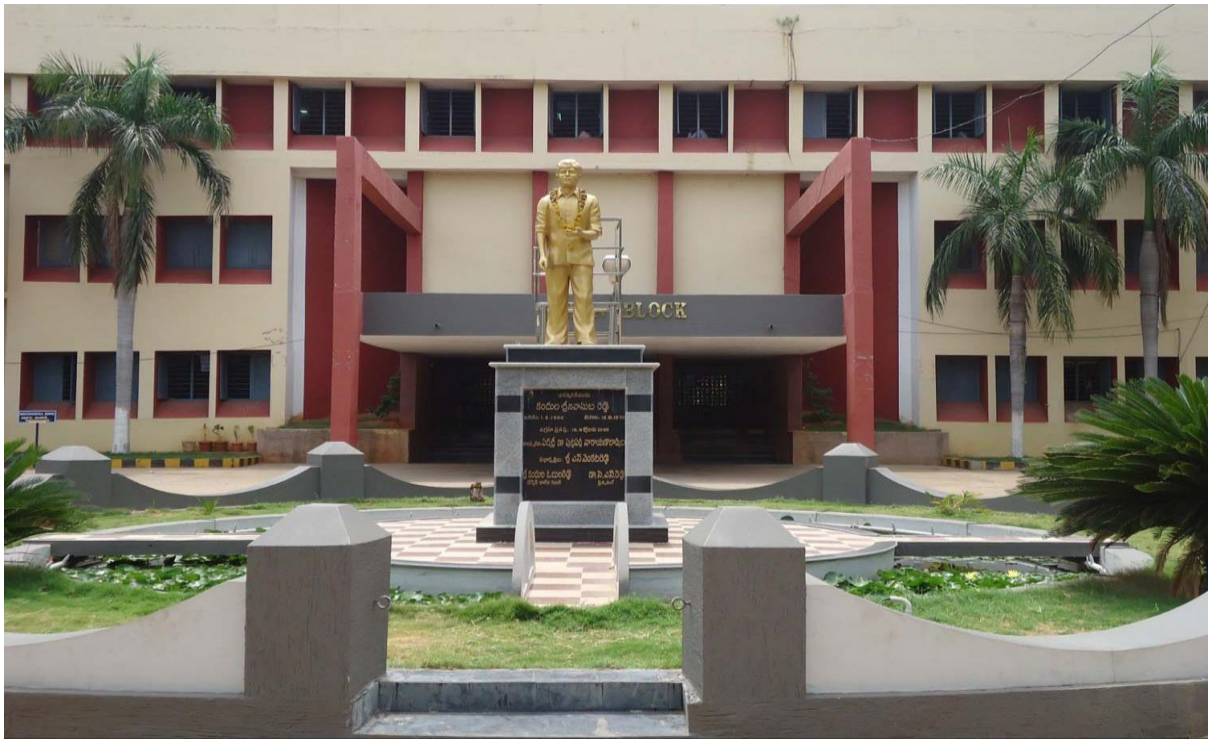
UG Programs in Engineering (R20UG)
Curriculum and Syllabus for

III - IV Sem B.Tech

Department of Computer Science and Engineering



KandulaSrinivasa Reddy Memorial College of Engineering (Autonomous)
Kadapa 516003 AP
(Approved by AICTE, Affiliated to JNTUA, Ananthapuramu, Accredited by NAAC)
(An ISO 9001-2008 Certified Institution)

COMPUTER SCIENCE AND ENGINEERING

Approved Course Structure

III Semester (Theory-05,Lab-03)

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2024301	Business Economics and Accounting for Engineers	HSMC	3	0	0	40	60	3
2	2005302	Advanced Data Structures	PCC	3	0	0	40	60	3
3	2005303	Formal Languages & Automata Theory	PCC	3	0	0	40	60	3
4	2005304	Object Oriented Programming through JAVA	PCC	3	0	0	40	60	3
5	2005305	Data Base Management Systems	PCC	3	0	0	40	60	3
6	2005306	Advanced Data Structures Lab	PCC	0	0	3	40	60	1.5
7	2005307	JAVA Lab	PCC	0	0	3	40	60	1.5
8	2005308	Data Base Management Systems Lab	PCC	0	0	3	40	60	1.5
9	2005309	Skill Oriented Course Exploring Data Analysis with R	SC	0	0	4	40	60	2.0
Total				**15**	**00**	**13**	**400**	**540**	**21.5**

IV Semester (Theory-05,Lab-03)

S.No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2004401	Microprocessors & Microcontrollers	ESC	3	0	0	40	60	3
2	2005402	Computer Organization	PCC	3	0	0	40	60	3
3	2005403	Principles of Operating Systems	PCC	3	0	0	40	60	3
4	2005404	Digital Logic Circuits & Design	PCC	3	0	0	40	60	3
5	2021405	Probability Theory & Statistical Methods	BSC	3	0	0	40	60	3
6	2004406	Microprocessors & Microcontrollers Lab	ESC	0	0	3	40	60	1.5
7	2005407	Principles of Operating Systems Lab	PCC	0	0	3	40	60	1.5
8	2005408	Digital Logic Design Lab	PCC	0	0	3	40	60	1.5
9	2005409	Skill Oriented Course Advanced Python Programming	SC	0	0	4	40	60	2.0
10	2024410	Universal Human Values	MC	3	0	0	40	60	3.0
Total				**18**	**00**	**13**	**400**	**600**	**24.5**

Structure of the Undergraduate Engineering Program:

S.No.	Category	Code	Credits	APSCHE Suggested Credits
1	Humanities &Social Sciences including Management Sciences	HSMC	10.5	10
2	Basic Science Courses	BSC	18	21
3	Engineering Science Courses	ESC	24	24
4	Professional Core Courses	PCC	54	51
5	Open Elective Courses	OEC	12	12
6	Professional Elective Courses	PEC	15	15
7	Internship & Project Work	Proj	16.5	17
8	Mandatory Courses	MC	03	Non-Credit
9	Skill Oriented Courses	SC	10	10
	Total Credits		**163**	**160**

B.Tech III SEM CSE (R20)

Course Title	BUSINESS ECONOMICS AND ACCOUNTING FOR ENGINEERS				B.Tech CSE III Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2024301	HSC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To equip the budding engineering student with an understanding of concepts andtools of economic analysis.
- To provide knowledge of Business economics through differential economics concepts and theories.
- To make aware of accounting concepts to analyze and solve complex problems relating financial related matters in industries.
- To understand professional and ethical responsibility and ability to communicate effectively.

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

CO 1	Understand the concept of Business Economics and able to apply.
CO 2	Understand the Production functions and application of Business Economics and Accounts for making business decisions.
CO 3	To Analyze the markets conditions and determine price-output relations.
CO 4	To understand the concepts of Accounting and able to prepare the financialstatement of a business firm.
CO 5	To evaluate, analyze and interpret the financial performance of business.

UNIT – I: INTRODUCTION TO BUSINESS ECONOMICS

Meaning, Definition, Nature and scope of Business Economics, Demand Analysis: Concept of Demand, Determinants of demand, Law of Demand and its exceptions, Elasticity of Demand – Types, Measurement of Elasticity of Demand, Demand Forecasting – Techniques of Demand Forecasting.

UNIT – II: THEORY OF PRODUCTION AND COST ANALYSIS

Production Functions: Law of variable proportion, Isoquants and Isocost, least cost combination of inputs, Returns to Scale and Cobb- Douglas production function. Internal and external economies of scale.

Cost Analysis: Cost concepts – Break-Even Analysis (BEA) – Break Even Point – significance and limitations of BEA.

UNIT – III : CLASSIFICATION OF MARKETS AND PRICING METHODS

Markets structures: Perfect and Imperfect competition – Features of Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly. Price- Output determination under perfect competition, monopoly and monopolistic competition – Price rigidity in Oligopoly.

Methods of Pricing – cost plus pricing, marginal cost pricing, skimming pricing, penetration pricing, differential pricing and administrative pricing.

UNIT – IV: INTRODUCTION TO FINANCIAL ACCOUNTING

Definition to Accounting, objective and need for Accounting, Double Entry Book keeping – Accounting process, Journal Ledger, Trial Balance, and Final Accounts – Trading Account, Profit and Loss Account and Balance sheet with problems.

UNIT – V: FINANCIAL ANALYSIS THROUGH RATIOS

Concept of Financial Ratios , Types of Ratios – Liquidity Ratios, Turnover Ratios, Capital Structure Ratios, Profitability Ratios with problems.

Text Books:

1. P.L Mehtha: Managerial Economics, Sulthan Chand Publishers
2. K K Dewett - Managerial Economics, S. Chand Publishers.
3. Varshney & Maheswari: Managerial Economics, Sultan Chand Publishers, 2009.
4. Prasad and K.V.Rao: Financial Accounting, Jai Bharath Publishers, Vijayawada.
5. A.R. Aryasri: Managerial Economics and Financial Analysis, TATA McGraw-Hill Publishing Co. Ltd.

Reference Books:

1. S.P Jain & K.L Narang: Financial Accounting, Kalyani publishers.
2. M.Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi, 2013.
3. Paul A Samuleson and William nordhaus : Economics, Oxford University Publications.
4. M L Jhingan : Micro Economics & Macro Economics, Vrinda Publacations (P) Ltd.

Course Title	ADVANCED DATA STRUCTURES				B.Tech CSE III Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005302	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To develop skills and analyze linear and non linear data structures.
- To understand basic concepts of stacks and queues.
- To study algorithms as they apply to trees and graphs.
- To study in detail about sorting, dictionaries and hashing.

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

CO 1	Understand the variety of abstract data types and data structures.
CO 2	Analyze data structures such as linked list, Stacks and Queues.
CO 3	Apply and analyze tree traversal algorithms.
CO 4	Analyze graph traversal algorithms and organize data using various sorting algorithms.
CO 5	Ability to understand the concept of hashing, B-Trees and B+-Trees.

UNIT-I

Introduction: Data structures, Primitive & Non Primitive data structures, Linear & NonLinear data structures, **Linear Lists:** Definition, **Arrays:** Definition, **Stacks:**Definition,Array&Linkedrepresentations,Operations,Applications

UNIT-II

Queues: Definition, Array & Linked representations, Operations, Circular Queues & Dequeues.

Trees: Basic terminology, Binary Trees- Definition, Properties, Representation,Complete and Full Binary Tree.

UNIT-III

Tree Traversal Algorithm: Inorder, Preorder and Post order.

Priority Queues: Definition, Heaps, Leftist Trees.

Binary Search Tree (BST): Definition, Operations & Implementations, BST with Duplicates, Indexed BST. **Balanced Search Trees:** AVL, Red-Black & Splay Trees.

UNIT-IV

Graphs: Terminology, Representations **Graph Traversal:** Depth First Search (DFS), Breadth First Search (BFS), Minimum Spanning Tree. **Sorting:** Quick, Merge, Heap.

UNIT-V

Dictionaries, Linear List Representation, Skip List Representation

Hashing: Introduction, Hash Table representation, Hash Functions.

Collisions: Introduction, Separate Chaining, Open Addressing, B-Trees, OperationsonB-Trees,B+-Trees.

Text books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G.Sorenson, McGrawHill.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed, Universitiespress.
3. Data Structures using C++,Varsha H.Patil, Oxford University Press.
4. Data Structures and Algorithmsin C++, S.Sahni, University Press (India) PrivateLimited, Second Edition

Reference books:

1. Data Structures, Seymour Lipschutz, Schaum's Outlines, McGrawHill.
2. Data Structures and Algorithms, G.A.V.Pai, TataMcGraw Hill.
3. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Data Structures and algorithms in C++,Mark Allen Weiss, Pearson Education Limited, Second Edition.
5. Data Structures, Algorithms and Applications in C++, Ananda Rao Akepoguand Radhik Raju Palagiri, Pearson Education.

Course Title	FORMAL LANGUAGES AND AUTOMATATHEORY				B.Tech CSE III Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005303	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			

Course Objectives:

- To be able to construct finite state machines and the equivalent regularexpressions and prove the equivalence of languages described by finite state machines and regular expressions.
- To be able to construct push down automata and the equivalent context free grammars, Turing machines and Post machines.

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

CO 1	Understand of the notion of a regular set and its representation by DFA's, NFA'sand regular expressions.
CO 2	Understand of the notion of a context-free language and its representation by
CO 3	Identify the applications of regular expressions and context-free grammars.
CO 4	Understand the concept of Push Down Automata.
CO 5	Solve to the problems using Turing machines.

UNIT-I

Fundamentals: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non deterministic finite automaton, transition diagrams and Language recognizers.

Finite Automata: NFA with Є transitions-Significance, acceptance of languages. Conversions and Equivalence : Equivalence between NFA with and without Є transitions, NFA to DFA conversion, minimization of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Mealy machines.

UNIT-II

Regular Languages: Regular sets, regular expressions, identity rules, Constructing finite Automata for a given regular expressions, Conversion of Finite Automata to Regular expressions. Pumping lemma of regular sets, closure properties of regular sets (proofs not required).

UNIT-III

Grammar Formalism: Regular grammars-right linear and left linear grammars, equivalence between regular linear grammar and FA, inter conversion, Context free grammar, derivation trees, and sentential forms. Right most and left most derivation of strings.

Context Free Grammars: Ambiguity in context free grammars. Minimization of Context Free Grammars. Chomsky normal form, Greiback normal form, Pumping Lemma for Context Free Languages. Enumeration of properties of CFL(proofs omitted).

UNIT-IV

Push Down Automata: Push down automata, definition, model, acceptance of CFL, Acceptance by final state and acceptance by empty state and its equivalence. Equivalence of CFL and PDA, interconversion. (Proofs not required). Introduction to DCFL and DPDA.

UNIT-V

Turing Machine: Turing Machine, definition, model, design of TM, Computable functions, recursively enumerable languages. Church's hypothesis, Types of Turing machines (proofs not required).

Computability Theory: Chomsky hierarchy of languages, linear bounded automata and context sensitive language, LR(0)grammar, decidability of problems, Universal Turing Machine, Turing reducibility, Definition of P and NP problems, NP complete and NP hard problems.

Text Books:

1. "Introduction to Automata Theory Languages and Computation". Hopcroft H.E. and Ullman J. D. Pearson Education.
2. Introduction to Theory of Computation - Sipser 2nd edition Thomson.
3. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley.
4. Introduction to languages and the Theory of Computation ,John C Martin, TMH

Reference Books:

1. "Elements of Theory of Computation", Lewis H.P. & Papadimition C.H. Pearson /PHI.
2. Theory of Computer Science and Automata languages and computation -Mishra and Chandrashekaran, 2nd edition, PHI. 5. Theory of Computation, By K.V.N. Sunitha and N.Kalyani

Course Title	OBJECT ORIENTED PROGRAMMING THROUGHJAVA				B.Tech CSE III Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005304	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			

Course Objectives:

- To give the students a firm foundation on Java concepts like Primitive data types, Java control flow, Methods, Object-oriented programming, Core Java classes, packages and interfaces, multithreading.
- To provide the students with an understanding of Java applets, Abstract Window, Toolkit and exception handling.

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

CO 1	Solve problems using object oriented approach and implement them using Java
CO 2	Apply the concept of inheritance, polymorphism and Packages, Interfaces
CO 3	Implement Exception handling and able to develop multithreaded applications with synchronization.
CO 4	Able to develop applets for web applications.
CO 5	Able to design GUI based applications.

UNIT-I

Object Oriented Programming basics: Need for OOP paradigm, Principles of OOP concepts.

Java Basics: History of Java, Java buzzwords, Simple java program, classes and objects – concepts of classes, objects, constructors, methods, Introducing access control**, this** keyword, overloading methods and constructors.

UNIT-II

Inheritance: Inheritance basics, Types of Inheritance, benefits of inheritance, **super** uses, using **final** with inheritance, polymorphism- method overriding, abstract classes. **Packages and Interfaces:** Defining, Creating and Accessing a Package, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT-III

Exception handling and multithreading: Concepts of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, creating own exception sub classes. Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads.

UNIT-IV

Event Handling : Events, Event sources, Event classes, Event Listeners, Delegation event model, handling Mouse and Keyboard events, Adapter classes, The AWT class hierarchy, user interface components- Labels, Button, Scrollbars, Text Components, Check box, Choices, Graphics, Layout manager types – Flow, Border, Grid, Card and Gridbag.

UNIT-V

Applets: Concepts of Applets, differences between applets and applications, life cycle of an Applet, creating applets, passing parameters to applets.

Swings: Introduction, JApplet, JFrame and JComponent, Icons and Labels, text fields, JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, and Tables.

Text Books:

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
3. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, eighth Edition,Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, eighth Edition,Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino and F.A.Hosch, Johnwiley & sons.
2. An introduction to Java programming and object oriented application development, R.A.Johnson- Thomson.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

Course Title	DATABASE MANAGEMENT SYSTEMS				B.Tech CSE III Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005305	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			

Course Objectives:

- To study the physical and logical database designs, database modeling, relatio hierarchical, and network models.
- To understand and use data manipulation language to query, update, and manag database.
- To develop an understanding of essential DBMS concepts such as: database secur integrity and concurrency. .

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

CO 1	To understand the basic concepts and the application of Database systems.
CO 2	To understand the basics of SQL and construct queries using SQL.
CO 3	To understand the Relational Database design principles.
CO 4	To apply various Normalization techniques for database design improvement.
CO 5	To apply concurrency control and recovery techniques during transactionexecution.

UNIT-I

Introduction - Database-System Applications, View of Data, Database languages, Database architecture, Database Users and Administrators.
E-R Model - The Entity Relationship Model, Constraints, Entity Relationship Diagrams, and Extended E-R features.

UNIT-II

Relational Model - Structure of Relational Databases, Database Schema, Keys, Query Languages, Fundamental Relational Algebra Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations, Modification of Database.

UNIT-III

Introduction to SQL - Data Definition, Basic Structure of SQL Queries, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Complex queries, views, Modification of the Database.

Advanced SQL -Integrity Constraints, Dynamic SQL, Functions and Procedures. **Other Relational Query Languages -** Tuple Relational Calculus, Domain Relational calculus.

UNIT-IV

Normal Forms – Atomic domain and First Normal Form, Keys and Functional Dependencies, Second Normal Form, BCNF, BCNF and Dependency Preservation, Third Normal Form, Lossless Decomposition, Dependency- preserving, Multi valued Dependencies, Fourth Normal Form, Join Dependencies, Fifth Normal Form, and Inclusiondependencies.

UNIT-V

Transactions -Transaction Concept, Transaction State, Implementation of Transaction Atomicity and Durability, Concurrent Executions, Serializability.
Concurrency Control -Lock-Based Protocols, Timestamp-Based Protocols.
Recovery System - Failure Classification, Storage, Recovery and Atomicity, Log based recovery.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database systemConcepts", 5thEdition, McGrawhill.
2. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education.
3. C.J.Date, Introduction to Database Systems.

Reference Books:

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems.3rd Edition, Tata McGrawHill.
2. Peter Rob, Ananda Rao and Carlos Corone, Database Management Systems, CengageLearning.

Reference Links:

1. https://nptel.ac.in/courses/106/105/106105175/ (IIT KHARAGPUR)
2. https://nptel.ac.in/courses/106/106/106106095/ (IIT MADRAS)

Course Title	ADVANCED DATA STRUCTURES LAB				B.Tech CSE III Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005306	PCC (Lab)	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To implement linear and non-linear Data Structures.
- To be able to understand the concept of Stacks and Queues.
- To be able to understand the concept of trees and tree traversing methods.
- To be able to understand graph traversal methods and various Sorting algorithms.

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

CO 1	Implement the operations of various linear data structures.
CO 2	Implement the ADTof Stack and Queue.
CO 3	Implement the concept Inorder, Preorder and Postorder tree traversingtechniques.
CO 4	Analyze and implement the Graph traversing methods and Sorting algorithms.

List of Experiments:

Exercise-1:

a. Write a program to implement Transpose of a given matrix.
b. Write a program to implement Matrix multiplication.

Exercise-2:

a. Write a program to implement Stack operations using arrays.
b. Write a program to convert Infix expression into Postfix expression.

Exercise- 3:

a. Write a program to implement Queue operations using arrays.
b. Write a program to implement Circular Queue operations using arrays

Exercise-4:

Write a programto implement the tree traversal methods.

Exercise-5:

Write a program for Binary Search Tree to implement the following operations.
i) Insertion ii) Deletion

Exercise-6:

a) Write a programto implement Breadth First Search.
b) Write a programto implement Depth First Search.

Exercise-7:

Write a program to implement Linear and Binary search using switch case.

Exercise-8:

a. Write a program to implement Bubble Sort.
b. Write a program to implement Insertion sort.

Exercise-9:

a. Write a program to implement Quick Sort
b. Write a program to implement Merge sort.

Exercise-10:

Write a program to implement Heap sort.

Text books:

1. An Introduction to Data Structures with applications, Jean Paul Trembley and Paul G.Sorenson, McGrawHill.
2. Fundamentals of Data Structures in C, Horowitz, Sahni, Anderson Freed,
3. Universitiespress.
4. Data Structures using C++,Varsha H.Patil, Oxford University Press.
5. Data Structures and Algorithmsin C++, S.Sahni, University Press (India) PrivateLimited, Second Edition

Reference books:

1. Data Structures, Seymour Lipschutz, Schaum's Outlines, McGrawHill.
2. Data Structures and Algorithms, G.A.V.Pai, TataMcGraw Hill.
3. Data Structures using C and C++, Langsam, Augenstein and Tanenbaum, PHI.
4. Data Structures and algorithms in C++,Mark Allen Weiss, Pearson Education Limited, Second Edition.
5. Data Structures, Algorithms and Applications in C++, Ananda Rao Akepoguand Radhik Raju Palagiri, Pearson Education.

Course Title	JAVA LAB				B.Tech CSE III Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005307	PCC (Lab)	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To teach fundamentals of object oriented programming in Java. Understand various concepts of JAVA. To familiarize Java environment to create, debug and run simple Java programs.
- To be able to understand Primitive data types, Java control flow, Methods, classes, packages, multithreading and exception handling
- To be able to understand and implement Java applications and applets

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

CO 1	Create, compile, and run Java programs
CO 2	Apply the concept of inheritance and polymorphism
CO 3	Implement Packages, Interfaces and Exception handling
CO 4	Develop windows applications both for standalone and Applets programs by usingawt and swings.

List of Experiments:

Exercise 1: (Basics)

a) The Fibonacci sequence is defined by the following rule: The first two values in the sequence are 1 and 1. Every subsequent value is the sum of the two values preceding it. Write a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence.

b) Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer. (use Scanner class to read input)

Exercise 2: (Basics)

a) Write a Java program to multiply two given matrices.

b) Write a Java Program that reads a line of integers, and then displays each integer,and the sum of all the integers (Use String Tokenizer class of java.util)

c) Write a Java program that checks whether a given string is a palindrome or not.Ex: MADAM is a palindrome.

Exercise 3:(Class, Objects)

a) Write a JAVA program to implement class mechanism. – Create a class, methodsand invoke them inside main method.

Exercise 4: (Methods)

a). Write a JAVA program to implement constructor overloading.b). Write a JAVA program implement method overloading.

Exercise 5: (Inheritance)

a). Write a JAVA program to implement Single Inheritance
b). Write a JAVA program to implement multi level Inheritance
c). Write a java program for abstract class to find areas of different shapes

Exercise 6: (Inheritance - Continued)

a). Write a JAVA program give example for "super" keyword.
b). Write a JAVA program to implement Interface. What kind of Inheritance can be achieved?

Exercise 7:(Threads & Packages)

c) . 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 the third display "Welcome" every 3 seconds ,(Repeat the same by implementing Runnable)
d) Write a Java program to implement packages.

Exercise 8: (Exception Handling)

a).Write a JAVA program that describes exception handling mechanismb). Write a JAVA program that implements Runtime polymorphism

Exercise 9: (Applet)

a) Write a JAVA program to display analog clock using Applet.
b) Write a JAVA program to create different shapes and fill colors using Applet.
c) Write a Java program to develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.

Exercise 10: (Event Handling)

a) Write a Java program for handling mouse events.
b) Write a Java program for handling keyboard events.

Exercise 11: (Swings)

a) Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -,*, % operations. Add a text field to display the result. (Real Time)

b) Write a JAVA program that to create a single ball bouncing inside a JPanel.

Text Books:

1. Java; the complete reference, 7th editon, Herbert schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.
3. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell,eighth Edition,Pearson Education.
4. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell,eighth Edition,Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J.Nino andF.A.Hosch, Johnwiley & sons.
2. An introduction to Java programming and object oriented applicationdevelopment, R.A.Johnson- Thomson.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

Course Title	DATABASE MANAGEMENT SYSTEMS LAB				B.Tech CSE III Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005308	PCC (Lab)	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To give an introduction to systematic database design approaches covering conceptual.
- Design, logical design and an overview of physical design.
- To give a good formal foundation on the relational model of data.

Course Outcomes: On successful completion of this course, the students will be able to	
CO 1	To understand and develop an Entity-Relationship model based on user requirements and Convert to Relational Schema.
CO 2	Populate and query a database using SQL DML/DDL commands.
CO 3	Declare and enforce integrity constraints on a database using a state-of-the-art RDBMS.
CO 4	Programming PL/SQL including stored procedures, stored functions.

DBMS LAB EXPERIMENTS

1. Draw E-R diagram and convert entities and relationships to relation table for agiven scenario.

   COLLEGE DATABASE:
   STUDENT (Rno, SName, Address, Phone, Gender)
   COURSE(CName)
   BRANCH(Code,BName
)SEMSEC (Sem, Sec)
   SUBJECT (Subcode, Title, Sem, Credits)
   IAMARKS (Rno, Subcode, Test1, Test2, Test3, Avg,Rank)

2. Consider University Database and Perform the following:
   a. Viewing all databases
   b. Creating a Database
   c. Viewing all Tables in a Database
   d. Creating Tables (With and Without Constraints)
   e. Inserting/Updating/Deleting Records in a Table
   f. Saving (Commit) and Undoing (rollback)

3. Consider Depttable (DEPTNO, DNAME, LOC) Perform the following:
   a. Rename the table dept as department
   b. Add a new column PINCODE with not null constraints to the existing table DEPT
   c. All constraints and views that reference the column are dropped automatically,along with the column.
   d. Rename the column DNAME to DEPT_NAME in dept table
   e. Change the data type of column loc as CHAR with size 10
   f. Delete table

4. Fo/r a given set of relation schemes, create tables and perform the following: Simple Queries, Simple Queries with Aggregate functions, Queries with Aggregate functions (group by and having clause), Queries involving- Date Functions, String Functions , Math Functions Join Queries- Inner Join, Outer Join Subqueries- With INclause, With EXISTS clause.

5. For a given set of relation tables perform the following:
a. Creating Views (with and without check option), Dropping views, Selecting from a view.

6. Write a Pl/SQL program to print integers from 1 to 10 by using PL/SQL FORloop.

7. Given the table EMPLOYEE (EmpNo, Name, Salary, Designation, DeptID) write acursor to select the five highest paid employees from the table.

8. Write PL/SQL code for finding specific Employee salary in given table.

9. Illustrate how you can embed PL/SQL in a high-level host language such asC/Java and demonstrates how a banking debit transaction might be done.

10. Given an integer i, write a PL/SQL procedure to insert the tuple (i, 'xxx') into agiven relation.

Text Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database systemConcepts", 5thEdition, McGrawhill.
2. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education.
3. C.J.Date, Introduction to Database Systems.

Reference Books:

1. Raghurama Krishnan, Johannes Gehrke, Data base Management Systems.3rd Edition, Tata McGrawHill.
2. Peter Rob, Ananda Rao and Carlos Corone, Database Management Systems, CengageLearning.

Web Links:

SQL and PL/SQL tutorial: 1. https://www.w3schools.com/sql/,
2 http://www.plsqltutorial.com/

Course Title	EXPLORING DATA ANALYSIS WITH R				B.Tech CSE III Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005309	Skill Oriented Course	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	1	2	2	40	60	100
						End Exam Duration: 3Hrs		

Course Objectives:

- The course enables the students to apply exploring data analysis with R on real time applications.

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

CO 1	Understanding the basic concepts of R programming.
CO 2	Apply critical R programming concepts to handle the data.
CO 3	Apply statistical concepts on real data.
CO 4	Use linear regression on given data set.
CO 5	Apply data visualization using R packages.

List of Experiments:

1. Download, install R and RStudio on windows.
2. Study of basic syntaxes in R.
   a. Write a R program to create a sequence of numbers from 20 to 50, find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91.
   b. Write a R program to get the first 10 Fibonacci numbers.
3. Implementation of different types of R operators.
4. Study and implementation of various control structures in R.
   a. Write a R program to check weather given is even or odd.
   b. Write a R program to find the sum of n natural numbers [1+2+3+…….+n].
   c. Write a R program to get all prime numbers up to a given number.
5. Write a R program to find factorial of a given number using recursive function.
6. Programs using vectors, matrix, factor and list in R.
   a. Write a R program to create a vector of a specified type and length. Create vector of numeric, complex, logical and character type of length 6.
   b. Write a R program to create a matrix taking a given vector of numbers as input and define the column and row names. Display the matrix.
   c. Write a R program to find the levels of factor of a given vector.
   d. Write a R program to create a list containing strings, numbers, vectors and a logical values.
7. Programs using statics (apply all statistical concepts using R)
8. Programs using linear regression.
   Consider the "cars" dataset. Assume "cars$dist" as the response variable and "cars$speed" as the predictor variable. Create a model using the lm() function.
9. Write a R program to create dataframe and extract specific rows and columns.
10. Study and implementation of data visualization using R packages.

Text Books:

1. ROBERT I. KABACOFF "R in Action Data analysis and graphics with R" Manning Publications Co 2011.
2. Aczel−Sounderpandian: "*Complete Business Statistics*" 7th Edition Complete Business Statistics, Seventh Edition McGraw−Hill Primis.
3. Pierre Lafaye de Micheaux, Remy Drouilhet and Benoit Liquet – " The R Software Fundamentals of Programming and Statistical Analysis", Springer.

Reference Books:

1. Seema Acharya - *"Data Analytics Using R"* ,Jan 01, 2018, Seema Acharya-MC GRAW HILL INDIA (2018)

Swayam/Nptel/Moocs:

1. https://onlinecourses.nptel.ac.in/noc21_ma35/preview
2. https://www.coursera.org/learn/data-analysis-r

B.Tech IV SEM CSE (R20)

Course Title	MICRO PROCESSORS & MICRO CONTROLLERS				B.Tech CSE IV Sem (R20)			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2004401	**ESC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- To become familiar with 8086 Microprocessor and 8051 Microcontroller Architecture, Instructions, Operating Modes and Programming.
- To use 8086 microprocessor and 8051 microcontroller for various applications.
- To study various peripherals for microprocessor based systems.

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

CO 1	Define various components and list out various features of microproces microcontroller and peripherals.
CO 2	Describe the internal block diagram of microprocessor, microcontroller and peripherals, addressing modes, instruction set and data transfer schemes.
CO 3	Develop algorithm and assembly language programs to solve problems.
CO 4	Apply an appropriate algorithm, program and peripheral for the application.
CO 5	Design the microprocessor or microcontroller based system to solve real time problems. (Prepare a case study model to get a first prototype).

UNIT-I

The 8086 Microprocessor–Introduction to microprocessors, 8086 microprocessor Architecture, Instruction set, Addressing modes, Interrupt system. Pin diagram, Minimum mode 8086 system and timings, Maximum mode 8086 system and timings.

UNIT- II

Assembly Language Programming: Assembler directives, Assembly language programs (8086) with Assembler directives for addition, subtraction, multiplication, division etc., sorting and searching, bit manipulation, look-up tables, string manipulations, Macros and Delay subroutines.

Data transfer schemes and Memory Interfacing: Synchronous, Asynchronous, Interrupt driven and DMA type schemes, Address decoding techniques, Interfacing Static RAM and ROM chips.

UNIT-III

Peripheral Interfacing: 8255 PPI and its interfacing, Programmable Communication Interface (8251 USART) and its interfacing, Programmable Interval Timer (8254) and its interfacing, Programmable interrupt controller (8259) and its interfacing, Programmable DMA controller (8257) and its interfacing, ADC and DAC Interfacing.

UNIT-IV

The 8051 microcontroller: Architecture, pin diagram, memory organization, external memory interfacing, stack, addressing modes, instruction set, Assembler directives, Assembly Language programs and Time delay Calculations, 8051 interrupt structure, 8051 counters and Timers, programming 8051 timers.

UNIT-V

Introduction to ARM: ARM Design philosophy, Registers, Program Status Register, Instruction pipeline, Interrupts and vector table, Instruction Set- Data Processing Instructions, Branch, Load-Store, Software interrupt, PSR instructions, Conditional instructions, Thumb instruction Set: Register Usage, Other Branch instructions, Data processing Instructions, Single-Register and Multi Register Load-Store Instructions, Stack, Software Interrupt Instructions.

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor architecture, programming and its applications with 8085", Penram International Publications, 4th Edition.
2. A. K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals",TMH.
3. Mazidi Muhammad Ali, Mazidi Janice Gillespie &McKinlayRolin D, "The 8051Microcontroller and Embedded Systems", 2nd Edition, Pearson Education, 2008.
4. Kenneth J Ayala, "The 8051 microcontroller: Architecture, Programming & Applications", Penram publications, 2nd edition.
5. Andrew N.Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide-Designing and Optimizing system software", Elsevier, 2008.

Reference Books:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware",2nd Edition, Tata McGraw-Hill.
2. Barry B. Brey, "The Intel Microprocessors-Architecture, Programming and Interfacing", 8th Edition, PHI.
3. Y. Liu and Glenn A. Gibson, "Microcomputer Systems: 8086/8088 Family Architecture, Programming and Design", 2nd Edition, PHI.
4. Raj Kamal,"Microcontrollers Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
5. Steve Furbur, "ARM System on-chip Architecture",2nd Edition, Addison Wesley, 2000.

Course Title	COMPUTER ORGANIZATION				B.Tech CSE IV Sem (R20)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2005402	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs		

Course Objectives:

- To make the students understand the structure of computers and internalorganization of different units like memory, I/O devices, registers.
- To study in detail about the microoperationsand implementation of fixed andfloating point addition, subtraction, multiplication and division operations.
- To study in detail about pipelining, Memory, I/O organization and multiprocessors.

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

CO 1	Understand the Basic concepts of computers and Data representation.
CO 2	Understand the concept of Register Transfer and various Micro operations.
CO 3	Understand the concept of basic computer organization and design, Micro programmed control and Computer Arithmetic.
CO 4	Understand the concept of Pipelining and Memory.
CO 5	Understand concept of I/O organization and Multiprocessors.

UNIT-I

Basic Concepts of Computers: Computer Types, Functional units, Basic operational concepts, Bus Structures, Performance. **Data Representation-** Fixed Point Representation, Floating Point Representation.

UNIT-II

Register Transfer and Microoperations: Register Transfer, Bus and memory transfers. Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.

UNIT-III

Basic Computer Organization and Design: Instruction codes, Computer instructions, Memory Reference Instructions, Input – Output and Interrupt, Addressing modes. **Micro Programmed Control:** Control memory, Address sequencing, Micro program example, Design of control unit, Hard wired control, Micro programmed control. **Computer Arithmetic:** Addition and subtraction, multiplication Algorithms, Division Algorithms.

UNIT-IV

Pipeline: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISCPipeline.
Memory: Basic concepts, Memory Hierarchy, Cache memory, Performance considerations, Virtual memory.

UNIT-V

Input-Output Organization: Peripheral Devices, Input- Output Interface, Asynchronousdata transfer, Modes of Transfer, Priority Interrupt, Direct memory Access (DMA).
Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures.

Text Books:

1. Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI.
3. Computer Organization and Architecture – William Stallings Sixth Edition,Pearson/PHI.
4. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.

Reference Books:

1. Fundamentals of Computer Organization and Design, - SivaraamaDandamudi, SpringerInt. Edition.
2. Computer Architecture a quantitative approach, John L. Hennessy and David A. Patterson, Fourth Edition, Elsevier.
3. Computer Architecture: Fundamentals and principles of Computer Design, Joseph D. Dumas II, BS Publication.

Course Title	PRINCIPLES OF OPERATING SYSTEMS				B.Tech CSE IV Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005403	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			

Course Objectives:

- Have an overview of functions of operating systems.
- Have a thorough knowledge of process management and memory management.
- To have a thorough knowledge of how handle to deadlocks.
- Learn the concepts of files, protection and security

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

CO 1	Understand the basic concepts related to the operating systems.
CO 2	Analyze the various process scheduling algorithms and processsynchronization mechanisms
CO 3	Analyze the various memory management schemes.
CO 4	Understand the ways to deal the deadlocks and the basic concepts related to filesin the system.
CO 5	Analyze the protection and security mechanism.

UNIT-I

Operating Systems Basics: Operating systems functions, Overview of computer operating systems, distributed systems, operating system services and systems calls, system programs, operating system structure.

UNIT-II

Process Management: Process concepts, scheduling-criteria, CPU scheduling algorithms, Evaluation of Scheduling Algorithms.

Concurrency: Process synchronization, the critical-section problem, Peterson's Solution, semaphores, Classic problems of Synchronization, monitors.

UNIT-III

Memory Management: Introduction**,** Swapping, contiguous memory allocation, paging, structure of the page table, segmentation, virtual memory, demand paging, page-replacement algorithms, Allocation of frames.

UNIT-IV

Deadlocks: system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock.
Files: The concept of a file, Access Methods, File Allocation Methods, Directorystructure, File system mounting, File sharing and Protection.

UNIT-V

Protection: Protection, Goals of Protection, Principles of Protection, Domain ofprotection Access Matrix, Implementation of Access Matrix.
Security: The security problem, Program threats, User authentication.

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts",Eighth edition, John Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education
3. William Stallings, "Operating Systems: Internals and Design Principles", Sixth Edition2009, Pearson Education.
4. D.M.Dhamdhere, "Operating Systems, A Concept based Approach", Third Edition, TMH

Reference Books:

1. A.S.Godbole, "Operating Systems", Second Edition, TMH.
2. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
3. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson
4. Operating Systems: A Practical Approach, Rajiv Chopra, 4th Edition, S Chand Publishers

Course Title	DIGITAL LOGIC CIRCUITS & DESIGN				B.Tech CSE IV Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005404	PCC	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					End Exam Duration: 3Hrs			

Course Objectives:

- To study the basic philosophy underlying the various number systems, Complements and binary codes.
- To study the theory of Boolean algebra and acquire the skills to manipulate andexamine Boolean algebraic expressions.
- To study the design principles of combinational and sequential circuits.

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

CO 1	Recall Binary Number systems.
CO 2	Understand Boolean algebra and apply to the Boolean functions.
CO 3	Apply different optimization techniques to construct effective logic circuit.
CO 4	Develop digital systems using combinational and sequential logic to solve engineering problems.
CO 5	Illustrating different registers, counters, Memory Concepts.

UNIT-I

BINARY SYSTEMS: Binary Numbers, Number base conversions, Octal and Hexadecimal Numbers, complements, Error detection and Correction, Binary codes.

BOOLEAN ALGEBRA AND LOGIC GATES: Basic Definitions, Axiomatic definition of Boolean Algebra, Basic theorems and properties of Boolean algebra, Boolean functions, canonical and standard forms, other logic operations, Digital logic Gates.

UNIT-II

GATE-LEVEL MINIMIZATION: The map method, Four-variable map, Five-variable map, Product of sums(POS) simplification , Don't-Care conditions, NAND and NOR implementation, Other Two-level implementations, Exclusive –OR function.

UNIT-III

COMBINATIONAL LOGIC: Combinational Circuits, Analysis of Combinational circuits, Design procedure, Code -converters, Binary adder-subtractor, Decimal Adder, Binary multiplier, Magnitude -comparator, Decoders, Encoders, Multiplexers.

UNIT-IV

SEQUENTIAL LOGIC: Sequential circuits, Latches, Flip-Flops, Analysis of clocked sequential circuits, State Reduction and Assignment, Design of Synchronous sequential circuits.

UNIT-V

REGISTERS AND COUNTERS: Registers, Shift Registers, Ripple counters, synchronous counters, Ring counter and Johnson counter.

MEMORY AND PROGRAMMABLE LOGIC: Random-Access memory, Read-Only memory, Programmable Logic Array, Programmable Array Logic.

Text Books:

1. Digital Design: With an introduction to the Verlog HDL, VHDL and System Verilog – 6thedition, M.Morris Mano and Michael D. Ciletti, Pearson Education/PHI.
2. Fundamentals of digital logic design with VHDL By Stephen Brown and I Zvonko Vranesic, second edition, The McGraw-Hill.
3. Fundamentals of logic design, Roth, 5th edition,Thomson.
4. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.

Reference Books:

1. Switching and Logic Design, C.V.S. Rao, Pearson Education
2. Digital Principles and Design –Donald D.Givone, Tata McGraw Hill, Edition.
3. Fundamentals of Digital Logic & Micro Computer Design, 5TH Edition, M.Rafiquzzaman John Wiley.

Course Title	PROBABILITY THEORY AND STATISTICALMETHODS				B.Tech CSE IV Sem (R20)			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2021405	**BSC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					**End Exam Duration: 3Hrs**			

Course Objectives:

- To help the students in getting a thorough understanding of the fundamentals of probabilities.
- To help the students in getting a thorough understanding and usage of statistical techniques like testing of hypothesis and statistical control.

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

CO 1	Understand the concepts of Probability and random variables.
CO 2	Interpret the properties of probability distributions and their applications.
CO 3	Analyze the problems of engineering and industry using the techniques of testingof hypothesis for large samples.
CO 4	Analyze the problems of engineering and industry using the techniques of testingof hypothesis for small samples.
CO 5	Apply statistical quality control and draw appropriate inferences for engineering problems.

UNIT-I

Random variables: Discrete random variables – Continuous random variables – Probability distribution function – Discrete and continuous probability distribution – Mathematical Expectation, Variance and standard deviation of probability distribution.

UNIT-II

Discrete distributions: Binomial and Poisson distributions with related properties.
Continuous distributions: Uniform and Normal distributions with related properties.

UNIT-III

Testing of Hypothesis: Formulation of null hypothesis, critical regions, level of significance. Large sample tests. Tests based on normal distribution – z -test for means and proportions.

UNIT-IV

Small samples: t-test for one sample, two samples problems and paired t-test. F-test –Chi-square test (testing of goodness of fit and independence).

UNIT-V

Statistical Quality Control: Concept of quality of a manufactured product – defect and defectives – Causes of variation – Random and assignable causes – The principle of Shewhart control chart – Charts for attributes and variable quality characteristics – Construction and operation of X-bar chart and R-chart, p-chart and c-chart.

Text Books:

1. Higher Engineering Mathematics, Dr. B.S.Grewal, Khanna Publishers-44 edition.
2. Probability and Statistics for Engineers and Scientists, Walpole and Myers, Seventh edition, Pearson Education Asia, 2002
3. Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publications, 9th edition- 2013.
4. An Introduction to Probability theory and its applications, William Feller

Reference Books:

1. Probability and Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publishers.
2. Statistical Methods by S.P.Gupta, S Chand Publications, 44th revised edition 2014.
3. Probability and Statistics for Engineers, Johnson, Fifth edition, Prentice Hall of India.
4. Probability & Statistics, Mendenhall Beaver, Beaver.

Course Title	MICROPROCESSORS & MICROCONTROLLERS LAB				B.Tech CSE IV Sem (R20)			
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
2004406	**ESC Lab**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To write 8086microprocessor and 8051 microcontroller programs for various operations
- Learning interfacing of processor with various Peripherals

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

CO 1	Develop algorithm and assembly language programs to solve problems.
CO 2	Analyze abstract problems and apply a combination of hardware and software toaddress the problem.
CO 3	Choosing an appropriate algorithm, program and peripheral for the application.
CO 4	Design the microprocessor based system to solve real time problems.

General Programs

1. Addition and Subtraction of two 8- bit/16 bit numbers, Multiplication of two 8-bit& two 16-bit numbers, Division of 16-bit by 8-bit and 32-bitby 16-bit number
2. Addition and Subtraction of 6 data bytes with 6-data bytes of another location.
3. Check the given Number is even or odd, Counting of 0's and 1's in a given data, Check the given number is logical palindrome or not.
4. Finding the maximum and minimum numbers in a given string of data.
5. Sorting the given numbers in ascending and descending order.
6. Finding the Factorial and Generating Fibonacci Series.
7. Conversion of BCD to hexadecimal number, Multiplication of two 3x3 matrices.
8. Addition, Subtraction, Multiplication, Division using Microcontroller.

Interfacing

1. Dual DAC interface (waveform generation).
2. Stepper motor control.
3. Display of flags using logic controller.
4. Traffic light controller.

Text Books:

1. Ramesh S. Gaonkar, "Microprocessor architecture, programming and itsapplications with 8085", Penram International Publications, 4th Edition.
2. A. K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals",TMH.
3. Mazidi Muhammad Ali, Mazidi Janice Gillespie &McKinlayRolin D, "The 8051Microcontroller and Embedded Systems", 2nd Edition, Pearson Education, 2008.
4. Kenneth J Ayala, "The 8051 microcontroller: Architecture, Programming & Applications", Penram publications, 2nd edition.
5. Andrew N.Sloss, Dominic Symes, Chris Wright, "ARM System Developer's Guide-Designing and Optimizing system software", Elsevier, 2008.

Reference Books:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware",2nd Edition, Tata McGraw-Hill.
2. Barry B. Brey, "The Intel Microprocessors-Architecture, Programming andInterfacing", 8th Edition, PHI.
3. Y. Liu and Glenn A. Gibson, "Microcomputer Systems: 8086/8088 FamilyArchitecture, Programming and Design", 2nd Edition, PHI.
4. Raj Kamal,"Microcontrollers Architecture, Programming, Interfacing and System Design", Pearson Education, 2005.
5. Steve Furbur, "ARM System on-chip Architecture",2nd Edition, Addison Wesley, 2000.

Course Title	PRINCIPLES OF OPERATING SYSTEMS LAB				B.Tech CSE IV Sem (R20)		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2005407	**PCC Lab**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- Have a thorough knowledge of process management and memory management.
- To have a thorough knowledge of how handle to deadlocks
- Have a thorough knowledge on paging and segmentation concepts

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

CO 1	Design, implement and analyze the various process scheduling algorithms andprocess synchronization mechanisms.
CO 2	Understand, implement and analyze the various memory management schemes.
CO 3	Design, implement and analyze the ways to deal the deadlocks in the system.
CO 4	Understand and analyze the paging and segmentation schemes.
CO 5	Understand and analyze the File Allocation Techniques.

List of Sample Experiments:

1. Write a C/C++ program to simulate the following CPU scheduling algorithmsto find the average turnaround time and average waiting time of process.
   (a) First Come First Serve
   (b) Shortest Job First
   (c) Priority
   (d) Round Robin Scheduling

2. Write a C/C++ Program to simulate Producer Consumer Problem.

3. Write a C program to simulate the concept of Dining-Philosophers problem.

4. Write a C/C++ program to simulate the following contiguous memory allocation techniques
   a) First Fit b) Best Fit c) Worst Fit

5. Write a C/C++ program to simulate the following page replacement algorithmsto find the total number of page faults for given page reference string.
   (a) First in First out
   (b) Least Recently Used
   (c) Optimal

6. Write a C/C++ program to simulate the paging and segmentation concepts.

7. Write a C program to simulate the following
a) Deadlock avoidance b) Deadlock detection

8. Write a C/C++program to simulate the following file allocation
a) Sequential b)Indexed c)Linked

Text Books:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts",Eighth edition, John Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", Fourth Edition, Pearson Education
3. William Stallings, "Operating Systems: Internals and Design Principles", Sixth Edition2009, Pearson Education.
4. D.M.Dhamdhere, "Operating Systems, A Concept based Approach", Third Edition, TMH

Reference Books:

1. A.S.Godbole, "Operating Systems", Second Edition, TMH.\
2. Operating Systems: A Spiral Approach – Elmasri, Carrick, Levine, TMH Edition
3. Operating Systems – H.M. Deitel, P. J. Deitel, D. R. Choffnes, 3rd Edition, Pearson
4. Operating Systems: A Practical Approach, Rajiv Chopra, 4th Edition, S Chand Publishers

Course Title	DIGITAL LOGIC DESIGN LAB				B.Tech CSE IV Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005408	PCC Lab	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	0	3	1.5	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- To study the theory of Boolean algebra and acquire the skills to manipulate andexamine Boolean algebraic expressions.
- To study the design principles of combinational and sequential circuits.

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

CO 1	Apply knowledge of binary systems, logic gates and Boolean functions to minimizeand implement digital logic circuit.
CO 2	Design digital logic circuit using combinational and sequential logic to solve engineering problems.

List of Experiments:

1. Implementation of basic gates with NAND and NOR gates.
2. Implementation of logic circuit for given Boolean Expression.
3. 4-bit Binary adder cum subtractor.
4. BCD to Excess-3 code conversion.
5. Design 3x8 Decoder.
6. Design the following encoders

   A) 8x3 Encoder.

   B)Priority Encoder.
7. Design 16x1 multiplexer using 4x1 multiplexer.
8. Design 4-bit Binary comparator.
9. Design BCD adder.
10. Design 4-bit shift register.
11. Design asynchronous UP/DOWN counter
12. Design

    A) Synchronous UP counter using D-flipflop

    B) Modulo 6 counter

Text Books:

1. Digital Design: With an introduction to the Verlog HDL, VHDL and System Verilog – 6th edition, M.Morris Mano and Michael D. Ciletti, Pearson Education/PHI.
2. Fundamentals of digital logic design with VHDL By Stephen Brown and I Zvonko Vranesic, second edition, The McGraw-Hill.
3. Fundamentals of logic design, Roth, 5th edition,Thomson.
4. Switching and Finite Automata Theory by Zvi. Kohavi, Tata McGraw Hill.

Reference Books:

1. Switching and Logic Design, C.V.S. Rao, Pearson Education
2. Digital Principles and Design –Donald D.Givone, Tata McGraw Hill, Edition.
3. Fundamentals of Digital Logic & Micro Computer Design, 5TH Edition, M.Rafiquzzaman John Wiley.

Course Title	ADVANCED PYTHON PROGRAMMING				B.Tech CSE IV Sem (R20)			
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2005409	Skill Oriented Course	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		0	1	2	2	40	60	100
					End Exam Duration: 3Hrs			

Course Objectives:

- Python is a very powerful programming language used for many different applications. Over time, the huge community around this open source language has created quite a few tools to efficiently work with Python. The course enables the students to learn various python libraries starting from Numpy arrays, Pandas Data Frames, Matplotlib. Along the way, they'll learn about data cleaning, feature extraction and object oriented concepts using python.

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

CO 1	Understanding the basic concepts on Numpy arrays and performs calculations on given data.
CO 2	Apply critical pandas concepts to handle the data frames.
CO 3	Apply data visualization using matplotlib packages.
CO 4	Analyze object oriented concepts for data reusability.
CO 5	Use data cleaning methods and feature extraction for data science applications.

List of Experiments:

Week-1: Study and implementation of various Basic Slicing and Advanced Indexing operations of NumPy arrays using Python over example data series?

Week-2: Implement the program using python Aggregations like Min, Max, and etc.?
Example: Consider the heights of all US presidents and find the Average Height of prime ministers of America? This data is available in the file "*president_heights.csv"*.
Week-3: Write a python Program using Numpy Comparisons, Masks, and Boolean Logic? Example: Consider the series of data that represents the amount of precipitation each day for a year in a given city and count the Rainy Days.
Week-4: Write a python Program using Numpy Fancy Indexing in single and multiple dimensions by selecting Random Points?
Week-5: Study and implementation of various Pandas operations on

i) Data sets ii) Data Frames iii) Crosstab iv) Group by
v) Filter vi) Missing values

Week-6: Implement the python program using pandas

i) Program to Combining Datasets using Merge.
ii) Program to Combining Datasets using joins.

Week-7: Implement the python program using pandas

i) Program using Pandas on Pivot Tables.
ii) Program using Pandas to Vectorized String Operations.

Week-8: Program using Pandas to Working with Time Series
Example: Visualizing Seattle Bicycle Counts data set.

Week-9: Implement the python program for the following matplotlib features

i) Color bars.
ii) Annotation
iii) Matplotlib to Text.
iv) Histograms
v) Scatter Plots
vi) Box plot

Week 10: Write the python program to implement various sub packages of Scipy.

Week11: Write a Python program to create a parent class and child class along with their own methods. Access parent class members in child class to implement the following sceneries.

a) Constructors & destructors
b) Polymorphism

Example:

Create a class ATM and define ATM operations to create account, deposit, check_balance, withdraw and delete account. Use constructor to initialize members.

Week-12: Implement the various data cleaning steps of example data sets using python nympy and pandas

Week13: Implement the feature selection of data set using appropriate sklearn libraries.

Text Books:

1. Robert Johansson, "Numerical Python: A Practical Techniques Approach for Industry" published by Apress.
2. Daniel Y. Chen, "Pandas for Everyone: Python Data Analysis", First Edition by Addison-Wesley Professional
3. Alvaro Fuentes, "Become a Python Data Analyst" by Packt publishing
4. Paul Barry, "Head First Python a Brain Friendly Guide", O'Reilly, 2nd Edition, 2016.

Reference Books:

1. Advanced Python Programming By Dr. Gabriele Lanaro, Quan Nguyen, SakisKasampalis by Packt publishing
2. Advanced Python Development: Using Powerful Language Features in Real World Applications By Matthew Wilkes ApressJuly 2020
3. Expert Python Programming - Fourth Edition By Michal Jaworski and Tarek ZiadePackt PublishingMay 2021
4. Modern Python Cookbook - Second Edition By Steven F. Lott Packt PublishingJuly 2020.

Course Title	UNIVERSAL HUMAN VALUES				B.Tech CSE IV Sem (R20)		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
2024410	**MC**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exams**	**Total**
		3	0	0	3	40	60	100
Mid Exam Duration: 90 Minutes					**External Exam Duration: 3Hrs**		

Course Objectives:

- Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

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

CO 1	Students are expected to become more aware of themselves, and theirsurroundings (family, society, nature).
CO 2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
CO 3	They would have better critical ability.
CO 4	They would also become sensitive to their commitment towards what theyhave understood (human values, human relationship and human society).
CO 5	It is hoped that they would be able to apply what they have learnt to their ownself in different day-to-day settings in real life, at least a beginning would be made in this direction.

UNIT- I

Course Introduction - Need, Basic Guidelines, Content and Process for ValueEducation

- Purpose and motivation for the course, recapitulation from Universal Human Values-I.
- Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations.
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.

- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II

Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding human being as a co-existence of the sentient 'I' and thematerial 'Body'
- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility
- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
- Understanding the characteristics and activities of 'I' and harmony in 'I'
- Understanding the harmony of I with the Body: Sanyam and Health;correct appraisal of Physical needs, meaning of Prosperity in detail
- Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT-III

Understanding Harmony in the Family and Society- Harmony inHuman-Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT-IV

Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature
- Understanding Existence as Co-existence of mutually interacting units in all- pervasive space
- Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

UNIT-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations
- Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. To discuss the conduct as an engineer or scientist etc.

Text Books:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2.
3. E. FSchumacher. "Small is Beautiful".
4. Slow is Beautiful –Cecile Andrews

Reference Books:

1. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. J C Kumarappa "Economy of Permanence"
6. Pandit Sunderlal "Bharat Mein Angreji Raj"
7. Dharampal, "Rediscovering India"
8. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
9. India Wins Freedom - Maulana Abdul Kalam Azad
10. Vivekananda - Romain Rolland(English)
11. Gandhi - Romain Rolland (English)

MOE OF CONDUCT (L-T-P-C 2-1-0-2)

Lecture hours are to be used for interactive discussion, placing the proposals about the topics at hand and motivating students to reflect, explore and verify them. Tutorial hours are to be used for practice sessions.

While analyzing and discussing the topic, the faculty mentor's role is in pointing to essential elements to help in sorting them out from the surface elements. In other words, help the students explore the important or critical elements.

In the discussions, particularly during practice sessions (tutorials), the mentor encourages the student to connect with one's own self and do self-observation, self-reflection and self- exploration.

Scenarios may be used to initiate discussion. The student is encouraged to take up "ordinary" situations rather than" extra-ordinary" situations. Such observations and their analyses are shared and discussed with other students and faculty mentor, in a group sitting.

Tutorials (experiments or practical) are important for the course. The difference is that the laboratory is everyday life, and practicals are how you behave and work in real life. Depending on the nature of topics, worksheets, home assignments and/or activities are included. The practice sessions (tutorials) would also provide support to a student in performing actions commensurate to his/her beliefs. It is intended that this would lead to development of commitment, namely behaving and working based on basic human values.