gradient, divergence, curl. Fourier Transform & Laplace Transform in ML applications.

UNIT V: Graph Theory for AI (08)

Graph representations: Adjacency matrices, Laplacian matrices. Bayesian Networks & Probabilistic Graphical Models. Introduction to Graph Neural Networks (GNNs).

Textbooks:

1. Mathematics for Machine Learning by Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong, Cambridge University Press, 2020.
2. Pattern Recognition and Machine Learning by Christopher Bishop, Springer.

Reference Books:

1. Gilbert Strang, Linear Algebra and Its Applications, Cengage Learning, 2016.
2. Jonathan Gross, Jay Yellen, Graph Theory and Its Applications, CRC Press, 2018.

Web References:

- MIT– Mathematics for Machine Learning <https://ocw.mit.edu>
- Stanford CS229 – Machine Learning Course <https://cs229.stanford.edu/>

DeepAI – Mathematical Foundations for AI <https://deepai.org>

III B.Tech I Sem

23HOE991b	MATERIALS CHARACTERIZATION TECHNIQUES (Common to all branches) (Open Elective-Interdisciplinary) (Open Elective-I)	Credits 3-0-0:3
-----------	---	--------------------

COURSE OBJECTIVES	
1	To provide exposure to different characterization techniques.
2	To explain the basic principles and analysis of different spectroscopic techniques.
3	To elucidate the working of Scanning electron microscope - Principle, limitations and applications.
4	To illustrate the working of the Transmission electron microscope (TEM) - SAED patterns and its applications.
5	To educate the uses of advanced electric and magnetic instruments for characterization.

UNIT I Structure analysis by Powder X-Ray Diffraction**9H**

Introduction, Bragg's law of diffraction, Intensity of Diffracted beams, Factors affecting Diffraction, Intensities, Structure of polycrystalline Aggregates, Determination of crystal structure, Crystallite size by Scherer and Williamson-Hall (W-H) Methods, Small angle X-ray scattering (SAXS) (in brief).

UNIT II Microscopy technique -1 –Scanning Electron Microscopy (SEM)**9H**

Introduction, Principle, Construction and working principle of Scanning Electron Microscopy, Specimen preparation, Different types of modes used (Secondary Electron and Backscatter Electron), Advantages, limitations and applications of SEM.

UNIT III Microscopy Technique -2 - Transmission Electron Microscopy (TEM)**9H**

Construction and Working principle, Resolving power and Magnification, Bright and dark fields, Diffraction and image formation, Specimen preparation, Selected Area Diffraction, Applications of Transmission Electron Microscopy, Difference between SEM and TEM, Advantage and Limitations of Transmission Electron Microscopy

UNIT IV Spectroscopy techniques**9H**

Principle, Experimental arrangement, Analysis and advantages of the spectroscopic techniques – (i) UV-Visible spectroscopy (ii) Raman Spectroscopy, (iii) Fourier Transform infrared (FTIR) spectroscopy, (iv) X-ray photoelectron spectroscopy (XPS).

UNIT V Electrical & Magnetic Characterization techniques**9H**

Electrical Properties analysis techniques (DC conductivity, AC conductivity) Activation Energy, Effect of Magnetic field on the electrical properties (Hall Effect). Magnetization measurement by induction method, Vibrating sample Magnetometer (VSM) and SQUID.

Textbooks:

1. Material Characterization: Introduction to Microscopic and Spectroscopic Methods – Yang Leng – John Wiley & Sons (Asia) Pvt. Ltd. 2013.
2. Microstructural Characterization of Materials - David Brandon, Wayne D Kalpan, John Wiley & Sons Ltd., 2008

Reference Books:

1. Fundamentals of Molecular Spectroscopy – IV Ed. – Colin Neville Banwell and Elaine M. McCash, Tata McGraw-Hill, 2008.
2. Elements of X-ray diffraction – Bernard Dennis Cullity & Stuart R Stocks, Prentice Hall, 2001 – Science.
3. Practical Guide to Materials Characterization: Techniques and Applications - Khalid Sultan – Wiley – 2021.
4. **Materials Characterization Techniques** -Sam Zhang, Lin Li, Ashok Kumar -CRC Press - 2008

NPTEL courses link :

1. <https://nptel.ac.in/courses/115/103/115103030/>
2. https://nptel.ac.in/content/syllabus_pdf/113106034.pdf
3. <https://nptel.ac.in/noc/courses/noc19/SEM1/noc19-mm08/>

	Course Outcomes	Blooms Level
CO1	Analyze the crystal structure and crystallite size by various methods	L1,L2, L3, L4
CO2	Analyze the morphology of the sample by using a Scanning Electron Microscope	L1,L2, L4
CO3	Analyze the morphology and crystal structure of the sample by using Transmission Electron Microscope	L1,L2, L3
CO4	Explain the principle and experimental arrangement of various spectroscopic techniques	L1,L2
CO5	Identify the construction and working principle of various Electrical & Magnetic Characterization technique	L1,L2

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1							
CO2	3	3	2	1	1							
CO3	3	3	2	1	1							
CO4	3	2	1	1	-							
CO5	3	3	1	1	-							

1-Slightly, 2-Moderately, 3-Substantially.

III B.Tech I Sem

Course Code	Title of the Subject	L	T	P	C
23HOE991c	CHEMISTRY OF ENERGY SYSTEMS	3	-	-	3

COURSE OBJECTIVES	
1	To make the student understand basic electrochemical principles such as standard electrode potentials, emf and applications of electrochemical principles in the design of batteries.
2	To understand the basic concepts of processing and limitations of Fuel cells & their applications.
3	To impart knowledge to the students about fundamental concepts of photo chemical cells, reactions and applications
4	Necessarily of harnessing alternate energy resources such as solar energy and its basic concepts.
5	To impart knowledge to the students about fundamental concepts of hydrogen storage in different materials and liquification method.

COURSE OUTCOMES	
CO1	<ul style="list-style-type: none"> ➤ Solve the problems based on electrode potential, Describe the Galvanic Cell ➤ Differentiate between Lead acid and Lithium ion batteries, Illustrate the electrical double layer
CO2	<ul style="list-style-type: none"> ➤ Describe the working Principle of Fuel cell, Explain the efficiency of the fuel cell ➤ Discuss about the Basic design of fuel cells, Classify the fuel cell
CO3	<ul style="list-style-type: none"> ➤ Differentiate between Photo and Photo electrochemical Conversions, Illustrate the photochemical cells, Identify the applications of photochemical reactions, ➤ Interpret advantages of photoelectron catalytic conversion.
CO4	<ul style="list-style-type: none"> ➤ Apply the photo voltaic technology, Demonstrate about solar energy and prospects ➤ Illustrate the Solar cells, Discuss about concentrated solar power
CO5	<ul style="list-style-type: none"> ➤ Differentiate Chemical and Physical methods of hydrogen storage, Discuss the metal organic frame work, Illustrate the carbon and metal oxide porous structures ➤ Describe the liquification methods.

UNIT-1: Electrochemical Systems: Galvanic cell, Nernst equation, standard electrode potential, application of EMF, electrical double layer, polarization, Batteries- Introduction ,Lead-acid ,Nickel- cadmium, Lithium ion batteries and their applications.

UNIT-2: Fuel Cells: Fuel cell- Introduction, Basic design of fuel cell, working principle, Classification of fuel cells, Polymer electrolyte membrane (PEM) fuel cells, Solid-oxide fuel cells (SOFC), Fuel cell efficiency and applications.

UNIT-3: Photo and Photo electrochemical Conversions: Photochemical cells Introduction and applications of photochemical reactions, specificity of photo electrochemical cell, advantage of photoelectron catalytic conversions and their applications.

UNIT-4: Solar Energy: Introduction and prospects, photovoltaic (PV) technology, concentrated solar power (CSP), Solar cells and applications. .

UNIT-5: Hydrogen Storage:Hydrogen storage and delivery: State-of-the art, Established technologies, Chemical and Physical methods of hydrogen storage, Compressed gas storage, Liquid hydrogen storage, Other storage methods, Hydrogen storage in metal hydrides, metal organic frameworks (MOF), Metal oxide porous structures, hydrogel , and Organic hydrogen carriers.

Text books

1. Physical chemistry by Ira N. Levine
2. Essentials of Physical Chemistry, Bahl and Bahl and Tuli.
3. Inorganic Chemistry, Silver and Atkins

Reference Books:

1. Fuel Cell Hand Book 7th Edition, by US Department of Energy (EG&G technical services And corporation)
2. Hand book of solar energy and applications by ArvindTiwari and Shyam.
3. Solar energy fundamental, technology and systems by Klaus Jagar et.al.
4. Hydrogen storage by Levine Klebonoff

III B.Tech I Sem

Course Code	ENGLISH FOR COMPETITIVE EXAMINATIONS	L	T	P	C
23HOE991d	(Open Elective-I) (Common to All Branches of Engineering)	3	0	0	3
Course Objectives:					
<ol style="list-style-type: none"> 1. To enable the students to learn about the structure of competitive English 2. To understand the grammatical aspects and identify the errors 3. To enhance verbal ability and identify the errors 4. To improve word power to answer competitive challenges 5. To make them ready to crack competitive exams 					
Course Outcomes (CO):		Blooms Level			
By the end of the program students will be able to					
<ul style="list-style-type: none"> Identify the basics of English grammar and its importance Explain the use of grammatical structures in sentences Demonstrate the ability to use various concepts in grammar and vocabulary and their applications in everyday use and in competitive exams Analyze an unknown passage and reach conclusions about it. Choose the appropriate form of verbs in framing sentences Develop speed reading and comprehending ability thereby perform better in competitive exams 		L1, L2 L1, L2 L3 L4 L5			
		L3			
UNIT - I	GRAMMAR-1	Lecture Hrs			
<u>Nouns</u> -classification-errors- <u>Pronouns</u> -types-errors- <u>Adjectives</u> -types-errors- <u>Articles</u> -definite-indefinite-Degrees of Comparison- <u>Adverbs</u> -types- errors- <u>Conjunctions</u> -usage- <u>Prepositions</u> -usage-Tag Questions, types-identifying errors- Practice					
UNIT - II	GRAMMAR-2	Lecture Hrs			
Verbs-tenses- structure-usages- negatives- positives- time adverbs-Sequence of tenses--If Clause-Voice-active voice and passive voice- reported <u>Speech</u> -Agreement- subject and verb-Modals- <u>Spotting Errors</u> -Practices					
UNIT - III	VERBAL ABILITY	Lecture Hrs			
Sentence completion-Verbal analogies-Word groups-Instructions-Critical reasoning-Verbal deduction-Select appropriate pair-Reading Comprehension-Paragraph-Jumbles-Selecting the proper statement by reading a given paragraph.					
UNIT - IV	READING COMPREHENSION AND VOCUBULARY	Lecture Hrs			

Competitive Vocabulary :Word Building – Memory techniques-Synonyms, Antonyms, <u>Affixes</u> -Prefix & Suffix-One word substitutes- <u>Compound words</u> - <u>Phrasal Verbs</u> - <u>Idioms and Phrases</u> - <u>Homophones</u> - <u>Linking Words</u> - <u>Modifiers</u> - <u>Intensifiers</u> - Mastering Competitive Vocabulary- Cracking the unknowing passage-speed reading techniques- Skimming & Scanning-types of answering–Elimination methods		
UNIT - V	WRITING FOR COMPETITIVE EXAMINATIONS	Lecture Hrs
Punctuation- Spelling rules- Word order-Sub Skills of Writing- Paragraph meaning-salient features-types - Note-making, Note-taking, summarizing-precise writing- Paraphrasing-Expansion of proverbs-Essay writing-types		
Textbooks:		
<ol style="list-style-type: none"> 1. Wren & Martin, <i>English for Competitive Examinations</i>, S.Chand & Co, 2021 2. <i>Objective English for Competitive Examination</i>, Tata McGraw Hill, New Delhi, 2014. 		
Reference Books:		
<ol style="list-style-type: none"> 1. <u>Hari Mohan Prasad</u>, <i>Objective English for Competitive Examination</i>, Tata McGraw Hill, New Delhi, 2014. 2. Philip Sunil Solomon, <i>English for Success in Competitive Exams</i>, Oxford 2016 3. Shalini Verma , <i>Word Power Made Handy</i>, S Chand Publications 4. Neira, Anjana Dev & Co. <i>Creative Writing: A Beginner's Manual</i>. Pearson Education India, 2008. 5. Abhishek Jain, <i>Vocabulary Learning Techniques Vol.I&II</i>, RR Global Publishers 2013. 6. Michel Swan, <i>Practical English Usage</i>, Oxford, 2006. 		

Online Resources

1. <https://www.grammar.cl/english/parts-of-speech.htm>
2. <https://academicguides.waldenu.edu/writingcenter/grammar/partsofspeech>
3. <https://learnenglish.britishcouncil.org/grammar/english-grammar-reference/active-passive-voice>
4. <https://languagetool.org/insights/post/verb-tenses/>
5. <https://www.britishcouncil.in/blog/best-free-english-learning-resources-british-council>
6. <https://www.careerride.com/post/social-essays-for-competitive-exams-586.aspx>

III B.Tech I Sem

Course Code	ENTREPRENEURSHIP AND NEW VENTURE CREATION (Open Elective-I)	L	T	P	C
23HOE991e		3	0	0	3

COURSE OBJECTIVES: The objectives of this course are	
1	To foster an entrepreneurial mind-set for venture creation and intrapreneurial leadership.
2	To encourage creativity and innovation
3	To enable them to learn pitching and presentation skills
4	To make the students understand MVP development and validation techniques to determine Product-Market fit and Initiate Solution design, Prototype for Proof of Concept.
5	To enhance the ability of analyzing Customer and Market segmentation, estimate Market size, develop and validate Customer Persona

UNIT-I: Entrepreneurship Fundamentals and context

Meaning and concept, attributes and mindset of entrepreneurial and intrapreneurial leadership, role models in each and their role in economic development. An understanding of how to build entrepreneurial mindset, skill sets, attributes and networks while on campus.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from), Venture Activity

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to

- Understand the concept of Entrepreneur and Entrepreneurship in India
- Analyze recent trends in Entrepreneurship role in economic development
- Develop a creative mind set and personality in starting a business.

Unit II: Problem & Customer Identification

Understanding and analysing the macro-Problem and Industry perspective - technological, socioeconomic and urbanization trends and their implication on new opportunities - Identifying passion - identifying and defining problem using Design thinking principles - Analysing problem and validating with the potential customer - Understanding customer segmentation, creating and validating customer personas.

Core Teaching Tool: Several types of activities including Class, game, Gen AI, ‘_Get out of the Building’ and Venture Activity.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to

- Understand the problem and Customer identification.
- Analyze problem and validating with potential customer
- Evaluate customer segmentation and customer personas

Unit III: Solution design, Prototyping & Opportunity Assessment and Sizing

Understanding Customer Jobs-to-be-done and crafting innovative solution design to map to customer's needs and create a strong value proposition - Understanding prototyping and Minimum Viable product (MVP) - Developing a feasibility prototype with differentiating value, features and benefits - Assess relative market position via competition analysis - Sizing the market and assess scope and potential scale of the opportunity.

Core Teaching Tool: Venture Activity, no-code Innovation tools, Class activity

LEARNING OUTCOMES

At the end if the Unit, the learners will be able to

- Analyze jobs-to-be-done
- Evaluate customer needs to create a strong value proposition
- Design and draw prototyping and MVP

UNIT-IV: Business & Financial Model, Go-to-Market Plan

Introduction to Business model and types, Lean approach, 9 block lean canvas model, riskiest assumptions to Business models. Importance of Build - Measure – Lean approach.

Business planning: components of Business plan- Sales plan, People plan and financial plan.

Financial Planning: Types of costs, preparing a financial plan for profitability using financial template, understanding basics of Unit economics and analysing financial performance.

Introduction to Marketing and Sales, Selecting the Right Channel, creating digital presence, building customer acquisition strategy.

Choosing a form of business organization specific to your venture, identifying sources of funds: Debt& Equity, Map the Start-up Life-cycle to Funding Options.

Core Teaching Tool: Founder Case Studies – Sama and Securely Share; Class activity and discussions; Venture Activities.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to:

- Understand lean approach in business models
- Apply business plan, sales plan and financial plan
- Analyze financial planning, marketing channels of distribution.
- Design their own venture and source of funds.

UNIT-V: Scale Outlook and Venture Pitch readiness

Understand and identify potential and aspiration for scale vis-a-vis your venture idea.
Persuasive Storytelling and its key components. Build an Investor ready pitch deck.

Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

LEARNING OUTCOMES

At the end of the Unit, the learners will be able to

- Understand aspiration for scale
- Analyze venture idea and its key components
- Evaluate and build investors ready pitch

TEXT BOOKS

1. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Sabyasachi Sinha .
Entrepreneurship, McGrawHill, 11th Edition.(2020)
2. Ries, E. *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Crown Business,(2011).
3. Osterwalder, A., & Pigneur, Y. *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. John Wiley & Sons. (2010).

REFERENCES

1. Simon Sinek,*Start with Why*, Penguin Books limited. (2011)
2. Brown Tim,*Change by Design Revised & Updated: How Design Thinking Transforms Organizations and Inspires Innovation*, Harper Business.(2019)
4. Namita Thapar (2022) *The Dolphin and the Shark: Stories on Entrepreneurship*, Penguin Books Limited
5. Saras D. Sarasvathy, (2008) *Effectuation: Elements of Entrepreneurial Expertise*, Elgar Publishing Ltd.

E-RESOURCES

Learning resource- Ignite 5.0 Course Wadhvani platform (Includes 200+ components of custom created modular content + 500+ components of the most relevant curated content)

COURSE OUTCOMES: At the end of the course, students will be able to		BTL
CO1	Develop an entrepreneurial mindset and appreciate the concept of entrepreneurship	L3
CO2	Comprehend the process of problem-opportunity identification through design thinking, identify market potential and customers while developing a compelling value proposition solution	L3
CO3	Analyze and refine business models to ensure sustainability and profitability	L3

CO4	Build Prototype for Proof of Concept and validate MVP of their practice venture idea	L4
CO5	Create business plan, conduct financial analysis and feasibility analysis to assess the financial viability of a venture	L5
CO6	Prepare and deliver an investible pitch deck of their practice venture to attract stakeholders	L6

BTL: Bloom's Taxonomy Level

III B.Tech. II Semester

Course Code	DISASTER MANAGEMENT (Open Elective – II)								L	T	P	C	
23HOE012a									3	0	0	3	
Course Objectives: The objectives of this course are to make the student :													
<ol style="list-style-type: none"> To understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies. To analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction. To apply wind engineering principles and computational techniques in designing wind-resistant structures. To evaluate earthquake effects on buildings and develop strategies for seismic retrofitting. To assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures. 													
Course Outcomes: After successful completion of this course, students will be able to:													
<ol style="list-style-type: none"> Understand the fundamental concepts of natural disasters, their occurrence, and disaster risk reduction strategies. Analyze the impact of cyclones on structures and explore retrofitting techniques for adaptive reconstruction. Apply wind engineering principles and computational techniques in designing wind-resistant structures. Evaluate earthquake effects on buildings and develop strategies for seismic retrofitting. Assess seismic safety planning, design considerations, and innovative construction materials for disaster-resistant structures. 													
CO – PO Articulation Matrix													
Course Outcomes	PO 1	PO 2	PO 3	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO -1	3	-	-	-	2	-	2	2	-	-	-	3	3
CO -2	-	3	-	2	-	-	-	-	-	-	2	3	-
CO -3	3	-	-	-	-	3	-	-	2	-	-	-	3
CO -4	-	-	3	3	-	-	2	-	-	-	-	3	-
CO -5	-	-	-	-	3	3	3	2	-	-	-	-	3

UNIT – I		
Introduction to Natural Disasters– Brief Introduction to Different Types of Natural Disasters, Occurrence of Disasters in Different Climatic and Geographical Regions, Hazard Maps (Earthquake and Cyclone) of The World and India, Regulations for Disaster Risk Reduction, Post-Disaster Recovery and Rehabilitation (Socioeconomic Consequences).		
UNIT – II		
Cyclones and Their Impact– Climate Change and Its Impact On Tropical Cyclones, Nature of Cyclonic Wind, Velocities and Pressure, Cyclone Effects, Storm Surges, Floods, and Landslides. Behavior of Structures in Past Cyclones and Windstorms, Case Studies. Cyclonic Retrofitting, Strengthening of Structures, and Adaptive Sustainable Reconstruction. Life-Line Structures Such as Temporary Cyclone Shelters.		
UNIT – III		
Wind Engineering and Structural Response– Basic Wind Engineering, Aerodynamics of Bluff Bodies, Vortex Shedding, and Associated Unsteadiness Along and Across Wind forces. Lab: Wind Tunnel Testing and Its Salient Features. Introduction to Computational Fluid Dynamics (CFD). General Planning and Design Considerations Under Windstorms and Cyclones. Wind Effects On Buildings, towers, Glass Panels, Etc., and Wind-Resistant Features in Design. Codal Provisions, Design Wind Speed, Pressure Coefficients. Coastal Zoning Regulations for Construction and Reconstruction in Coastal Areas. Innovative Construction Materials and Techniques, Traditional Construction Techniques in Coastal Areas.		
UNIT – IV		
Seismology and Earthquake Effects– Causes of Earthquakes, Plate Tectonics, Faults, Seismic Waves; Magnitude, Intensity, Epicenter, Energy Release, and Ground Motions. Earthquake Effects– On Ground, Soil Rupture, Liquefaction, Landslides. Performance of Ground and Buildings in Past Earthquakes– Behavior of Various Types of Buildings and Structures, Collapse Patterns; Behavior of Non-Structural Elements Such as Services, Fixtures, and Mountings – Case Studies. Seismic Retrofitting– Weakness in Existing Buildings, Aging, Concepts in Repair, Restoration, and Seismic Strengthening.		
UNIT – V		
Planning and Design Considerations for Seismic Safety– General Planning and Design Considerations; Building forms, Horizontal and Vertical Eccentricities, Mass and Stiffness Distribution, Soft Storey Effects, Etc.; Seismic Effects Related to Building Configuration. Plan and Vertical Irregularities, Redundancy, and Setbacks. Construction Details– Various Types of Foundations, Soil Stabilization, Retaining Walls, Plinth Fill, Flooring, Walls, Openings, Roofs, Terraces, Parapets, Boundary Walls, Underground and Overhead Tanks, Staircases, and Isolation of Structures. Innovative Construction Materials and Techniques. Local Practices– Traditional Regional Responses. Computational Investigation Techniques.		

TEXT BOOKS:
<ol style="list-style-type: none">1. David Alexander, <i>Natural Disasters</i>, 1st Edition, CRC Press, 2017.2. Edward A. Keller and Duane E. DeVecchio, <i>Natural Hazards: Earth's Processes as Hazards, Disasters, and Catastrophes</i>, 5th Edition, Routledge, 2019.
REFERENCE BOOKS:
<ol style="list-style-type: none">1. Ben Wisner, J.C. Gaillard, and Ilan Kelman (Editors), <i>Handbook of Hazards and Disaster Risk Reduction and Management</i>, 2nd Edition, Routledge, 2012.2. Damon P. Coppola, <i>Introduction to International Disaster Management</i>, 4th Edition, Butterworth-Heinemann, 2020.3. Bimal Kanti Paul, <i>Environmental Hazards and Disasters: Contexts, Perspectives and Management</i>, 2nd Edition, Wiley-Blackwell, 2020.
Online Learning Resources:
<p>https://nptel.ac.in/courses/124107010 https://onlinecourses.swayam2.ac.in/cec19_hs20/preview</p>

III B.Tech – II Semester

Course Code	SUSTAINABILITY IN ENGINEERING PRACTICES (OE – II)										L	T	P	C
23HOE012b											3	0	0	3
Course Objectives: The objectives of this course are to make the student :														
<ol style="list-style-type: none"> 1. To understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials. 2. To analyze sustainable construction materials, their durability, and life cycle assessment. 3. To apply energy calculations in construction materials and assess their embodied energy. 4. To evaluate green building standards, energy codes, and performance ratings. 5. To assess the environmental effects of energy use, climate change, and global warming. 														
Course Outcomes: After successful completion of this course, students will be able to:														
<ol style="list-style-type: none"> 1. Understand the fundamentals of sustainability, the carbon cycle, and the environmental impact of construction materials. 2. Analyze sustainable construction materials, their durability, and life cycle assessment. 3. Apply energy calculations in construction materials and assess their embodied energy. 4. Evaluate green building standards, energy codes, and performance ratings. 5. Assess the environmental effects of energy use, climate change, and global warming. 														
CO – PO Articulation Matrix														
Course Outcomes	PO 1	PO 2	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PO 13	PO 14	
CO -1	3	-	-	-	2	3	2	-	-	-	-	3	3	
CO -2	-	3	-	2	-	3	-	-	-	-	2	3	3	
CO -3	-	-	3	3	-	2	-	-	2	-	-	3	3	
CO -4	-	-	3	3	-	3	2	-	-	-	-	3	3	
CO -5	-	-	-	-	3	3	3	-	-	-	-	-	3	
UNIT – I														
INTRODUCTION Introduction and Definition of Sustainability - Carbon Cycle - Role of Construction Material:														

Concrete and Steel, Etc. - CO ₂ Contribution From Cement and Other Construction Materials.		
UNIT – II		
MATERIALS USED in SUSTAINABLE CONSTRUCTION Construction Materials and Indoor Air Quality - No/Low Cement Concrete - Recycled and Manufactured Aggregate - Role of QC and Durability - Life Cycle and Sustainability.		
UNIT – III		
ENERGY CALCULATIONS Components of Embodied Energy - Calculation of Embodied Energy for Construction Materials - Energy Concept and Primary Energy - Embodied Energy Via-A-Vis Operational Energy in Conditioned Building - Life Cycle Energy Use		
UNIT – IV		
GREEN BUILDINGS Control of Energy Use in Building - ECBC Code, Codes in Neighboring Tropical Countries - OTTV Concepts and Calculations – Features of LEED and TERI – GRIHA Ratings - Role of Insulation and Thermal Properties of Construction Materials - Influence of Moisture Content and Modeling - Performance Ratings of Green Buildings - Zero Energy Building		
UNIT – V		
ENVIRONMENTAL EFFECTS Non-Renewable Sources of Energy and Environmental Impact– Energy Norm, Coal, Oil, Natural Gas - Nuclear Energy - Global Temperature, Green House Effects, Global Warming - Acid Rain: Causes, Effects and Control Methods - Regional Impacts of Temperature Change.		
TEXT BOOKS:		
<ol style="list-style-type: none"> 1. Charles J Kibert, Sustainable Construction: Green Building Design & Delivery, 4th Edition , Wiley Publishers 2016. 2. Steve Goodhew, Sustainable Construction Process, Wiley Blackwell,UK, 2016. 		
REFERENCE BOOKS:		
<ol style="list-style-type: none"> 1. Craig A. Langston & Grace K.C. Ding, Sustainable Practicesin the Built Environment, Butterworth Heinemann Publishers, 2011. 2. William P Spence, Construction Materials, Methods & Techniques (3e), Yesdee Publication Pvt. Ltd, 2012. 		
Online Learning Resources:		
https://archive.nptel.ac.in/courses/105/105/105105157/		

IIIB.Tech. II Semester

23HOE0202	RENEWABLE ENERGY SOURCES (Open Elective –II)	L	T	P	C
		3	0	0	3

Course the student will be able to:

CO 1: Understand principle operation of various renewable energy sources. L1

CO 2: Identify site selection of various renewable energy sources. L2

CO 3: Analyze various factors affecting on solar energy measurements, wind energy conversion techniques, Geothermal, Biomass, Tidal Wave and Fuel cell energies L3

CO 4: Design of Solar PV modules and considerations of horizontal and vertical axis Wind energy systems. L5

CO 5: Apply the concepts of Geo Thermal Energy, Ocean Energy, Bio mass and Fuel Cells for generation of power. L4

UNIT I Solar Energy:

Solar radiation - beam and diffuse radiation, solar constant, Sun at Zenith, attenuation and measurement of solar radiation, local solar time, derived solar angles, sunrise, sunset and day length. flat plate collectors, concentrating collectors, storage of solar energy-thermal storage.

UNIT II PV Energy Systems:

Introduction, The PV effect in crystalline silicon basic principles, the film PV, Other PV technologies, Solar PV modules from solar cells, mismatch in series and parallel connections design and structure of PV modules, Electrical characteristics of silicon PV cells and modules, Stand-alone PV system configuration, Grid connected PV systems.

UNIT III Wind Energy:

Principle of wind energy conversion; Basic components of wind energy conversion systems; wind mill components, various types and their constructional features; design considerations of horizontal and vertical axis wind machines: analysis of aerodynamic forces acting on wind mill blades; wind data and energy estimation and site selection considerations.

UNIT IV Geothermal Energy:

Estimation and nature of geothermal energy, geothermal sources and resources like hydrothermal, geopressured hot dry rock, magma. Advantages, disadvantages and application of geothermal energy, prospects of geothermal energy in India.

UNIT – V Miscellaneous Energy Technologies:

Ocean Energy: Tidal Energy-Principle of working, Operation methods, advantages and limitations. Wave Energy-Principle of working, energy and power from waves, wave energy conversion devices, advantages and limitations.

Bio mass Energy: Biomass conversion technologies, Biogas generation plants, Classification, advantages and disadvantages, constructional details, site selection, digester design consideration

Fuel cell: Principle of working of various types of fuel cells and their working, performance and limitations.

Text books:

1. G. D. Rai, —Non-Conventional Energy Sources, 4th Edition, Khanna Publishers, 2000.
2. Chetan Singh Solanki —Solar Photovoltaics fundamentals, technologies and applications, 2nd Edition PHI Learning Private Limited. 2012.

Reference Books:

1. Stephen Peake, —Renewable Energy Power for a Sustainable Future, Oxford International Edition, 2018.
2. S. P. Sukhatme, —Solar Energy, 3rd Edition, Tata Mc Graw Hill Education Pvt. Ltd, 2008.
3. B H Khan , — Non-Conventional Energy Resources, 2nd Edition, Tata Mc Graw Hill Education Pvt Ltd, 2011.
4. S. Hasan Saeed and D.K.Sharma,—Non-Conventional Energy Resources, 3rd Edition, S.K.Kataria & Sons, 2012.
5. G. N. Tiwari and M.K.Ghosal, —Renewable Energy Resource: Basic Principles and Applications, Narosa Publishing House, 2004.

Online Learning Resources:

1. <https://nptel.ac.in/courses/103103206>
2. <https://nptel.ac.in/courses/108108078>

III B. Tech -II Sem

23HOE0302	AUTOMATION AND ROBOTICS (Open Elective –II)	L	T	P	C
		3	0	0	3

Course objectives: The objectives of the course are to	
1	Fundamentals of industrial automation, production types, automation strategies, and hardware elements used in modern manufacturing processes.
2	Understanding of automated manufacturing systems, and strategies for improving productivity and flexibility in industrial automation.
3	Knowledge of industrial automation and robotics, sensors, and end-effector design for modern manufacturing environments.
4	Explain industrial automation and robotics, and trajectory planning for intelligent and efficient manufacturing applications.
5	Familiarity of industrial automation and robotics, and practical applications in manufacturing processes.

COURSE OUTCOMES On successful completion of this course the student will be able to		
1	Understand and analyze the structure and functions of automated manufacturing systems, and evaluate hardware components for efficient production.	L2,L4,L5
2	Analyze and design automated flow lines with or without buffer storage, perform quantitative evaluations, apply assembly line balancing techniques.	L4,L5,L6
3	Classify robot configurations, select suitable actuators and sensors, analyze and apply automation and robotics principles to optimize production efficiency and flexibility.	L2,L3,L4
4	Apply kinematic and dynamic modeling using D-H notation and select appropriate hardware and control strategies for real-world industrial scenario to analyze and design automated and robotic systems.	L3,L4,L5
5	Design, program, and implement robotic systems, understand and apply robotics technology to manufacturing tasks.	L1,L3,L6

UNIT-I**Introduction to Automation:**

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.

UNIT-II**Automated flow lines:**

Automated flow lines, Part transfer methods and mechanisms, types of Flow lines, flow line with/without buffer storage, Quantitative analysis of flow lines. Assembly line balancing: Assembly process and systems assembly line, line balancing methods, ways of improving line balance, flexible assembly lines.

UNIT-III**Introduction to Industrial Robotics:**

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 actuators and Feedback components: Actuators, Pneumatic, Hydraulic actuators, Electric & Stepper motors, comparison. Position sensors - potentiometers, resolvers, encoders - velocity sensors, Tactile sensors, Proximity sensors.

UNIT-IV**Manipulator Kinematics:**

Manipulator Kinematics, Homogenous transformations as applicable to rotation and translation - D-H notation, Forward inverse kinematics.

Manipulator Dynamics: Differential transformations, Jacobians, Lagrange - Euler and Newton – Euler formulations. Trajectory Planning: Trajectory Planning and avoidance of obstacles path planning, skew motion, joint integrated motion - straight line motion.

UNIT-V**Robot Programming:**

Robot Programming, Methods of programming - requirements and features of programming languages, software packages. Problems with programming languages.

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading - Process - spot and continuous arc welding & spray painting - Assembly and Inspection.

Text Books:

1. Automation, Production systems and CIM, M.P.Groover/Pearson Edu.
2. Industrial Robotics -M.P.Groover, TMH.
- 3.

References:

1. Robotics, FuKS, McGrawHill,4thedition,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 RK & NagrathIJ, TMH.

Online Learning Resources:

<https://www.youtube.com/watch?v=yxZm9WQJUA0&list=PLRLB5WCqU54UJG45UnazSYmmhl-gt76o>

<https://www.youtube.com/watch?v=6f3bvIhSWyM&list=PLRLB5WCqU54X5Vy4DwjfSODT3ZJgwEjyE>

III B.Tech II Sem

23HOE0402	DIGITAL ELECTRONICS (Open Elective –II)	L	T	P	C
		3	0	0	3

Course Objectives:

1. To Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. To analyze combinational circuits like adders, subtractors, and code converters.
3. To explore combinational logic circuits and their applications in digital design.
4. To understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. To gain knowledge about programmable logic devices and digital IC's.

Course Outcomes:

At the end of this course, the students will be able to

1. Learn Boolean algebra, logic simplification techniques, and combinational circuit design.
2. Analyze combinational circuits like adders, subtractors, and code converters.
3. Explore combinational logic circuits and their applications in digital design.
4. Understand sequential logic circuits, including latches, flip-flops, counters, and shift registers.
5. Gain knowledge about programmable logic devices and digital IC's.

UNIT-I

Logic Simplification and Combinational Logic Design: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Introduction to Logic Gates, Ex-OR, Ex-NOR operations, Minimization of Switching Functions: Karnaugh map method, Logic function realization: AND-OR, OR-AND and NAND/NOR realizations.

UNIT-II

Introduction to Combinational Design 1: Binary Adders, Subtractors and BCD adder, Code converters - Binary to Gray, Gray to Binary, BCD to excess3, BCD to Seven Segment display.

UNIT-III

Combinational Logic Design 2: Decoders, Encoders, Priority Encoder, Multiplexers, Demultiplexers, Comparators, Implementations of Logic Functions using Decoders and Multiplexers.

UNIT-IV

Sequential Logic Design: Latches, Flip-flops, S-R, D, T, JK and Master-Slave JK FF, Edge triggered FF, set up and hold times, Ripple counters, Shift registers.

UNIT-V

Programmable Logic Devices: ROM, Programmable Logic Devices (PLA and PAL).

Digital IC's: Decoder (74x138), Priority Encoder (74x148), multiplexer (74x151) and de-multiplexer (74x155), comparator (74x85).

TEXT BOOKS:

1. Digital Design, M.Morris Mano & Michel D. Ciletti, 5th Edition, Pearson Education, 1999.
2. Switching theory and Finite Automata Theory, ZviKohavi and NirahK.Jha, 2nd Edition, Tata McGraw Hill, 2005.

REFERENCE BOOKS:

1. Fundamentals of Logic Design, Charles H Roth,Jr., 5th Edition, Brooks/cole Cengage Learning,

2004.

III B.Tech II Sem

23HOE0502a	OPERATING SYSTEMS (Open Elective-II)	L	T	P	C
		3	0	0	3

Course Objectives: The main objectives of the course is to make student

- Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection
- Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
- Illustrate different conditions for deadlock and their possible solutions.

Course Outcomes: After completion of the course, students will be able to

CO1: Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication. (L1)

CO2: Understand the basic concepts and principles of operating systems, including process management, memory management, file systems, and Protection. (L2)

CO3: Make use of process scheduling algorithms and synchronization techniques to achieve better performance of a computer system. (L3)

CO4: Illustrate different conditions for deadlock and their possible solutions. (L2) □Analyze the memory management and its allocation policies. (L4)

CO5: Able to design and implement file systems, focusing on file access methods, directory structure, free space management, and also explore various protection mechanisms,

UNIT - I Operating Systems Overview, System Structures

Lecture 8Hrs

Operating Systems Overview: Introduction, Operating system functions, Operating systems operations, 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 Design and Implementation, Operating system structure, Operating system debugging, System Boot.

UNIT - II Process Concept, Multithreaded Programming, Process Scheduling, Inter-process Communication

Lecture 10Hrs

Process Concept: Process scheduling, Operations on processes, Inter-process communication, Communication in client server systems. Multithreaded Programming: Multithreading models, Thread libraries, Threading issues, Examples. Process Scheduling: Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor scheduling, Thread scheduling, Examples. Inter-process Communication: Race conditions, Critical Regions, Mutual exclusion with busy waiting, Sleep and wakeup, Semaphores, Mutexes, Monitors, Message passing, Barriers, Classical IPC Problems - Dining philosophers problem, Readers and writers problem.

UNIT - III Memory-Management Strategies, Virtual Memory Management

Lecture 8Hrs

Memory-Management Strategies: Introduction, Swapping, Contiguous memory allocation, Paging, Segmentation, Examples. Virtual Memory Management: Introduction, Demand paging, Copy on-write,

Page replacement, Frame allocation, Thrashing, Memory-mapped files, Kernel memory allocation, Examples.

UNIT - IV Deadlocks, File Systems

Lecture 9Hrs

Deadlocks: Resources, Conditions for resource deadlocks, Ostrich algorithm, Deadlock detection And recovery, Deadlock avoidance, Deadlock prevention. File Systems: Files, Directories, File system implementation, management and optimization. Secondary-Storage Structure: Overview of disk structure, and attachment, Disk scheduling, RAID structure, Stable storage implementation.

UNIT - V System Protection, System Security

Lecture 8Hrs

System Protection: Goals of protection, Principles and domain of protection, Access matrix, Access control, Revocation of access rights. System Security: Introduction, Program threats, System and network threats, Cryptography as a security, User authentication, implementing security defenses, firewalling to protect systems and networks, Computer security classification. Case Studies: Linux, Microsoft Windows.

Textbooks:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2016.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (Topics: Inter-process Communication and File systems.)

Reference Books:

1. Tanenbaum A S, Woodhull A S, Operating Systems Design and Implementation, 3rd edition, PHI, 2006.
2. Dhamdhare D M, Operating Systems A Concept Based Approach, 3rd edition, Tata McGraw Hill, 2012.
3. Stallings W, Operating Systems -Internals and Design Principles, 6th edition, Pearson Education, 2009
4. Nutt G, Operating Systems, 3rd edition, Pearson Education, 2004

Online Learning Resources:

<https://nptel.ac.in/courses/106/106/106106144/>

<http://peterindia.net/OperatingSystems.html>

III B.Tech – II Sem

23HOE0502b	INTRODUCTION TO MACHINE LEARNING (Open Elective-II)	L	T	P	C
		3	0	0	3

Course Objectives: The objectives of the course are

- Define machine learning and its different types (supervised and unsupervised) and understand their applications.
- Apply supervised learning algorithms including decision trees and k-nearest neighbors (k-NN).
- Implement unsupervised learning techniques, such as K-means clustering.

Course Outcomes:

- CO1: Identify machine learning techniques suitable for a given problem. (L3)
- CO2: Solve real-world problems using various machine learning techniques. (L3)
- CO3: Apply Dimensionality reduction techniques for data preprocessing. (L3)
- CO4: Explain what is learning and why it is essential in the design of intelligent machines. (L2)
- CO5: Evaluate Advanced learning models for language, vision, speech, decision making etc. (L5)

UNIT-I: Introduction to Machine Learning: Evolution of Machine Learning, Paradigms for ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data, Matching, Stages in Machine Learning, Data Acquisition, Feature Engineering, Data Representation, Model Selection, Model Learning, Model Evaluation, Model Prediction, Search and Learning, Data Sets.

UNIT-II: Nearest Neighbor-Based Models: Introduction to Proximity Measures, Distance Measures, Non-Metric Similarity Functions, Proximity Between Binary Patterns, Different Classification Algorithms Based on the Distance Measures ,K-Nearest Neighbor Classifier, Radius Distance Nearest Neighbor Algorithm, KNN Regression, Performance of Classifiers, Performance of Regression Algorithms.

UNIT-III: Models Based on Decision Trees: Decision Trees for Classification, Impurity Measures, Properties, Regression Based on Decision Trees, Bias–Variance Trade-off, Random Forests for Classification and Regression.

The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, The Bayes Classifier and its Optimality, Multi-Class Classification | Class Conditional Independence and Naive Bayes Classifier (NBC)

UNIT-IV: Linear Discriminants for Machine Learning: Introduction to Linear Discriminants, Linear Discriminants for Classification, Perceptron Classifier, Perceptron Learning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linear SVM, Kernel Trick, Logistic Regression, Linear Regression, Multi-Layer Perceptrons (MLPs), Backpropagation for Training an MLP.

UNIT-V: Clustering : Introduction to Clustering, Partitioning of Data, Matrix Factorization | Clustering of Patterns, Divisive Clustering, Agglomerative Clustering, Partitional Clustering,

K-Means Clustering, Soft Partitioning, Soft Clustering, Fuzzy C-Means Clustering, Rough Clustering, Rough K-Means Clustering Algorithm, Expectation Maximization-Based Clustering, Spectral Clustering.

Textbooks:

1. —Machine Learning Theory and Practicell, M N Murthy, V S Anantha narayana, Universities Press (India), 2024

Reference Books:

1. —Machine Learningll, Tom M. Mitchell, McGraw-Hill Publication, 2017

2. —Machine Learning in Actionll, Peter Harrington, Dream Tech

3. —Introduction to Data Miningll, Pang-Ning Tan, Michel Stenbach, Vipin Kumar, 7th Edition, 2019.

III B.Tech II Sem

23HOE992a	OPTIMIZATION TECHNIQUES Open Elective – II	L	T	P	C
		3	0	0	3

Course Outcomes:

After successful completion of this course, the students should be able to:

COs	Statements	Blooms level
CO1	Understand the meaning, purpose, tools of Operations Research and linear programming in solving practical problems in industry.	L2, L3
CO2	Interpret the transportation models' solutions and infer solutions to the real-world problems.	L3, L5
CO3	Develop mathematical skills to analyze and solve nonlinear programming models arising from a wide range of applications.	L3
CO4	Apply the concept of non-linear programming for solving the problems involving non-linear constraints and objectives	L2, L3
CO5	Apply the concept of unconstrained geometric programming for solving the problems involving non-linear constraints and objectives.	L3,L5

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	-	-	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	1
CO3	3	2	2	1	-	-	-	-	-	-	-	1
CO4	2	2	2	1	-	-	-	-	-	-	-	1
CO5	3	3	2	1	-	-	-	-	-	-	-	1

1-Slightly, 2-Moderately, 3-Substantially.

UNIT – I: Linear programming I**(08)**

Introduction, Applications of Linear Programming, Standard form of a Linear Programming Problem, Geometry of Linear Programming Problems, Basic Definitions in Linear Programming. Simplex Method, Simplex Algorithm and Two phase Simplex Method, Big-M method.

UNIT – II Linear programming II: Duality in Linear Programming**(08)**

Symmetric Primal-Dual Relations, General Primal-Dual Relations, Duality Theorem, Dual Simplex Method, Transportation Problem and assignment problem, Complementary slackness Theorem

UNIT – III Non-linear programming: Unconstrained optimization techniques**(08)**

Introduction: Classification of Unconstrained minimization methods,

Direct Search Methods: Random Search Methods: Descent Method and Fletcher Powell Method, Grid Search Method

UNIT – IV Non-linear programming: Constrained optimization techniques**(08)**

Introduction, Characteristics of a constrained problem, Random Search Methods, complex method, Sequential linear programming, Basic approach in methods of Feasible directions, Zoutendijk's method of feasible directions: direction finding problem, determination of step length, Termination criteria.

UNIT-V Geometric Programming**(08)**

Unconstrained Minimization Problems: solution of unconstrained geometric programming using differential calculus and arithmetic-geometric inequality.

Constrained minimization Problems: Solution of a constrained geometric programming problem, primal-dual programming in case of less-than inequalities, geometric programming with mixed inequality constraints.

TEXT BOOK:

1. Singiresu S Rao., Engineering Optimization: Theory and Practices, New Age Int. (P) Ltd. Publishers, New Delhi.
2. J. C. Panth, Introduction to Optimization Techniques, (7-e) Jain Brothers, New Delhi.

REFERENCES:

1. Harvey M. Wagner, Principles of Operation Research, Printice-Hall of India Pvt. Ltd. New Delhi.
2. Peressimi A.L., Sullivan F.E., Vhl, J. J. Mathematics of Non-linear Programming, Springer – Verlag.

Web Reference:

- https://onlinecourses.nptel.ac.in/noc24_ee122/preview
- <https://archive.nptel.ac.in/courses/111/105/111105039/>
- https://onlinecourses.nptel.ac.in/noc21_ce60/preview

III B.Tech II Sem

23HOE992b	MATHEMATICAL FOUNDATION OF QUANTUM TECHNOLOGIES Open Elective – II	L	T	P	C
		3	0	0	3

Course Objectives:

- To provide students with essential linear algebra foundations including vector spaces, inner products, and operators for quantum mechanical applications.
- To develop understanding of the transition from finite-dimensional systems to infinite-dimensional function spaces and Hilbert space concepts.
- To establish quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution principles.
- To enable students to apply quantum mechanical principles to solve problems in simple quantum systems and understand statistical interpretation.
- To introduce advanced concepts in composite systems, measurement processes, and modern perspectives in quantum mechanics.

Course Outcomes:

After successful completion of this course, the students should be able to:

COs	Statements	Blooms level
CO1	Understand vector spaces, inner products, and linear operators with applications to quantum systems.	L1, L2 (Understand, Comprehend)
CO2	Apply linear algebra concepts to function spaces and analyze the transition from finite to infinite dimensional systems.	L3, L4 (Apply, Analyze)
CO3	Analyze quantum mechanical formalism including measurement theory, uncertainty relations, and time evolution.	L4 (Analyze)
CO4	Apply quantum mechanical principles to solve problems in simple quantum systems and evaluate statistical interpretations.	L3, L5 (Apply, Evaluate)
CO5	Evaluate advanced concepts in composite systems and synthesize understanding of measurement processes and modern quantum theory.	L5, L6 (Evaluate, Create)

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	2
CO2	3	3	2	3	2	-	-	-	-	-	-	2
CO3	3	3	3	3	2	-	-	-	-	-	-	2
CO4	3	3	3	3	2	-	-	-	-	-	-	2
CO5	3	3	3	3	2	1	-	-	-	-	-	3

• 3 = Strong Mapping, 2 = Moderate Mapping, 1 = Slight Mapping, - = No Mapping

UNIT I: Linear Algebra Foundation for Quantum Mechanics (10 hours)

Vector spaces definition and examples (\mathbb{R}^2 , \mathbb{R}^3 , function spaces), Inner products (dot product, orthogonality, normalization), Linear operators (matrices, eigenvalues, eigenvectors), Finite-dimensional examples (2×2 matrices, spin-1/2 systems), Dirac notation introduction ($|\psi\rangle$, $\langle\phi|$, $\langle\phi|\psi\rangle$), Change of basis (transformations, unitary matrices).

UNIT II: From Finite to Infinite Dimensions (08 hours)

Function spaces (L^2 space, square-integrable functions), Inner products for functions ($\int \psi^* \phi \, dx$), Orthogonal function sets (Fourier series, basis functions), Introduction to Hilbert space concept (complete inner product spaces), Position and momentum representations (wave functions), Operators on functions (d/dx , multiplication by x).

UNIT III: Quantum Mechanical Formalism (08 hours)

Mathematical formulation (states as vectors, observables as operators), Measurement theory (Born rule, expectation values, probabilities), Uncertainty relations (mathematical derivation from commutators), Time evolution (Schrödinger equation, unitary evolution).

UNIT IV: Applications and Statistical Interpretation (06 hours)

Simple applications (infinite square well, harmonic oscillator), Statistical interpretation (ensembles, pure vs mixed states), Measurement process (von Neumann measurement scheme).

UNIT V: Advanced Topics (08 hours)

Composite systems (tensor products basic introduction), Reversibility and irreversibility (unitary evolution vs measurement), Thermodynamic connections (equilibrium states, entropy), Modern perspectives (decoherence, measurement problem conceptual).

Textbooks:

1. David J. Griffiths, Darrell F. Schroeter, —Introduction to Quantum Mechanics, 3rd Edition, Cambridge University Press (2018).
2. R. Shankar, Principles of Quantum Mechanics, 2nd Edition, Kluwer Academy/Plenum Publishers (1994).

Reference Books:

1. George. F. Simmons, —Introduction to Topology and Modern Analysis, MedTech Science Press.
2. Gilbert Strang, Linear Algebra and Its Applications, 4th Edition, Cengage Learning (2006).
3. John von Neumann and Robert T Beyer, Mathematical Foundations of Quantum Mechanics, Princeton Univ. Press (1996).

Web Resources

1. <https://eclass.uoa.gr/modules/document/file.php/CHEM248/Griffiths%20-%20Introduction%20to%20Quantum%20Mechanics%203rd%20ed%202018.pdf>

2. <https://fisica.net/mecanica-quantica/Shankar%20-%20Principles%20of%20quantum%20mechanics.pdf>

III B.Tech II Sem

23HOE992c	PHYSICS OF ELECTRONIC MATERIALS AND DEVICES (Common to all branches) Open Elective-II	L-T-P-C 3-0 - 0-3
-----------	--	-----------------------------

Course Objectives	
1	To make the students to understand the concept of crystal growth, defects in crystals and thin films.
2	To provide insight into various semiconducting materials and their properties.
3	To develop a strong foundation in semiconductor physics and device engineering.
4	To elucidate excitonic and luminescent processes in solid-state materials.
5	To understand the principles, technologies, and applications of modern display systems.

Syllabus:**UNIT-I Fundamentals of Materials Science****9H**

Introduction, Phase rule, Phase Diagram, Elementary idea of Nucleation and Growth, Methods of crystal growth. The basic idea of point, line, and planar defects. Concept of thin films, preparation of thin films, Deposition of thin film using sputtering methods (RF and glow discharge).

UNIT II Semiconductors**9H**

Introduction, charge carriers in semiconductors, effective mass, Diffusion and drift, Diffusion and recombination, Diffusion length. The Fermi level & Fermi-Dirac distribution, Electron and Hole in quantum well, Change of electron-hole concentration- Qualitative analysis, Temperature dependency of carrier concentration, Conductivity and mobility, Effects of temperature and doping on mobility, High field effects.

UNIT III Physics of Semiconductor Devices:**9H**

Introduction, Band structure, PN junctions and their typical characteristics under equilibrium and under bias, Heterojunctions, Transistors, MOSFETs.

UNIT IV Excitons and Luminescence:**9H**

Luminescence: Different types of luminescence, basic definitions, Light emission in solids, Inter-band luminescence, Direct and indirect gap materials.

Photoluminescence : General Principles of photoluminescence, Excitation and relaxation, OLED, Quantum-dot.

Electro-luminescence : General Principles of electroluminescence, light emitting diode, diode laser.

UNIT V Display devices :**9H**

LCD, three-dimensional display: Holographic display, light-field displays: Head-mounted display, MOEMS (Micro-Opto-Electro-Mechanical Systems) and MEMS displays.

Textbooks:

1. Principles of Electronic Materials and Devices-S.O. Kasap, McGraw-Hill Education (India) Pvt. Ltd.,4thedition, 2021.
2. Semiconductor physics & devices: basic principles, 4th Edition, McGraw-Hill, 2012.

Reference Books:

1. Solid State Electronic Devices -B.G. Streetman and S. Banerjee, PHI Learning,6th edition
2. Electronic Materials Science- Eugene A. Irene, Wiley, 2005
3. Electronic Components and Materials, Grover and Jamwal, DhanpatRai and Co., New Delhi., 2012.
4. An Introduction to Electronic Materials for Engineers-Wei Gao, Zhengwei Li, Nigel Sammes, World Scientific Publishing Co. Pvt. Ltd. 2nd Edition,2011

NPTEL course links:

<https://nptel.ac.in/courses/113/106/113106062/>

https://onlinecourses.nptel.ac.in/noc20_ph24/preview

	Course Outcomes	Blooms Level
CO1	Understand crystal growth and thin film preparation	L1,L2
CO2	Summarize the basic concepts of semiconductors	L1,L2
CO3	Illustrate the working of various semiconductor devices	L1,L2, L3
CO4	Analyze various luminescent phenomena and the devices based on these concepts	L1,L2, L3
CO5	Explain the working of different display devices	L1,L2

Course Articulation Matrix:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1							
CO2	3	3	2	1	1							
CO3	3	3	2	1	1							
CO4	3	2	1	1	-							
CO5	3	3	1	1	-							

1-Slightly, 2-Moderately,3-Substantially.

III B.Tech –II Sem

23HOE992d	CHEMISTRY OF POLYMERS AND APPLICATIONS (Common to all branches) Open Elective-II	Credits 3-0-0:3
Course Objectives		
1	To understand the basic principles of polymers	
2	To understand natural polymers and their applications.	
3	To impart knowledge to the students about synthetic polymers, their preparation and importance.	
4	To enumerate the applications of hydrogel polymers	
5	To enumerate applications of conducting and degradable polymers in engineering.	

Course Outcomes	
CO1	Classify the polymers, Explain polymerization mechanism, Differentiate addition, condensation polymerizations, Describe measurement of molecular weight of polymer
CO2	Describe the physical and chemical properties of natural polymers and Modified cellulose.
CO3	Differentiate Bulk, solution, Suspension and emulsion polymerization, Describe fibers and elastomers, Identify the thermosetting and thermo polymers.
CO4	Identify types of polymer networks, Describe methods involve in hydrogel preparation, Explain applications of hydrogels in drug delivery,
CO5	Explain classification and mechanism of conducting and degradable polymers.

Unit – I: Polymers-Basics and Characterization:-

Basic concepts: monomers, repeating units, degree of polymerization, linear, branched and network polymers, classification of polymers, Polymerization: addition, condensation, copolymerization and coordination polymerization. Average molecular weight concepts: number, weight and viscosity average molecular weights, polydispersity and molecular weight distribution. Measurement of molecular weight: End group, viscosity, light scattering, osmotic and ultracentrifugation methods, analysis and testing of polymers.

Unit – II: Natural Polymers & Modified cellulose

Natural Polymers: Chemical & Physical structure, properties, source, important chemical modifications, applications of polymers such as cellulose, lignin, starch, rosin, shellac, latexes, vegetable oils and gums, proteins.

Modified cellulose: Cellulose esters and ethers such as Ethyl cellulose, CMC, HPMC, cellulose acetals, Liquid crystalline polymers; specialty plastics- PES, PAES, PEEK, PEA.

Unit – III: Synthetic Polymers

Addition and condensation polymerization processes– Bulk, Solution, Suspension and Emulsion polymerization. Preparation and significance, classification of polymers based on physical properties. Thermoplastics, Thermosetting plastics, Fibers and elastomers, General Applications. Preparation of Polymers based on different types of monomers, Olefin polymers(PE,PVC), Butadiene polymers(BUNA-S,BUNA-N), nylons, Urea-formaldehyde, phenol – formaldehyde, Melamine Epoxy and Ion exchange resins.

Unit-IV: Hydrogels of Polymer networks

Definitions of Hydrogel, polymer networks, Types of polymer networks, Methods involved in hydrogel preparation, Classification, Properties of hydrogels, Applications of hydrogels in drug delivery.

Unit – V: Conducting and Degradable Polymers:

Conducting polymers: Introduction, Classification, Mechanism of conduction in Poly Acetylene, Poly Aniline, Poly Thiophene, Doping, Applications.

Degradable polymers: Introduction, Classifications, Examples, Mechanism of degradation, poly lactic acid, Nylon-6, Polyesters, applications.

Text Books:

1. A Text book of Polymer science, Billmayer
2. Polymer Chemistry – G.S.Mishra
3. Polymer Chemistry – Gowarikar

References Books:

1. Organic polymer Chemistry, K.J.Saunders, Chapman and Hall
2. Advanced Organic Chemistry, B.Miller, Prentice Hall
3. Polymer Science and Technology by Premamoy Ghosh, 3rd edition, McGraw-Hill, 2010.

III B.Tech –II Sem

23HOE992e	ACADEMIC WRITING AND PUBLIC SPEAKING (Common to All Branches of Engineering) OPEN ELECTIVE - II	L	T	P	C
		3	0	0	3
Course Objectives:					
<ul style="list-style-type: none"> To encourage all round development of the students by focusing on writing skills To make the students aware of non-verbal skills To develop analytical skills To deliver effective public speeches 					
Course Outcomes (CO):		Blooms Level			
By the end of the program students will be able to					
<ul style="list-style-type: none"> Understand various elements of Academic Writing 		L1, L2			
<ul style="list-style-type: none"> Identify sources and avoid plagiarism 		L1, L2			
<ul style="list-style-type: none"> Demonstrate the knowledge in writing a Research paper 		L3			
<ul style="list-style-type: none"> Analyse different types of essays 		L4			
<ul style="list-style-type: none"> Assess the speeches of others and know the positive strengths of speakers 		L5			
<ul style="list-style-type: none"> Build confidence in giving an impactful presentation to the audience 		L3			
UNIT - I	Introduction to Academic Writing	Lecture Hrs			
Introduction to Academic Writing – Essential Features of Academic Writing – Courtesy – Clarity – Conciseness – Correctness – Coherence – Completeness – Types – Descriptive, Analytical, Persuasive, Critical writing					
UNIT - II	Academic Journal Article	Lecture Hrs			
Art of condensation- summarizing and paraphrasing - Abstract Writing, writing Project Proposal, writing application for internship, Technical/Research/Journal Paper Writing – Conference Paper writing - Editing, Proof Reading - Plagiarism					
UNIT - III	Essay & Writing Reviews	Lecture Hrs			
Compare and Contrast – Argumentative Essay – Exploratory Essay – Features and Analysis of Sample Essays – Writing Book Report, Summarizing, Book/film Review- SoP					
UNIT - IV	Public Speaking	Lecture Hrs			
Introduction, Nature, characteristics, significance of Public Speaking – Presentation – 4 Ps of Presentation – Stage Dynamics – Answering Strategies –Analysis of Impactful Speeches- Speeches for Academic events					
UNIT - V	Public Speaking and Non-Verbal Delivery	Lecture Hrs			
Body Language – Facial Expressions-Kinesics – Oculistics – Proxemics – Haptics – Chronemics - Paralanguage - Signs					

Textbooks:
<ol style="list-style-type: none"> 1. <i>Critical Thinking, Academic Writing and Presentation Skills</i>: MG University Edition Paperback – 1 January 2010 Pearson Education; First edition (1 January 2010) 2. Pease, Allan & Barbara. <i>The Definitive Book of Body Language</i> RHUS Publishers, 2016
Reference Books:
<ol style="list-style-type: none"> 1. <u>Alice Savage</u>, Masoud Shafiei <i>Effective Academic Writing, 2Ed.</i>, 2014 .sserP ytisrevinU drofxO 2. Shalini Verma, <i>Body Language</i>, S Chand Publications 2011. 3. Sanjay Kumar and Pushpalata, <i>Communication Skills 2E</i> 2015, Oxford. 4. Sharon Gerson, Steven Gerson, <i>Technical Communication Process and Product</i>, Pearson, New Delhi, 2014 5. <i>Elbow, Peter. Writing with Power. OUP USA, 1998</i>
Online Learning Resources:
<ol style="list-style-type: none"> 1. https://youtu.be/NNhTIT81nH8 2. https://www.youtube.com/watch?v=478ccrWKY-A 3. https://www.youtube.com/watch?v=nzGo5ZC1gMw 4. https://www.youtube.com/watch?v=Qve0ZBmJMh4 5. https://courses.lumenlearning.com/publicspeakingprinciples/chapter/chapter-12-nonverbal-aspects-of-delivery/ 6. https://onlinecourses.nptel.ac.in/noc21_hs76/preview 7. https://archive.nptel.ac.in/courses/109/107/109107172/# 8. https://archive.nptel.ac.in/courses/109/104/109104107/