B.TECH - CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

II YEAR I SEMESTER COURSE STRUCTURE & SYLLABUS

SNO	CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
1	Discrete Mathematics & Graph Theory
2	Universal Human Values 2- Understanding Harmony and Ethical human conduct
3	Artificial Intelligence
4	Advanced Data Structures & Algorithms Analysis
5	Object-Oriented Programming Through JAVA
6	Advanced Data Structures and Algorithms Analysis Lab
7	Object-Oriented Programming Through JAVA Lab
8	Python programming
9	Environmental Science

B.Tech II Year - I Semester	DISCRETEMATHEMATICS &GRAPHTHEORY (CommontoCSE, AI&DS, CSE(AI&ML))	L	T	P	C
		3	0	0	3

CourseOutcomes: Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto:

COs	Statements	Blooms Level
CO1	Applymathematicallogictosolveproblems.	L2,L3
CO2	Understandtheconceptsandperformtheoperationsrelatedtosets, relationsand functions. Gaintheconceptualbackgroundneededandidentifystructuresofalgebraicnature.	L3,L5
CO3	Applybasiccountingtechniquestosolvecombinatorial problems.	L3
CO4	Formulateproblemsandsolverecurrencerelations.	L2,L3
CO5	ApplyGraphTheoryinsolvingcomputerscienceproblems	L3,L5

UNITI: MathematicalLogic
Introduction, Statements and Notation, Connectives, Well-formed formulas, Tautology, Duality law, Equivalence, Implication, Normal Forms, Functionally complete set of connectives, Inference TheoryofStatement Calculus, Predicate Calculus, Inference theoryof Predicate Calculus.

UNITII: Settheory
The Principle of Inclusion- Exclusion, Pigeon hole principle and its application, Functions compositionoffunctions, Inverse Functions, Recursive Functions, Lattices and its properties.
Algebraic structures: Algebraic systems-Examples and General Properties, Semi groups and Monoids, groups, sub groups, homomorphism, Isomorphism.

UNITIII: Elementary Combinatorics
Combinations and Permutations, Enumeration of Combinations and Permutations, Enumerating Combinations and Permutations with Repetitions, Enumerating Permutations with Constrained Repetitions, Binomial Coefficients, The Binomial and Multinomial Theorems.

UNITIV: RecurrenceRelations
Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence relations, Solving Recurrence Relations by Substitution and Generatingfunctions, The Method of Characteristic roots, Solutions of Inhomogeneous, Recurrence Relations.

UNITV: Graphs
Basic Concepts, Isomorphism and Subgraphs, Trees and their Properties, Spanning Trees, Directed Trees, Binary Trees, Planar Graphs, Euler's Formula, Multigraphs and Euler Circuits, Hamiltonian Graphs.

Textbooks:

1. J.P.TremblayandR. Manohar, DiscreteMathematicalStructureswithApplicationsto Computer Science, Tata McGraw Hill, 2002.
2. KennethH.Rosen,DiscreteMathematicsanditsApplicationswithCombinatorics and Graph Theory, 7th Edition, McGraw Hill Education (India) Private Limited.

Reference Books:

1. JoeL.Mott,AbrahamKandelandTheodoreP.Baker,DiscreteMathematicsfor Computer Scientists & Mathematicians, 2nd Edition, Pearson Education.
2. NarsinghDeo,GraphTheorywithApplicationstoEngineeringandComputerScience.

OnlineLearningResources:
http://www.cs.yale.edu/homes/aspnes/classes/202/notes.pdf

B.Tech II Year-I Semester	ARTIFICIALINTELLIGENCE (23HES3301)	L	T	P	C
		3	0	0	3

CourseObjectives:

- Able tostudytheconceptsofArtificialIntelligence.
- Tolearnthe methodsofsolvingproblemsusingArtificialIntelligence.
- ToundertandtheapplicationsofAI.
- Tolearndifferentknowledgerepresentationtechniques.
- ThestudentshouldbemadetointroducetheconceptsofExpertSystems.

CourseOutcomes:

- Describe the fundamental concepts in Artificial Intelligence.
- Apply searching techniques for solving a problem.
- Analyze various knowledge representations in Artificial Intelligence.
- Apply logic concepts in various learning methods.
- Describe the basic concepts of exports systems.

UNIT–I :Introduction:

AI problems, foundation of AI and history of AI intelligent agents: Agents andEnvironments, the concept of rationality, the nature of environments, structure of agents,problemsolvingagents,problemformulation.

UNIT–II:Searching

Searching for solutions, uniformed search strategies – Breadth first search, depthfirstSearch.Search with partial information (Heuristicsearch)Hill climbing,A*,AO*Algorithms,Problemreduction,GamePlaying-Adversialsearch,Games,mini-maxalgorithm, optimal decisions in multiplayer games, Problem in Game playing, Alpha-Betapruning,Evaluationfunctions.

UNIT–III :RepresentationofKnowledge:

Knowledgerepresentationissues,predicatelogic-logicprogramming, semantic nets- frames and inheritance, constraint propagation, representingknowledge using rules, rules based deduction systems.Reasoning under uncertainty, reviewofprobability,Bayes'probabilisticinterferencesanddempstershafertheory.

UNIT–IV :Logic concepts: First order logic. Inference in first order logic, propositional vs. first orderinference, unification & lifts forward chaining, Backward chaining, Resolution, Learningfrom observation Inductive learning, Decision trees, Explanation based learning, StatisticalLearningmethods,ReinforcementLearning.

UNIT–V :ExpertSystems:Architectureof expertsystems,Rolesof expertsystems– KnowledgeAcquisition Meta knowledge Heuristics. Typical expert systems – MYCIN, DART, XCON:Expertsystems shells.

Textbooks:

1. S.RusselandP.Norvig,"ArtificialIntelligence–AModernApproach",SecondEdition,PearsonEducation.
2. KevinNightandElaineRich,NairB.,"ArtificialIntelligence(SIE)",McGrawHill

ReferenceBooks:

1. DavidPoole,AlanMackworth,RandyGoebel,"ComputationalIntelligence:alogic alapproach",OxfordUniversityPress.
2. G. Luger, "Artificial Intelligence: Structures and Strategies forcomplexproblemsolving",FourthEdition,PearsonEducation.
3. J.Nilsson,"ArtificialIntelligence:AnewSynthesis",ElsevierPublishers.
4. ArtificialIntelligence,SarojKaushik,CENGAGELearning.

OnlineLearningResources:

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

B.Tech II Year-I Semester	**ADVANCEDDATASTRUCTURES&ALGORITHM ANALYSIS (23HPC0503)**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

CourseObjectives:
The main objectivesofthecourseisto
- Learn asymptotic notations, and analyze the performance of different algorithms
- Understand and Implement various Data Structures
- Learn and greedy, divide and conquer, dynamic programming and back tracking algorithms using relevant Data structures
- Understand the concepts of NP Hard and NP Complete

CourseOutcomes:

After completionofthecourse, studentswillbeableto
- Understand the performance analysis of Space complexity and Time complexity(L2)
- Explain non-linear data structures – Heaps Trees and Graphs(L2)
- Apply dynamic programming algorithms for various real time applications (L3)
- Apply Back Tracking algorithms to solve different problems (L4)
- Understand the computational problems –NP hard and NP complete   (L2)

UNIT–I:
IntroductiontoAlgorithmAnalysis,SpaceandTimeComplexityanalysis,AsymptoticNotations.
AVLTrees–
Creation,Insertion,DeletionoperationsandApplicationsB-
Trees–Creation,Insertion, DeletionoperationsandApplications

UNIT–II:
HeapTrees(PriorityQueues)–MinandMaxHeaps, OperationsandApplications
Graphs–
Terminology,Representations,BasicSearchandTraversals,ConnectedComponentsand
BiconnectedComponents,applications
DivideandConquer:TheGeneralMethod,QuickSort,MergeSort,Strassen'smatrixmul
tiplication,ConvexHull

UNIT–III:
Greedy   Method:General
Method,JobSequencingwithdeadlines,KnapsackProblem,Minimumcostspanningtree
s,SingleSourceShortestPaths
Dynamic Programming: General Method, All pairs shortest paths, Single Source
ShortestPaths – General Weights (Bellman Ford Algorithm), Optimal Binary Search
Trees, 0/1Knapsack,StringEditing,TravellingSalespersonproblem

UNIT– IV:
Backtracking:GeneralMethod,8-QueensProblem,SumofSubsetsproblem,GraphColoring,0/1KnapsackProblem
Branch and Bound: The General Method, 0/1 Knapsack Problem, Travelling Salespersonproblem

UNIT– V:
NPHardand NPCompleteProblems:BasicConcepts,Cook'stheorem
NPHardGraphProblems:CliqueDecisionProblem(CDP),ChromaticNumberDecisionProblem(CNDP),TravelingSalespersonDecisionProblem(TSP)
NPHardSchedulingProblems:SchedulingIdenticalProcessors,JobShopScheduling

Textbooks:

1. FundamentalsofDataStructuresinC++,Horowitz,Ellis;Sahni,Sartaj;Mehta,Dinesh2ndEditionUniversities Press
2. ComputerAlgorithms/C++EllisHorowitz,SartajSahni,SanguthevarRajasekaran2ndEditionUniversityPress

ReferenceBooks:

1. DataStructuresandprogramdesigninC,RobertKruse,PearsonEducationAsia
2. AnintroductiontoDataStructureswithapplications,Trembley&Sorenson,McGraw Hill
3. TheArtofComputerProgramming,Vol.1:FundamentalAlgorithms,DonaldEKnuth, Addison-Wesley,1997.
4. DataStructuresusingC&C++:Langsam,Augenstein&Tanenbaum,Pearson,1995
5. Algorithms+DataStructures&Programs:, N.Wirth, PHI
6. FundamentalsofDataStructuresinC++:HorowitzSahni&Mehta,GalgottiaPub.
7. DatastructuresinJava:, ThomasStandish, PearsonEducationAsia

OnlineLearningResources:

1. https://www.tutorialspoint.com/advanced_data_structures/index.asp
2. http://peterindia.net/Algorithms.html
3. AbdulBari,1. IntroductiontoAlgorithms(youtube.com)

B.Tech II Year-I Semester	OBJECT-ORIENTEDPROGRAMMING THROUGH JAVA (23HPC0504)	L	T	P	C
		3	0	0	3

Course Objectives: The learning objectives of this course are to:
- To understanding the object oriented concepts and problem solving techniques.
- To obtain Knowledge about the principles of Inheritance and polymorphism.
- To introduce the implementation of packages and Exception handling and execution.
- Able to design GUI based application and Java FX.

Course Outcomes: After completion of the course, students will be able to
- Able to solve real world problems using OOP'S techniques.
- Understanding the Syntax, Semantics and Features of Java programming language.
- Demonstrate features of Interfaces to implement Multiple Interfaces.
- Learn when to use Exception handling and how to create user defined exception.
- Able to develop multithreaded applications with Synchronizations, graphical user interface(GUI) java FX.

UNIT I: Object Oriented Programming:

Basic concepts, Principles, Program Structure inJava: Introduction, Writing Simple Java Programs, Elements or Tokens in Java Programs,Java Statements, Command Line Arguments, User Input to Programs, Escape SequencesComments,ProgrammingStyle.
Data Types: Variables, and Operators :Introduction, Data Types in Java, Declaration ofVariables,DataTypes,TypeCasting,ScopeofVariableIdentifier,LiteralConstants,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,TernaryOperator,RelationalOperators,BooleanLogicalOperators,BitwiseLogicalOperators.
Control Statements: Introduction, if Expression, Nested if Expressions, if–else Expressions,TernaryOperator?:,SwitchStatement,IterationStatements,whileExpression,do–whileLoop, forLoop, NestedforLoop,For–Eachfor Loop, BreakStatement, ContinueStatement.

UNITII:ClassesandObjects: Introduction,ClassDeclarationandModifiers,ClassMembers, Declaration of Class Objects, Assigning One Objectto Another, Access Controlfor Class Members, Accessing Private Members of Class, Constructor Methods for Class,OverloadedConstructorMethods,NestedClasses,FinalClassandMethods,Passing ArgumentsbyValueandbyReference,Keywordthis.

Methods: Introduction, Defining Methods, Overloaded Methods, Overloaded ConstructorMethods,Class Objects as Parametersin Methods,Access Control,Recursive Methods,NestingofMethods,OverridingMethods,AttributesFinalandStatic.

UNIT III: Arrays: Introduction, Declaration and Initialization of Arrays, Storage of Array inComputer Memory, Accessing Elements of Arrays, Operations on Array Elements, AssigningArray toAnother Array, Dynamic Change of Array Size, Sorting of Arrays, Search forValues in Arrays, Class Arrays, Two-dimensional Arrays, Arrays of Varying Lengths, Three-dimensionalArrays,Arrays as Vectors.

Inheritance: Introduction, Process of Inheritance, Types of Inheritances, Universal SuperClass-ObjectClass,InhibitingInheritanceofClassUsingFinal,AccessContlandInheritance, Multilevel Inheritance, Application of Keyword Super, Constructor Method andInheritance, Method Overriding, Dynamic Method Dispatch, Abstract Classes, Interfaces andInheritance.

Interfaces: Introduction,Declaration of Interface,Implementation of Interface,MultipleInterfaces, Nested Interfaces, Inheritance of Interfaces, Default Methods in Interfaces, StaticMethodsinInterface,FunctionalInterfaces,Annotations.

UNITIV:PackagesandJavaLibrary: Introduction,DefiningPackage,ImportingPackag es and Classes into Programs, Path and Class Path, Access Control, Packages in JavaSE, Java.lang Package and its Classes, Class Object, Enumeration, class Math, WrapperClasses, 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 inJava,TemporalAdjustersClass,TemporalAdjustersClass.

ExceptionHandling: Introduction,Hierarchy of StandardException Classes,Keywordsthrows and throw, try, catch, and finally Blocks, Multiple Catch Clauses, Class Throwable,UncheckedExceptions,CheckedExceptions.

Java I/O and File: Java I/O API, standard I/O streams, types, Byte streams, Characterstreams,Scannerclass,FilesinJava(TextBook2)

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

MultithreadedProgramming: Introduction,NeedforMultipleThreadsMultithreadedPr ogrammingforMulti-coreProcessor,ThreadClass,MainThread-CreationofNewThreads,ThreadStates,ThreadPriority-Synchronization,DeadlockandRaceSituations,Inter-thread Communication-Suspending,Resuming,andStopping ofThreads.

JavaDatabaseConnectivity: Introduction,JDBCArchitecture,InstallingMySQLandMy SQL Connector/J, JDBC Environment Setup, Establishing JDBC Database Connections,ResultSetInterface

Java FX GUI: Java FX Scene Builder, Java FX App Window Structure, displaying text andimage,eventhandling,laying outnodesinscenegraph,mouseevents(TextBook 3)

TextBooks:

1. JAVAonestepahead, AnithaSeth,B.L.Juneja, Oxford.
2. JoywithJAVA,FundamentalsofObjectOrientedProgramming,DebasisSamanta, MonalisaSarma,Cambridge,2023.
3. JAVA9for Programmers,PaulDeitel,HarveyDeitel,4thEdition,Pearson.

ReferencesBooks:

1. ThecompleteReferenceJava,11ᵗʰedition, HerbertSchildt,TMH
2. IntroductiontoJavaprogramming, 7ᵗʰEdition, YDanielLiang, Pearson

OnlineResources:

1.https://nptel.ac.in/courses/106/105/106105191/
2.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012880464547618816
347_shared/overview

B.Tech II Year-I Semester	ADVANCEDDATASTRUCTURES&ALGORITHMANALYSISLAB (23HPC0505)	L	T	P	C
		0	0	3	1.5

CourseObjectives:

The objectivesofthecourseisto

- Learn non- linear Data Structures for various applications
- Develop application using Greedy, Divide and conquer, dynamic programming.
- Implement application for backtracking algorithms using relevant data structures

CourseOutcomes:

Aftercompletionofthecourse, studentswillbeableto

- Demonstrate an understanding of Non-Linear data structures by developingimplementingtheoperationsonAVLTrees,B-Trees,HeapsandGraphs.(L2)
- Apply Greedy ,Divide and conquer algorithms.(L3)
- Design Dynamic programming algorithms for various real time applications.(L6)
- Apply back tracking algorithms (L3)

ExperimentscoveringtheTopics:

- OperationsonAVLtrees,B-Trees,HeapTrees
- GraphTraversals
- Sortingtechniques
- Minimumcostspanningtrees
- Shortestpathalgorithms
- 0/1KnapsackProblem
- TravellingSalespersonproblem
- OptimalBinarySearchTrees
- N-QueensProblem
- JobSequencing

SamplePrograms:

1. Construct an AVL tree for a given set of elements which are stored in a file. Andimplement insert and delete operation on the constructed tree. Write contents of treeintoanewfileusingin-order.
2. Construct B-Tree an order of 5 with a set of 100 random elements stored in array.Implementsearching,insertionanddeletionoperations.
3. Construct Min and Max Heap using arrays, delete any element and display the contentoftheHeap.
4. ImplementBFT andDFTfor givengraph,whengraphisrepresentedby
   a) AdjacencyMatrix   b) AdjacencyLists
5. Writeaprogramfor findingthebi-connectedcomponentsinagivengraph.
6. ImplementQuick sort and Merge sort and observe the execution time for

variousinputsizes(Average,WorstandBestcases).
7. Compare the performance of Single Source Shortest Paths using Greedy method whenthe graphisrepresentedbyadjacencymatrixandadjacencylists.
8. ImplementJobsequencingwithdeadlinesusingGreedystrategy.
9. Writeaprogramto solve0/1 KnapsackproblemUsing DynamicProgramming.
10. ImplementN-QueensProblemUsingBacktracking.

11. UseBacktrackingstrategytosolve0/1Knapsackproblem.
12. ImplementTravellingSalesPersonproblemusingBranchandBoundapproach.

ReferenceBooks:

1. FundamentalsofDataStructuresin C++,HorowitzEllis,SahniSartaj,Mehta,Dinesh,2ndEdition,Universities Press
2. ComputerAlgorithms/C++EllisHorowitz,SartajSahni,SanguthevarRajasekaran, 2ndEdition,UniversityPress
3. DataStructuresandprogramdesign inC,RobertKruse,PearsonEducationAsia
4. AnintroductiontoDataStructureswithapplications,Trembley&Sorenson,McGra wHill

OnlineLearningResources:

1. http://cse01-iiith.vlabs.ac.in/
2. http://peterindia.net/Algorithms.html

B.TechIIYear-ISemester	OBJECT-ORIENTEDPROGRAMMINGTHROUGHJAVA LAB (23HPC0506)	L	T	P	C
		0	0	3	1.5

CourseObjectives: The aimofthiscourseisto
- To Practiceobjectorientedprogramming intheJavaprogramming language
- To implement Classes, Objects, Methods, Inheritance, Exception, Runtime Polymorphism, User defined Exception handlingmechanism
- To Illustrateinheritance,Exceptionhandling mechanism,JDBCconnectivity
- To ConstructThreads,EventHandling,implementpackages,JavaFXGUI

CourseOutcomes: Aftercompletionofthecourse,studentswillbeableto
- Understand JAVA syntax ,data types, control structures(L6)
- Apply fundamental oops principles(L3)
- Develop problem solving thinking and algorithmic thinking(L6)
- Apply oops concepts to design efficient solutions (L3)
- Analyze JAVA libraries and API ,including the collections frame works, JDBC(L4)

ExperimentscoveringtheTopics:

- ObjectOrientedProgrammingfundamentals- datatypes, controlstructures
- Classes,methods,objects,Inheritance,polymorphism,
- Exceptionhandling,Threads,Packages,Interfaces
- Files,I/Ostreams,JavaFXGUI

SampleExperiments:

Exercise– 1

a) WriteaJAVAprogramtodisplaydefaultvalueofallprimitivedatatypeofJAVA

b) Write a java program that display the roots of a quadratic equation $ax^2+bx=0$. Calculate thediscriminate Dandbasingonvalue ofD,describe thenatureofroot.

Exercise-2

a) WriteaJAVAprogramtosearchforanelementinagivenlistofelementsusingbinarysearchmechanism.

b) WriteaJAVAprogramtosortfor anelementinagiven listofelementsusingbubblesort

c) WriteaJAVAprogramusingStringBuffertodelete, removecharacter.

Exercise-3

a) Write a JAVA program to implement class mechanism. Create a class, methods and invoketheminsidemainmethod.

b) WriteaJAVAprogramimplementmethodoverloading.

c) WriteaJAVAprogramtoimplementconstructor.

d) WriteaJAVAprogramtoimplementconstructoroverloading.

Exercise-4

    a) WriteaJAVAprogramtoimplementSingleInheritance

    b) WriteaJAVAprogramtoimplementmultilevelInheritance

    c) WriteaJAVAprogramforabstractclasstofindareasofdifferentshapes

Exercise-5

    a) WriteaJAVAprogramgiveexamplefor "super"keyword.

    b) WriteaJAVAprogramtoimplementInterface.Whatkind ofInheritancecanbeachieved?

    c) WriteaJAVAprogramthatimplementsRuntimepolymorphism

Exercise-6

    a) WriteaJAVAprogramthatdescribesexceptionhandlingmechanism

    b) WriteaJAVAprogramIllustrating Multiplecatchclauses

- Write a JAVAprogramforcreationofJava Built-inExceptions
- WriteaJAVAprogramforcreationofUser Defined Exception

Exercise-7

    a) Write a JAVA program that creates threads by extending Thread class. First thread display"Good Morning "every 1 sec, the second thread displays "Hello "every 2 seconds and thethirddisplay "Welcome"every3 seconds,(Repeatthesameby implementingRunnable)

    b) Writeaprogramillustrating**isAlive** and **join**()

    c) WriteaProgramillustratingDaemonThreads.

    d) WriteaJAVAprogramProducerConsumer Problem

Exercise– 8

    a) WriteaJAVAprogramthatimport andusetheuser definedpackages

    b) Withoutwritinganycode,buildaGUIthatdisplaytextinlabelandimageinanImageView (useJavaFX)

    c)

BuildaTipCalculatorappusingseveralJavaFXcomponentsandlearnhowtorespondtouseri nteractions withtheGUI

Exercise– 9

    a) WriteajavaprogramthatconnectstoadatabaseusingJDBC

    b) WriteajavaprogramtoconnecttoadatabaseusingJDBCandinsertvalues intoit.

    c) WriteajavaprogramtoconnecttoadatabaseusingJDBCanddeletevaluesfromit

TextBooks:

1. JAVAonestepahead, AnithaSeth,B.L.Juneja, Oxford.
2. JoywithJAVA,FundamentalsofObjectOrientedProgramming,DebasisSamanta, MonalisaSarma,Cambridge,2023.
3. JAVA9for Programmers,PaulDeitel,HarveyDeitel,4thEdition,Pearson.

ReferencesBooks:

1. ThecompleteReferenceJava, 11thedition,HerbertSchildt,TMH

2. Introductionto Javaprogramming, 7thEdition, YDanielLiang, Pearson

OnlineResources:

1.https://nptel.ac.in/courses/106/105/106105191/
2.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01288046454761881634 7
_shared/overview

B.Tech II Year-I Semester	PYTHON PROGRAMMING (SKILL ENHANCEMENT COURSE) (23HSC0502)	L	T	P	C
		0	1	2	2

Course Objectives:- The main objectives of the course are to
- To learn the fundamentals of python
- To understand the concepts of functions, strings and lists of python
- To discuss the concepts of Dictionaries, Tuples and Sets
- To analyze the concepts of files and object oriented programming
- To familiarize with python libraries for Data Science

Course Outcomes:- After completion of the course, students will be able to
- To understand the basics concepts of python to solve computational problems (L2)
- Solve the problems by applying the modularity principle (L4)
- Use the Data Structure Dictionaries, Tuples and Sets (L4)
- Apply the conditional execution of the program (L4)
- Analyze and manipulation Data using Pandas(L2)

UNTI-I: History of Python ProgrammingLanguage,ThrustAreasof Python,InstallingAnaconda PythonDistribution,InstallingandUsingJupyterNotebook.
PartsofPythonProgrammingLanguage: Identifiers,Keywords,StatementsandExpressions, Variables, Operators, Precedence and Associativity, Data Types, Indentation,Comments, Reading Input, PrintOutput, Type Conversions, the type () Function and IsOperator,DynamicandStronglyTypedLanguage.
Control Flow Statements: if statement, if-else statement, if...elif…else, Nested if statement,while Loop, for Loop, continue and break Statements, Catching Exceptions Using try andexceptStatement.

SampleExperiments:

1. WriteaprogramtofindthelargestelementamongthreeNumbers.
2. WriteaProgramto displayallprimenumberswithin an interval
3. Writeaprogramtoswaptwonumberswithoutusingatemporaryvariable.
4. Demonstratethefollowing OperatorsinPythonwithsuitable examples.
   i) ArithmeticOperatorsii)RelationalOperatorsiii)AssignmentOperatorsiv)Logical Operatorsv)BitwiseOperatorsvi)TernaryOperatorvii)MembershipOperators viii)IdentityOperators
5. Writeaprogramtoadd and multiplycomplexnumbers
6. Writeaprogramto printmultiplicationtableofagiven number.

UNIT-II: Functions: Built-In Functions, Commonly Used Modules, Function

Definition andCalling the function, return Statement and void Function, Scope and Lifetime of Variables,DefaultParameters,KeywordArguments,*argsand**kwargs,CommandLine Arguments.

Strings: Creating and Storing Strings, Basic String Operations, Accessing Characters inStringbyIndexNumber, StringSlicingandJoining,StringMethods, FormattingStrings.
Lists: Creating Lists, Basic List Operations, Indexing and Slicing in Lists, Built-In FunctionsUsedonLists,ListMethods,delStatement.

SampleExperiments:

7. Writeaprogramtodefineafunctionwithmultiplereturnvalues.
8. Writeaprogramtodefineafunctionusingdefaultarguments.
9. Writeaprogramtofind thelengthofthestringwithoutusinganylibraryfunctions.
10. Writeaprogramto checkifthesubstringispresent inagivenstringornot.
11. Writea programtoperformthe givenoperationsonalist:
                     i. Addition   ii.Insertion   iii.slicing
12. Write a programtoperformany5built-infunctionsbytakinganylist.

UNIT-III: Dictionaries: Creating Dictionary, Accessing and Modifying key:value Pairs inDictionaries,Built-InFunctionsUsed onDictionaries,DictionaryMethods,delStatement.
Tuples and Sets: Creating Tuples, Basic Tuple Operations, tuple() Function, Indexing andSlicing in Tuples, Built-In Functions Used on Tuples, Relation between Tuples and Lists,RelationbetweenTuplesandDictionaries,Usingzip()Function,Sets,SetMethods,Frozenset.

SampleExperiments:

13. Write a program to create tuples (name, age, address, college) for at least two membersandconcatenatethe tuplesandprinttheconcatenated tuples.
14. Writeaprogramtocountthenumberofvowels inastring(Nocontrolflowallowed).
15. Writea programtocheckifa givenkeyexistsinadictionaryornot.
16. Writeaprogramtoaddanewkey-valuepairtoanexistingdictionary.
17. Writeaprogramtosumalltheitemsinagivendictionary.

UNIT-IV: Files: Types of Files, Creating and Reading Text Data, File Methods to Read andWrite Data, Reading and Writing Binary Files, Pickle Module, Reading and Writing CSVFiles,Pythonosandos.pathModules.
Object-Oriented Programming: Classes and Objects, Creating Classes in Python, CreatingObjects in Python, Constructor Method, Classes with Multiple Objects, Class Attributes VsData Attributes,Encapsulation,Inheritance,Polymorphism.

SampleExperiments:

18. Write a program to sort words in a file and put them in another file. The output fileshould have only lower-case words, so any upper-case words from source must belowered.
19. Pythonprogramto printeachlineofafileinreverseorder.
20. Pythonprogramtocomputethenumber ofcharacters,wordsandlinesinafile.

21. Write a program to create, display, append, insert and reverse the order of the items in the array.
22. Write a program to add, transpose and multiply two matrices.
23. Write a Python program to create a class that represents a shape. Include methods to calculate its area and perimeter. Implement subclasses for different shapes like circle, triangle, and square.

UNIT-V: Introduction to Data Science: Functional Programming, JSON and XML in Python, NumPy with Python, Pandas.

SampleExperiments:

24. Python program to check whether a JSON string contains complex object or not.
25. Python Program to demonstrate NumPy arrays creation using array() function.
26. Python program to demonstrate use of ndim, shape, size, dtype.
27. Python program to demonstrate basic slicing, integer and Boolean indexing.
28. Python program to find min, max, sum, cumulative sum of array
29. Create a dictionary with at least five keys and each key represent value as a list where this list contains at least ten values and convert this dictionary as a pandas data frame and explore the data through the data frame as follows:
    a)   Apply head () function to the pandas data frame
    b)   Perform various data selection operations on DataFrame
30. Select any two columns from the above data frame, and observe the change in one attribute with respect to other attribute with scatter and plot operations in matplotlib

ReferenceBooks:

1.   Gowrishankar S, Veena A., Introduction to Python Programming, CRC Press.
2.   Python Programming, S Sridhar, J Indumathi, V M Hariharan, 2nd Edition, Pearson, 2024
3.   Introduction to Programming Using Python, Y. Daniel Liang, Pearson.

OnlineLearningResources/VirtualLabs:

1.   https://www.coursera.org/learn/python-for-applied-data-science-ai
2.   https://www.coursera.org/learn/python?specialization=python#syllabus

ANNAMACHARYA INSTITUTE OF TECHNOLOGY & SCIENCES::KADAPA
(AUTONOMOUS)
(Approved by AICTE New Delhi & Affiliated to JNTUA, Anantapuramu)
Accredited by NAAC with 'A' grade, Bangalore

B.Tech. II Year-I Semester	ENVIRONMENTAL SCIENCE (Common to all Branches)	L	T	P	C
		2	0	0	0

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

UNIT I:
Multidisciplinary Nature of Environmental Studies: – Definition, Scope and Importance – Need for Public Awareness.
Natural Resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

UNIT II:
Ecosystems: Concept of an ecosystem. – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem:
    a. Forest ecosystem.
    b. Grassland ecosystem
    c. Desert ecosystem.
    d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)
Biodiversity and its Conservation : Introduction 0 Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III:
Environmental Pollution: Definition, Cause, effects and control measures of :
    a. Air Pollution.
    b. Water pollution
    c. Soil pollution
    d. Marine pollution
    e. Noise pollution
    f. Thermal pollution
    g. Nuclear hazards

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods,

earthquake, cyclone and landslides.

UNIT IV:

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

UNIT V:

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmes. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

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

Textbooks:
1. Textbook of Environmental Studies for Undergraduate Courses ErachBharucha for University Grants Commission, Universities Press.
2. Palaniswamy, "Environmental Studies", Pearson education
3. S.AzeemUnnisa, "Environmental Studies" Academic Publishing Company
4. K.RaghavanNambiar, "Text book of Environmental Studies for Undergraduate Courses as per UGC model syllabus", Scitech Publications (India), Pvt. Ltd.

References:

1. Deeksha Dave and E.Sai Baba Reddy, "Textbook of Environmental Science", Cengage Publications.
2. M.Anji Reddy, "Text book of Environmental Sciences and Technology", BS Publication.
3. J.P.Sharma, Comprehensive Environmental studies, Laxmi publications.
4. J. Glynn Henry and Gary W. Heinke, "Environmental Sciences and Engineering", Prentice hall of India Private limited
5. G.R.Chatwal, "A Text Book of Environmental Studies" Himalaya Publishing House
6. Gilbert M. Masters and Wendell P. Ela, "Introduction to Environmental Engineering and Science, Prentice hall of India Private limited.

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B.TECH - CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

II YEAR II SEMESTER COURSE STRUCTURE & SYLLABUS

SNO	CSE (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)
1	Optimization Techniques
2	Probability & Statistics
3	Machine Learning
4	Database Management Systems
5	Digital Logic and Computer Organization
6	Machine Learning Lab
7	Database Management Systems Lab
8	Full Stack Development-1
9	Design Thinking & Innovation

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B.Tech II Year - II Semester	OPTIMIZATIONTECHNIQUES (For CSE(AI&ML))	**L**	**T**	**P**	C
		2	**0**	**0**	**2**

CourseObjectives: Theobjectivesofthecourseare

- To provide the basic knowledge about Optimization, importance, application areas of in theindustry, Linear Programming.
- Toimpartdifferentoptimizationmodelsundertypicalsituationsinthebusinessorganization like transportation, assignment.
- Tounderstandtheprocessofsequencinginatypicalindustry.
- Todescribedifferentgamestrategiesundercut-throat competitivebusiness environment
- Todevelopnetworksofactivitiesofprojectsandtofindoutoptimalmodesofcompleting projects using network modelling evaluation techniques.

CourseOutcomes:

COs	Statements	Blooms Level
CO1	UnderstandingOptimizationandFormulationofLinearPrograming Models	L1
CO2	FormulateandSolveTransportation&AssignmentModels	L3
CO3	Sequencingofoperationsandoptimizing	L2
CO4	Discuss thegametheoryandstrategies	L2
CO5	Developingnetworksofactivitiesandfindingoptimalmodeofprojects evaluation.	L3

UNIT-I

Introduction: Meaning, Nature, Scope & Significance of Optimization - Typical applications. The Linear Programming Problem – Introduction, Formulation of Linear Programming problem, Limitations of L.P.P, Graphical method, Simplex method: Maximization and Minimization model(exclude Duality problems), Big-M method and Two Phase method.

UNIT-II

Transportation Problem: Introduction, Transportation Model, Finding initial basic feasible solutions, Moving towards optimality, Unbalanced Transportation problems, Transportation problems with maximization, Degeneracy.
Assignment Problem: Introduction, Mathematical formulation of theproblem, Solution of an Assignment problem, Hungarian Algorithm, Multiple Solution, Unbalanced Assignment problems, Maximization in Assignment Model.

UNIT-III

Sequencing – Job sequencing, Johnsons Algorithm for n Jobs and Twomachines, n Jobs and Three Machines, n jobs through m machines, Two jobs and m Machines Problems.

UNIT-IV

Game Theory: Concepts, Definitions and Terminology, Two Person Zero Sum Games, Pure Strategy Games (with Saddle Point), Principal of Dominance, Mixed Strategy Games (Game without Saddle Point), Significance of Game Theory in Managerial Application.

UNIT-V

Project Management: Network Analysis – Definition –objectives -Rulesfor constructing network diagram- Determining Critical Path– Earliest & Latest Times– Floats-Application of CPM and PERT techniques in Project Planning and Control – PERT Vs CPM. (exclude Project Crashing).

Textbooks:

1. OperationsResearchbyS.D.Sharma-Kedarnath
2. OperationsResearchbyR.Pannerselvam,PHIPublications.

ReferenceBooks:

1. QuantitativeTechniquesinManagementbyNDVohra,TataMcGrawHill,4th Edition, 2011.
2. Introductionto O.RbyHiller&Libermann(TMH).
3. OperationsResearch:Methods&ProblemsbyMauriceSaseini,ArhurYaspan& Lawrence Friedman. Pearson
4. QuantitativeAnalysisForManagement byBarryRender,RalphM.Stair,Jrand MichaelE.Hanna.
5. OperationsResearchbyWagner,PHIPublications.

Online Learning Sources

https://onlinecourses.swayam2.ac.in/cec20_ma10/previewhttps://onlinecourses.nptel.ac.in/noc20_ma23/previewhttps://onlinecourses.nptel.ac.in/noc19_ma29/preview

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B.Tech. II Year - II Semester	PROBABILITY&STATISTICS (CommontoCSE, CSE(AI&ML))	L	T	P	C
		3	0	0	3

CourseOutcomes:

Aftersuccessfulcompletionofthiscourse,thestudentsshouldbeableto:

COs	Statements	Blooms level
CO1	Acquireknowledgeinfindingtheanalysisofthedataquantitativelyor categorically and various statistical elementary tools.	L2,L3
CO2	Developskillsindesigningmathematicalmodelsinvolvingprobability,random variables andthecritical thinkinginthetheoryofprobabilityand its applications in real life problems.	L3,L5
CO3	Apply the theoretical probability distributions like binomial, Poisson, and Normal in the relevant application areas.	L3
CO4	Analyze to test various hypotheses includedintheory andtypes of errors for large samples.	L2,L3
CO5	Apply thedifferenttesting toolslike t-test,F-test,chi-square testto analyze the relevant real life problems.	L3,L5

UNITI: **Descriptivestatistics**
Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Measures of Central tendency, Measures of Variability (spread or variance) Skewness, Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines.

UNITII: **ProbabilityandRandomvariables**
Probability: Sample space andevents, axiomsof probability,someelementary theorems(addition and multiplicative law) of probability, conditional probability, Bayes' Theorem.
Random variables: Introduction,discrete and continuous,probability density functions,properties, mathematical expectation.

UNIT III: **Probabilitydistributions**
Probabilitydistributions:Binomial,PoissonandNormal-theirproperties(Chebyshevsinequality). Approximation of the binomial distribution to normal distribution.

UNITIV:EstimationandTestingofhypothesis,largesampletests
Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, thecritical andacceptanceregions, level of significance, twotypes of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems.

UNITV: **Smallsampletests**
Studentt-distribution(testforsinglemean,twomeansandpairedt-test),testingofequalityof variances (F-test), $\chi 2$ - test for goodness of fit, $\chi 2$ - test for independence $\jmath$f attributes.

Textbooks:

1. MillerandFreunds,ProbabilityandStatisticsforEngineers,7/e,Pearson,2008.
2. S.C. GuptaandV.K.Kapoor, Fundamentals of MathematicalStatistics, 11/e, SultanChand& Sons Publications, 2012.

ReferenceBooks:

1. S.Ross,aFirstCourseinProbability,PearsonEducationIndia,2002.
2. W.Feller,anIntroductiontoProbabilityTheoryanditsApplications,1/e,Wiley,1968.
3. B.V.Ramana,HigherEngineeringMathematics,McGrawHillEducation.

OnlineLearningResources:

1. https://onlinecourses.nptel.ac.in/noc21_ma74/preview
2. https://onlinecourses.nptel.ac.in/noc22_mg31/preview

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B.Tech II Year - II Semester	MACHINELEARNING (23HPC3301)	L	T	P	C
		3	0	0	3

CourseObjectives: Theobjectivesofthe course are
- Understand the basic concepts of machine Learning
- Apply different machine learning algorithms
- Implement clustering techniques

,

CourseOutcomes:
- Identifymachinelearningtechniquessuitableforagivenproblem. (L3)
- Solve the problems using various machine learning algorithms(L3)
- Apply data processing techniques(L3)
- Applythe design of intelligent machines(L3)
- Evaluate different clustering techniques(L5)

UNIT-I:Introductionto Machine Learning:
Evolution of Machine Learning,Paradigmsfor ML, Learning by Rote, Learning by Induction, Reinforcement Learning, Types of Data,Matching,StagesinMachineLearning,DataAcquisition,FeatureEngineering,DataRepresentation,Model Selection,Model Learning,Model Evaluation,Model Prediction,SearchandLearning,DataSets.

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

UNIT-III: Models Based on Decision Trees:
Decision Trees for Classification, ImpurityMeasures,Properties,RegressionBasedonDecisionTrees,Bias–VarianceTrade-off,RandomForests forClassificationandRegression.
The Bayes Classifier: Introduction to the Bayes Classifier, Bayes' Rule and Inference, TheBayesClassifieranditsOptimality,Multi-ClassClassification|ClassConditionalIndependence andNaive Bayes Classifier(NBC)

UNIT-IV:LinearDiscriminantsforMachineLearning:
IntroductiontoLinearDiscriminants,LinearDiscriminantsforClassification,PerceptronClassifier,PerceptronLearning Algorithm, Support Vector Machines, Linearly Non-Separable Case, Non-linearSVM,KernelTrick,LogisticRegression,LinearRegression,Multi-

LayerPerceptrons(MLPs),BackpropagationforTraininganMLP.

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, RoughClustering,RoughK-MeansClusteringAlgorithm,ExpectationMaximization-BasedClustering,SpectralClustering.

TextBooks:

1."Machine Learning Theory and Practice", M N Murthy, V S Ananthanarayana, UniversitiesPress(India),2024

ReferenceBooks:

1."Machine Learning", Tom M. Mitchell, McGraw-Hill Publication,
20172."MachineLearninginAction",PeterHarrington,DreamTech
3."Introductionto DataMining",Pang-
NingTan,MichelStenbach,VipinKumar,7thEdition,2019.

B.Tech II Year - II Semester	DATABASEMANAGEMENTSYSTEMS (23HES0504)	L	T	P	C
		3	0	0	3

CourseObjectives: Themainobjectivesofthecourseisto
- Introducethe fundamental concepts of database management systems
- Introduce the basic concepts of SQL
- Demonstrate the principles of logical design through normalization
- Provide knowledge on concurrency control and indexing techniques

CourseOutcomes: Aftercompletionofthecourse,studentswillbeableto
- Understandthebasicconceptsofdatabasemanagementsystems(L2)
- Analyzea givendatabase application using ER model (L4)
- Utilize SQL proficiently to address diverse query challenges (L3)
- Employ normalization methods to enhance database structure (L3)
- Implement concurrency control and indexing techniques (L3)

UNITI:Introduction:

Databasesystem,Characteristics(DatabaseVsFileSystem),Database Users, Advantages of Database systems,Database applications. Brief introductionof different Data Models; Concepts of Schema, Instance and data independence; Three tierschemaarchitecturefordataindependence;Databasesystemstructure,environment,CentralizedandClientServerarchitectureforthe database.

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set,relationship, relationship set, constraints, sub classes, super class, inheritance, specialization,generalizationusingER Diagrams.

Unit II: Relational Model:

Introduction to relational model, concepts of domain, attribute,tuple, relation, importance of null values, constraints (Domain, Key constraints, integrityconstraints) and theirimportance, Relational Algebra, Relational Calculus. BASIC SQL:SimpleDatabaseschema,datatypes,tabledefinitions(create,alter),differentDMLoperations(insert,delete,update).

UNIT III: SQL:

Basic SQL querying (select and project) using where clause, arithmetic &logicaloperations,SQLfunctions(DateandTime,Numeric,Stringconversion).Creatingtables with relationship, implementation of key and integrity constraints, nested queries,
subqueries,grouping,aggregation,ordering,implementationofdifferenttypesofjoins,view(updatable andnon-updatable),relationalsetoperations.

UNITIV:SchemaRefinement(Normalization):

PurposeofNormalizationorschemarefinement, concept of functional dependency, normal forms based on functional dependencyLossless join and dependency preserving decomposition, (1NF, 2NF and 3 NF), concept ofsurrogate key, Boyce-Codd normal form(BCNF), MVD, Fourth normal form(4NF),FifthNormalForm(5NF).

UNITV:TransactionConcept:

TransactionState,ACIDproperties,ConcurrentExecutions,Serializability,Recoverability,ImplementationofIsolation,TestingforSerializability,lock based, time stamp based, optimistic, concurrency protocols, Deadlocks,FailureClassification,Storage,RecoveryandAtomicity,Recoveryalgorithm.

IntroductiontoIndexingTechniques:B+Trees,operationsonB+Trees,HashBasedIndexing:

TextBooks:

1. DatabaseManagementSystems,3rdedition,RaghuramaKrishnan,JohannesGehrke,TMH (ForChapters 2,3,4)
2. DatabaseSystemConcepts,5thedition,Silberschatz,Korth,Sudarsan,TMH(ForChapter1andChapter5)

ReferenceBooks:

1. IntroductiontoDatabaseSystems,8thedition, CJDate,Pearson.
2. DatabaseManagementSystem,6thedition,RamezElmasri,ShamkantB.Navathe,Pearson
3. DatabasePrinciplesFundamentalsofDesignImplementationandManagement,CorlosCoronel,StevenMorris,PeterRobb,Cengage Learning.

Web-Resources:

1.https://nptel.ac.in/courses/106/105/106105175/
2.https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01275806667282022456_shared/overview

B.Tech II Year - II Semester	**(23A30402)DIGITALLOGIC&COMPUTERORGANIZATION**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

CourseObjectives: Themainobjectiveofthecourseisto

- Providestudentswithacomprehensiveunderstandingofdigitallogicdesignprinciplesand computerorganization fundamentals
- Describememoryhierarchyconcepts
- Explaininput/output(I/O)systemsandtheirinteractionwiththeCPU,memory,andperipheraldevices

CourseOutcomes: Aftercompletionofthecourse,studentswillbeableto

- Differentiatebetweencombinationalandsequentialcircuitsbasedontheircharacteristicsandfunctionalities. (L2)
- Demonstrateanunderstandingofcomputerfunctionalunits.(L2)
- Analyzethedesignandoperationofprocessors,including instructionexecution,pipelining,andcontrolunitmechanisms,tocomprehendtheirroleincomputersystems.(L3)
- Describe memory hierarchy concepts, including cache memory, virtual memory, andsecondary storage, and evaluate their impact on system performance and scalability.(L3)
- Explain input/output (I/O) systems and their interaction with the CPU, memory, andperipheraldevices,includinginterrupts,DMA,andI/Omappingtechniques. (L3)
- DesignSequentialandCombinationalCircuits(L6)

UNIT–I:
DataRepresentation: BinaryNumbers,FixedPointRepresentation,FloatingPointRepresentation, Number base conversions, Octal and Hexadecimal Numbers, Complements**,**Signed binarynumbers
DigitalLogicCircuits-
I:BasicLogicFunctions,Logicgates,universallogicgates,MinimizationofLogicexpressions.K-MapSimplification,CombinationalCircuits,Decoders,Multiplexers

UNIT–II:
DigitalLogicCircuits-II:SequentialCircuits,Flip-FlopConversions,Binarycounters,Ripplecounters

BasicStructureofComputers: ComputerTypes,Functionalunits,Basicoperationalconcepts,Busstructures,Software,Performance,multiprocessorsandmulticomputers,ComputerGenerations, Von-NeumannArchitecture

UNIT–III:
Computer Arithmetic : Addition and Subtraction, Multiplication Algorithms**,** Design ofFastAdders,MultiplicationofPositiveNumbers,Signed-

operandMultiplication,FastMultiplication,IntegerDivision,Floating-Point   Numbersand Operations

ProcessorOrganization: FundamentalConcepts,ExecutionofaCompleteInstruction,Multiple-BusOrganization, HardwiredControl andMulti programmedControl

UNIT–IV:

The Memory Organization: Basic Concepts, Semiconductor RAM Memories, Read-OnlyMemories, Speed, Size and Cost, Cache Memories, Performance Considerations, VirtualMemories,MemoryManagement Requirements, SecondaryStorage

UNIT–V:

Input/OutputOrganization: AccessingI/ODevices,Interrupts,ProcessorExamples,DirectMemoryAccess,Buses,InterfaceCircuits,Standard I/OInterfaces

Textbooks:
1. Computer Organization, Carl Hamacher,ZvonkoVranesic,Safwat Zaky,6thedition,McGraw Hill, 2023.
2. DigitalDesign,6thEdition,M.MorrisMano,PearsonEducation,2018.
3. ComputerOrganizationandArchitecture,WilliamStallings,11thEdition,Pearson, 2022.

ReferenceBooks:
1. ComputerSystemsArchitecture,M.MorisMano,3rdEdition,Pearson,2017.
2. ComputerOrganizationandDesign, DavidA.Paterson,JohnL.Hennessy,Elsevier,2004.
3. FundamentalsofLogicDesign,Roth,5thEdition,Thomson,2003.

OnlineLearningResources:
https://nptel.ac.in/courses/106/103/106103068/

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B.Tech II Year - II Semester	MACHINE LEARNING LAB (23HPC3302)	L	T	P	C
		0	0	3	1.5

Course Objectives:
- To learn about computing central tendency measures and Data preprocessing techniques.
- Implement machine learning algorithms in any suitable language of choice.

Course Outcomes:
- Understand the statistical perspectives of machine learning algorithms(L2)
- Evaluate different machine learning algorithms(L5)

Software Required: Python/R/Weka
Lab should cover the concepts studied in the course work, sample listof 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 performparameter 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. Evaluateperformance by measuring the sum of the Euclidean distance of each example fromits class center. Test the performance of the algorithm as a function of the parametersK.
13. Demonstrate the use of Fuzzy C-Means Clustering
14. Demonstrate the use of Expectation Maximization based clustering algorithm

B.Tech II Year - II Semester	DATABASEMANAGEMENTSYSTEMS LAB (23HPC0510)	L	T	P	C
		0	0	3	1.5

CourseObjectives: ThisCoursewillenablestudentsto
- Implement the basic knowledge of SQL queries
- Practice PL/SQL Programs using triggers ,procedures and cursors
- Develop connection to a database using JDBC

CourseOutcomes: Aftercompletionofthecourse,studentswillbeableto
- Define and execute SQL queries(L1)
- Implement PL/SQL programs (L3)
- Establish database connectivity through JDBC(L3)

Experimentscoveringthetopics:

- DDL,DML, DCLcommands
- Queries,nestedqueries,built-infunctions,
- PL/SQLprogramming-controlstructures
- Procedures,Functions,Cursors,Triggers,
- Databaseconnectivity-ODBC/JDBC

SampleExperiments:

1. Creation, altering and droping of tables and inserting rows into a table (use constraintswhile creatingtables)examplesusingSELECTcommand.
2. Queries (along with sub Queries)usingANY,ALL,IN,EXISTS,NOTEXISTS,UNION, INTERSET, Constraints. Example:- Select the roll number and name of thestudentwhosecuredfourthrankintheclass.
3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUPBY,HAVINGandCreationanddroppingofViews.
4. QueriesusingConversionfunctions(to_char,to_numberandto_date),stringfuncti ons (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substrand instr), date functions (Sysdate, next_day, add_months, last_day, months_between,least,greatest,trunc,round,to_char,to_date)
5.
    i. CreateasimplePL/SQLprogramwhichincludesdeclarationsection,execut able section and exception –Handling section (Ex. Student marks can beselected from the table and printed for those who secured first class and anexceptioncanberaisedifnorecordswerefound)
    ii. InsertdataintostudenttableanduseCOMMIT,ROLLBACKandSAVEPO INTinPL/SQLblock.

6. DevelopaprogramthatincludesthefeaturesNESTEDIF,CASEandCASEexpressi on.The programcanbeextendedusingtheNULLIFandCOALESCEfunctions.

7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loopsusing ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATIONERROR.
8. Programs development using creation of procedures, passing parameters IN and OUTofPROCEDURES.
9. Program development using creation of stored functions, invoke functions in SQLStatements andwrite complexfunctions.
10. DevelopprogramsusingfeaturesparametersinaCURSOR,FORUPDATECURS OR,WHERECURRENTofclause andCURSORvariables.
11. DevelopProgramsusingBEFOREandAFTERTriggers,RowandStatementTrigge rsandINSTEADOFTriggers
12. Createatableandperformthesearchoperationontableusingindexingandnon- indexingtechniques.
13. WriteaJavaprogramthatconnectstoadatabaseusingJDBC
14. WriteaJavaprogramtoconnecttoadatabaseusingJDBCandinsertvaluesintoit
15. WriteaJavaprogramtoconnecttoadatabaseusingJDBCanddeletevalues fromit

TextBooks/SuggestedReading:

1. Oracle:TheCompleteReferencebyOraclePress
2. NileshShah,"DatabaseSystemsUsingOracle",PHI, 2007
3. RickFVanderLans, "IntroductiontoSQL",FourthEdition, PearsonEducation, 2007

B.Tech II Year - II Semester	FULLSTACK DEVELOPMENT–1 (SkillEnhancementCourse) **(23HSC0503)**	L	T	P	C
		0	1	2	2

Course Objectives :- The main objectives of the course are to
- Learn the concepts of both front end and back end Programming Course.
- To get familiar with the latest web development technologies.
- By applying appropriate Cascading Style Sheets styles to HTML elements.
- To Develop Dynamics web pages and validate application forms

Course Outcomes :- After completion of the course, students will be able to
- Understand a fully functioning Websites (L2)
- Design styling to Webpages (L6)
- Create web pages interactive (L6)
- Create forms of applications (L6)
- Apply Java Scripts- internal and external (L4)
- Analyze HTML tags, Attributes and Cascading style sheets Properties (L2)

ExperimentscoveringtheTopics:

- Lists,LinksandImages
- HTMLTables, FormsandFrames
- HTML5 andCascading StyleSheets,TypesofCSS
- Selectorforms
- CSSwithColor,Background,Font,TextandCSSBoxModel
- ApplyingJavaScript-internalandexternal, I/O,TypeConversion
- JavaScriptConditionalStatementsandLoops,Pre-definedandUser-definedObjects
- JavaScriptFunctionsandEvents
- Node.js

SampleExperiments:

1. Lists,LinksandImages
a. WriteaHTMLprogram, toexplaintheworkingoflists.
   Note: It should have an ordered list, unordered list, nested lists and ordered list in anunorderedlistanddefinitionlists.
b. Write a HTML program, to explain the working of hyperlinks using <a> tag and href,targetAttributes.
c. Create a HTML document that has your image and your friend's image with a specificheight and width. Also when clicked on the images it should navigate to

their respectiveprofiles.

d. Write a HTML program, in such a way that, rather than placing large images on a page,the preferred technique is to use thumbnails by setting the height and width parameters tosomething like to 100*100 pixels. Each thumbnail image is also a link to a full sizedversionoftheimage.Createanimage galleryusingthistechnique

2. HTMLTables,FormsandFrames

- WriteaHTMLprogram,toexplaintheworkingoftables.(usetags:<table>,<tr>,<th>, <td>andattributes:border,rowspan,colspan)
- Write a HTML program, to explain the working of tables by preparing a timetable. (Note:Use <caption> tag to set the caption to the table & also use cell spacing, cell padding,border,rowspan,colspanetc.).
- Write a HTML program, to explain the working of forms by designing Registration form.(Note: Include text field, password field, number field, date of birth field, checkboxes,radio buttons, list boxes using <select>&<option> tags, <text area> and two buttons ie:submitandreset.Usetablestoprovide abetterview).
- Write a HTML program, to explain the working of frames, such that page is to be dividedinto 3 parts on either direction. (Note: first frameimage, second frameparagraph, thirdframe □ hyperlink. And also make sure of using "no frame" attribute such that frames tobefixed).

3. HTML5 andCascadingStyleSheets,TypesofCSS

a. WriteaHTMLprogram,thatmakesuseof<article>,<aside>,<figure>,<figcaption>, <footer>,<header>,<main>,<nav>,<section>,<div>,<span>tags.

b. WriteaHTMLprogram,toembedaudioandvideointoHTMLwebpage.

c. Writeaprogramtoapplydifferenttypes(orlevelsofstylesorstylespecificationformats)-
inline,internal,externalstylestoHTMLelements.(identifyselector,propertyandvalue).

4. Selectorforms

a. Writeaprogramto applydifferent typesofselectorforms
  - Simpleselector(element,id,class,group,universal)
  - Combinatorselector(descendant,child,adjacentsibling,generalsibling)
  - Pseudo-classselector
  - Pseudo-element selector
  - Attributeselector

5. CSSwithColor,Background,Font,TextandCSSBoxModel

a. Writeaprogramto demonstratethevariouswaysyou canreferenceacolorinCSS.

b. WriteaCSSrulethatplacesa backgroundimagehalfwaydownthepage,tiltingithorizontally.Theimageshould remaininplacewhentheuserscrollsup ordown.

c. Writeaprogramusingthefollowing termsrelatedtoCSSfontandtext:
  i.font-size   ii.font-weight   iii.font-style
  iv.text-decoration   v.text-transformation   vi.text-alignment

d. Writeaprogram,toexplaintheimportanceofCSSBoxmodelusing
  i.Content   ii. Border   iii.Margin   iv.padding

6. ApplyingJavaScript-internalandexternal,I/O, TypeConversion

a. Writeaprogramto embedinternalandexternalJavaScriptinawebpage.

b. Writeaprogramtoexplainthedifferentways fordisplayingoutput.

c. Writeaprogramtoexplainthedifferentways fortakinginput.

d. Create a webpage which uses promptdialoguebox toaska voter forhis name andage.Displaytheinformation intableformatalongwith eitherthevotercanvoteornot

7. JavaScriptPre-definedandUser-definedObjects

a. Writeaprogramusingdocumentobjectpropertiesandmethods.
b. Writeaprogramusingwindowobjectpropertiesandmethods.
c. Writeaprogramusingarrayobjectpropertiesandmethods.
d. Writeaprogramusingmathobjectpropertiesandmethods.
e. Writeaprogramusingstringobjectpropertiesandmethods.
f. Writeaprogramusingregexobjectpropertiesandmethods.
g. Writeaprogramusingdateobjectpropertiesandmethods.
h. Writeaprogramtoexplainuser-definedobjectbyusingproperties,methods,accessors,constructorsanddisplay.

8. JavaScriptConditionalStatementsandLoops

a. Write a program which asks the user to enter three integers, obtains the numbers from theuserand outputs HTML text thatdisplays thelargernumberfollowed by the words"LARGER NUMBER" in an information message dialog. If the numbers are equal, outputHTMLtextas"EQUALNUMBERS".
b. Writea programtodisplayweekdaysusingswitchcase.
c. Writeaprogramtoprint1to 10numbersusingfor,whileanddo-whileloops.
d. Writeaprogramtoprintdatainobjectusingfor-in,for-eachandfor-ofloops
e. Developaprogramtodeterminewhetheragivennumberisan'ARMSTRONGNUMBER' or not. [Eg: 153 is an Armstrong number, since sum of the cube of the digits isequaltothenumberi.e.,13+53+33= 153]
f. Write a program to display the denomination of the amount deposited in the bank in termsof 100's, 50's, 20's, 10's, 5's, 2's & 1's. (Eg: If deposited amount is Rs.163, the outputshouldbe 1-100's,1-50's,1-10's,1-2's&1-1's)

9. Javascript FunctionsandEvents

a. Designaappropriatefunctionshouldbecalledtodisplay
  ● Factorialofthatnumber
  ● Fibonacciseriesuptothatnumber
  ● Primenumbersuptothatnumber
  ● Isitpalindromeornot
b. DesignaHTMLhavingatextboxandfourbuttonsnamedFactorial,Fibonacci,Prime, and Palindrome. When a button is pressed an appropriate function should be called todisplay
  11. Factorialofthatnumber
  12. Fibonacciseriesuptothatnumber
  13. Primenumbersuptothatnumber
  14. Isitpalindromeornot
c. Writeaprogramtovalidatethefollowingfields inaregistrationpage
  i. Name(startwithalphabetandfollowedbyalphanumericandthelengthshouldno tbeless than6characters)
  ii. Mobile(onlynumbersandlength10digits)
  iii. E-mail(shouldcontainformatlikexxxxxxx@xxxxxx.xxx)

TextBooks:

1. ProgrammingtheWorldWideWeb,7thEdition, RobetWSebesta,Pearson, 2013.
2. WebProgrammingwithHTML5,CSSandJavaScript,JohnDean,Jones&BartlettLea rning,2019(Chapters 1-11).
3. ProMERNStack:FullStackWebAppDevelopmentwithMongo,Express,React,and

Node,VasanSubramanian,2nd edition,APress,O'Reilly.

WebLinks:

1. https://www.w3schools.com/html
2. https://www.w3schools.com/css
3. https://www.w3schools.com/js/
4. https://www.w3schools.com/nodejs
5. https://www.w3schools.com/typescript

B.Tech II Year - II Semester	DESIGNTHINKINGFORINNOVATION (23HBS9916)	L	T	P	C
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CourseObjectives:

- To familiarize students with designthinking process as a toolfor breakthrough innovation.
- To equip students with design thinking skills and ignitetheminds
- Tocreateinnovativeideas,develop solutionsforreal-time problems.

CourseOutcomes:

- Definetheconceptsrelatedtodesignthinking. (L1,L2)
- ExplainthefundamentalsofDesignThinkingandinnovation(L1,L2)
- Applythedesignthinkingtechniques for solvingproblemsinvarioussectors.(L3)
- Analyzetoworkinamultidisciplinaryenvironment(L4)
- Evaluatethevalue ofcreativity(L5)
- Formulatespecificproblemstatementsofrealtimeissues(L3,L6)

UNITI :Introduction toDesignThinking:
Introduction to elements and principles of Design, basics of design-dot, line, shape, form asfundamental design components. Principles of design.Introduction to design thinking, historyofDesignThinking,NewmaterialsinIndustry.

UNITII :DesignThinkingProcess:
Design thinking process (empathize, analyze, idea & prototype), implementing the process indriving inventions, design thinking in social innovations. Tools of design thinking - person,costumer,journeymap,brainstorming,productdevelopment.
Activity: Every student presents their idea in three minutes, Every student can present designprocess in the form of flow diagram or flow chart etc. Every student should explain aboutproductdevelopment.

UNITIII :Innovation:
Artofinnovation,Differencebetweeninnovationandcreativity,roleofcreativityandinnovation
in organizations- Creativity to Innovation- Teams for innovation- Measuring theimpactandvalueofcreativity.
Activity: Debate on innovation and creativity, Flow and planning from idea to innovation,Debate onvalue-basedinnovation.

UNITIV :ProductDesign

Problemformation,introductiontoproductdesign,Productstrategies,Productvalue,Productplanning,product specifications-Innovationtowardsproductdesign-Casestudies.

Activity: Importance of modelling, how to set specifications, Explaining their own productdesign.

UNITV :Design ThinkinginBusinessProcesses

Design Thinking applied in Business & Strategic Innovation, Design Thinking principles thatredefinebusiness–
Businesschallenges:Growth,Predictability,Change,MaintainingRelevance, Extreme competition, Standardization. Design thinking to meet corporate needs-Design thinking for Startups- Defining and testing Business Models and Business Cases-Developing&testingprototypes.

Activity: How to marketour own product, Aboutmaintenance, Reliability and plan forstartup.

Textbooks:

1. TimBrown,Changebydesign,HarperBollins(2009)
2. IdrisMootee,DesignThinkingforStrategicInnovation, 2013,JohnWiley&Sons.

ReferenceBooks:

1. DavidLee,DesignThinkingintheClassroom,Ulyssespress
2. ShrutinNShetty,DesigntheFuture,NortonPress
3. WilliamLidwell,UniversalPrinciplesofDesign-Kritinaholden,JillButter.
4. Chesbrough.H,TheEraofOpenInnovation–2013

Online LearningResources:

https://nptel.ac.in/courses/110/106/110106124/https://n
ptel.ac.in/courses/109/104/109104109/https://swayam.
gov.in/nd1_noc19_mg60/preview