COURSE STRUCTURE (R20)
AND
DETAILED SYLLABUS
(II YEAR)

COMPUTER SCIENCE & ENGINEERING

For
B.Tech., Four Year Degree Course
(Applicable for the batches admitted from 2020-21)

LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution
Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC with "A" Grade and NBA (CSE,ECE, EEE & ME)
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DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (CSE)

B. Tech II-Year Course Structure and Syllabus –R20

II Year - I Semester							
S. No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R20BSH-HM2101	Managerial Economics and Financial Accountancy	HM	3	0	0	3
2	R20CIT-PC2101	Python Programming	PC	3	0	0	3
3	R20CSE-ES2101	Mathematical Foundations of Computer Science	ES	3	0	0	3
4	R20CSE-PC2101	Database Management Systems	PC	3	0	0	3
5	R20ECE-ES2101	Digital Logic Design	ES	3	0	0	3
6	R20CIT-PC2102	Python Programming LAB	PC	0	0	3	1.5
7	R20CSE-PC2102	Database Management Systems LAB	PC	0	0	3	1.5
8	R20ECE-ES2102	Digital Logic Design LAB	ES	0	0	3	1.5
9	R20CSE-SC2101	MAT Lab for Computational Mathematics (Skill Oriented Course)	SC	1	0	2	2
10	R20BSH-MC2101	Constitution of India	MC	2	0	0	0
11	R20BSH-MC1203	Community Service Project(Evaluation)	MC	0	0	0	0
Total				**18**	0	**11**	**21.5**

II Year - II Semester							
S. No	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1.	R20CIT-PC2201	Computer Organization and Architecture	PC	**3**	**0**	0	3
2.	R20CSE-PC2201	Software Engineering	PC	**3**	**0**	0	3
3.	R20CSE-PC2202	Object Oriented programming through Java	PC	**3**	**0**	0	3
4.	R20CSE-PC2203	Operating Systems	PC	**3**	**0**	0	3
5.	R20BSH-MA2202	Probability and Statistics	BS	**3**	**0**	0	3
6.	R20CSE-PC2204	Object Oriented programming through Java LAB	PC	**0**	**0**	3	1.5
7.	R20CSE-PC2205	Operating Systems LAB	PC	**0**	**0**	3	1.5
8.	R20CSE-PC2206	Software Engineering LAB	PC	**0**	**0**	3	1.5
9.	R20CSE-SC2201	R- Programming (Skill Oriented Course)	SC	1	0	2	**2**
10.	R20BSH-MC2201	Employbility Skills-I	MC	0	0	3	**0**
			Total	**16**	0	**14**	**21.5**
Honors Course -1							
Track No.	**Course Code**	**Course Title**	**Category**	**L**	**T**	**P**	**Credits**
1	R20CSE-HN2201	Data Communication	**HN**	**3**	0	2	4
2	R20CSE-HN2202	Information Security	**HN**	**3**	0	2	4
3	R20CSE-HN2203	Web UI Framework	**HN**	**3**	**0**	2	4
4	R20CSE-HN2204	Advanced Python Programming	**HN**	**3**	**0**	2	4
Minor Course-1							
Summer Internship-1(After Second Year & Evaluated in III-I Semester)							

HONOR DEGREE IN COMPUTER SCIENCE AND ENGINEERING

Track-I (Networks)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CSE-HN2201	Data Communication	HN	3	0	2	4
2	III-I	R20CSE-HN3101	TCP/IP Protocol Suite	HN	3	0	2	4
3	III-II	R20CSE-HN3201	Wireless Sensor Networks	HN	3	0	2	4
4	IV-I	R20CSE-HN4101	Internet of Things	HN	3	0	2	4
5	II Year to IV Year	R20CSE-HNMS01.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CSE-HNMS01.2	Honors MOOCS-2	HN	0	0	0	2
							Total	**20**

Track- II (Cyber Security)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CSE-HN2202	Information Security	HN	3	0	2	4
2	III-I	R20CSE-HN3102	Secure Coding	HN	3	0	2	4
3	III-II	R20CSE-HN3202	Blockchain Technologies	HN	3	0	2	4
4	IV-I	R20CSE-HN4102	Vulnerability Assessment & Penetration Testing	HN	3	0	2	4
5	II Year to IV Year	R20CSE-HNMS02.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CSE-HNMS02.2	Honors MOOCS-2	HN	0	0	0	2
							Total	**20**

Track III (Web Frameworks)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CSE-HN2203	Web UI Framework	HN	3	0	2	4
2	III-I	R20CSE-HN3103	Angular Framework	HN	3	0	2	4
3	III-II	R20CSE-HN3203	.Net Framework	HN	3	0	2	4
4	IV-I	R20CSE-HN4103	J2EE Framework	HN	3	0	2	4
5	II Year to IV Year	R20CSE-HNMS03.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CSE-HNMS03.2	Honors MOOCS-2	HN	0	0	0	2
							Total	**20**

Track IV (Data Science)

S.No	Year & Semester	Course Code	Subject Title	Category	L	T	P	C
1	II-II	R20CSE-HN2203	Advanced Python Programming	HN	3	0	2	4
2	III-I	R20CSE-HN3103	Mathematical Essential For Data Science	HN	3	1	0	4
3	III-II	R20CSE-HN3203	Natural Language Processing	HN	3	0	2	4
4	IV-I	R20CSE-HN4103	Deep Learning	HN	3	0	2	4
5	II Year to IV Year	R20CSE-HNMS03.1	Honors MOOCS-1	HN	0	0	0	2
6	II Year to IV Year	R20CSE-HNMS03.2	Honors MOOCS-2	HN	0	0	0	2
							Total	**20**

II-I Semester

Course Code	Subject Name	L	T	P	C
R20BSH-HM2101	Managerial Economics and Financial Accountancy Common to CSE, CSIT	3	0	0	3

Course Objectives

1. Assess micro economic factors and its effect on the firm in relation to demand and supply.
2. Analyse various factors of production with proposed theories in relation to cost - volume profit analysis
3. Appraise price- output methodologies in different market structures and discuss business environment pertaining to business cycle
4. Measure the financial position using laws of accounting in an organization
5. Judge as well as propose the best investment decisions by means of time value of money.

Course Outcomes:

1. Equipped with the knowledge of fundamentals of economics, estimating the Demand for a product, Capable of analyzing Elasticity & Forecasting methods(L2)
2. Apply production concepts, assess the costs and Determine Break Even Point (BEP) of an enterprise for managerial decision making(L4)
3. Identify the influence and price determination of various markets structures and knowledge of the forms of business organization and Business cycles(L4)
4. Analyze and interpret the process & principles of accounting & apply financial statements for appropriate decisions to run the business profitably(L4)
5. Analyze how to invest adequate amount of capital in order to get maximum return from selected business activity(L4)

Unit-I

Introduction to Managerial Economics and demand Analysis: Definition of Managerial Economics –Scope of Managerial Economics and its relationship with other subjects –Concept of Demand, Types of Demand, Determinants of Demand- Demand schedule, Demand curve, Law of Demand and its limitations- Elasticity of Demand, Types of Elasticity of Demand and Measurement- Demand forecasting and Methods of forecasting, Concept of Supply and Law of Supply.

Learning Outcomes:

At the end of this unit students will be able to:

- Awareness about basics of managerial economics(L1)
- Knowledge of the concepts of demand, elasticity of demand and methods of demand forecasting(L1)

Application:

1. Analyze the demand of a product by applying methods of the elasticity of demand.

Unit – II

Theories of Production and Cost Analysis: Theories of Production function- Law of Variable proportions-Isoquants and Isocosts and choice of least cost factor combination-Concepts of Returns to scale and Economies of scale-Different cost concepts: opportunity costs, explicit and implicit costs-Fixed costs, Variable Costs and Total costs –Cost –Volume-Profit analysis-Determination of Breakeven point(problems)-Managerial significance and limitations of Breakeven point.

Learning Outcomes:

At the end of this unit students will be able to:

- Examine various issues involved in production decision analysis (L1)
- Construct how production function is carried out to achieve least cost combination of inputs(L3)
- Apply Break – Even Analysis and its importance in managerial decision making(L4)

Application:

Compute contribution, revenue, Cost comparison, Margin of safety for making accurate decisions related to profitability of particular Enterprise

Unit – III

Introduction to Markets, Theories of the Firm & Pricing Policies: Market Structures: Perfect Competition, Monopoly, Monopolistic competition and Oligopoly – Features – Methods of Pricing: Average cost pricing, Limit Pricing, Market Skimming Pricing, Internet Pricing: (Flat Rate Pricing, Usage sensitive pricing) and Priority Pricing, Goods and services Tax, Business Cycles: Meaning and Features – Phases of a Business Cycle. Features and Evaluation of Sole Trader, Partnership, Joint Stock Company.

Learning Outcomes:

At the end of this unit students will be able to:

- Identify the various market structures like Monopoly, Monopolistic competition (L4)
- Determine the appropriate pricing strategies to be applied in each market(L2)
- Compare the suitability of various organizational and ownership structures like sole trading, partnership. (L2)

Application: Analyse the leaps and bounds faced by the service providers in estimation of pricing in Telecom sector**.**

Unit – IV

Introduction to Accounting & Financial Analysis: Introduction to Double Entry System, Journal, Ledger, Trail Balance and Preparation of Final Accounts with adjustments – Preparation of Financial Statements-Analysis and Interpretation of Financial Statements.

Learning Outcomes:

At the end of this unit students will be able to

- Knowledge about the framework for accounting process(L1)
- Analyze financial accounting decisions(L3)

Application:

Prepare the financial accounting statements like Trading account, Profit and Loss account, Balance sheet of any organization.

Unit – V

Capital and Capital Budgeting: Capital Budgeting: Meaning of Capital-Capitalization-Meaning of Capital Budgeting-Time value of money- Methods of appraising Project profitability: Traditional Methods (pay back period, accounting rate of return) and modern methods (Discounted cash flow method, Net Present Value method, Internal Rate of Return Method and Profitability Index)

Learning Outcomes:

At the end of this unit students will be able to

- Analyze how capital budgeting decisions are carried out(L4)
- Knowledge of the concepts and various methods of capital budgeting(L1)
- Apply traditional or modern methods of Capital budgeting in business decision making(L3)

Application:

1. Assess long term investments and funds required in small scale organization**.**

Text Books:

1. Aryasri, Managerial Economics and Financial Analysis, TMH, 2012.
2. Varshney&Maheshwari, Managerial Economics, Sultan Chand& Sons, 2014.

References:

1. JL Pappas and EF Brigham, Managerial Economics, Holt, R & W; New edition edition
2. N.P Srinivasn and M. SakthivelMurugan, Accounting for Management, S. Chand & Company Ltd,
3. Maheswari S. N, AnIntroduction to Accountancy, Vikas Publishing House Pvt Ltd
4. I.M Pandey, Financial Management, Vikas Publishing House Pvt Ltd
5. V. Maheswari, Managerial Economics, S. Chand & Company Ltd,

Weblinks

1. https://www.smartzworld.com/notes/managerial-economics-and-financial-analysis-mefa/
2. Production and cost analysis- https://slideplayer.com/slide/5708722/
3. Accountinganalysis -https://www.readyratios.com/reference/accounting/accounting_analysis.html
4. 4.https://nptel.ac.in/courses/110/101/110101131/

Course Code	Subject Name	L	T	P	C
R20CIT-PC2101	Python Programming Common to CSE, CSSE,CSIT	3	0	0	3

Course Objectives:

1. Understand structure and data types of python script.
2. Implement iterations and functions in python.
3. Implement modules and data structures using mutable & immutable objects.
4. Understand object oriented concepts on real world scenarios.
5. Understand packages for statistics and gaming.

Course Outcomes:

- Understand program structure python REPL shell environment.
- Implement iterators and functions for data processing.
- Implement different modules and objects to organize data.
- Apply various data structures for data organization.
- Implement Object Oriented concepts and exception handling

Unit I:

Introduction: History of Python, Features of Python, Applications, Python Using the REPL (Shell), Running Python Scripts, Variables, Assignment forms, Keywords, Input-Output, Indentation.

Operators and Type Conversion: Data Types: Numeric, Booleans, Sequence, Strings, Operators, Type conversions, Expressions.

Learning Outcomes:

After completing this chapter, student will be able to

1. Understand the environment of python. (L2)
2. Create and run simple scripts in python.(L2)
3. Understand data types and their conversions. (L2)
4. Understand operators for doing operations on different expressions. (L2)

Unit II:

Control Flow: Control Flow- if, if-elif-else, for, while, break, continue, pass.

Functions: Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables, Anonymous Functions, Lambdas, map, reduce and filter.

Learning Outcomes:

After completing this chapter, student will be able to

1. Understand the iterations using looping structures. (L2)
2. Make decisions through conditional statements. (L2)
3. Understand functions to define call and pass as arguments. (L2)
4. Write anonymous functions for resolving complex problems. (L2)

Unit III:

Modules: Creating modules, import statement, from Import statement, name space, builtin modules- os, random, math, json, request, date, RegEx, itertools.

Packages: Introduction to PIP**,** Installing packages using PIP.

Exploring Data Science Libraries: NumPy, Pandas, Matplotlib

After completing this chapter, student will be able to

1. Create and implement modules using import. (L3)
2. Understand different built-in modules. (L2)
3. Understand data science libraries. (L2)

Unit IV:

Strings & Data Structures: String**,** String Formatting**,** List, String and List Slicing, Tuple, Sets,

Frozen Sets, Dictionaries, Comprehensions, Built-in methods of all sequences, File I/O Operations.

Learning Outcomes:

After completing this chapter, student will be able to

1. Implement String operations and formatting. (L3)
2. Understand fundamentals of data structures and their methods. (L2)
3. Implementing file operations for data processing. (L3)

Unit V:

Object Oriented Programming OOP in Python: Classes, 'self variable', Methods, Constructor, Inheritance, Polymorphism, and Data Abstraction.

Errors and Exceptions: Syntax Errors, Exceptions, Exception Handlers, Raising Exceptions, User-defined Exceptions

Learning Outcomes:

After completing this chapter, student will be able to

1. Implement Object oriented concepts with real world scenarios. (L3)
2. Understand class hierarchies and abstraction. (L2)
3. Understand error handling and handle exceptions. (L2)

Text Books:

1. Python Programming: Using Problem Solving Approach by Reema Theraja, Oxford publications
2. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.

Reference Books:

1. Fundamentals of Python by Kenneth H Lambert, Cengage
2. Learning Python, Mark Lutz, Orielly.
3. Python Programming by Ashok N Kamathane, McGrawhill

Course Code	Subject Name	L	T	P	C
R20CSE-ES2101	Mathematical Foundations of Computer Science Common to CSE, CSSE, CSIT	3	0	0	3

Course Objectives:

1. To develop logical thinking in the field of Computer Science and Engineering.
2. To introduce basic concepts and various algorithms of graphs.
3. To introduce basics of group theory.
4. To familiarise the concepts ofvarious trees (i.e) spanning trees, shortest spanning trees.
5. To Familiarise closed form solution of linear recurrence relations by various methods.
6. To design the logical circuits using Boolean expressions.

Course Outcomes:

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

1. Test the validity of an argument through enhanced logical capabilities. (L3)
2. Implement Shortest path algorithm for different graphs. (L3)
3. Construct minimal spanning tree usingalgorithms for the graphs. (L3)
4. Understand the algebraic structures and their properties. (L3)
5. Find a general solution of recurrence equation using suitable method and apply the different properties of lattice to simplify Boolean expressions. (L3)

Unit I:

Mathematical logic:

Propositional Calculus: Statements, negation, conjunction, disjunction, conditional and bi-conditional, well formed formulae, tautologies, equivalence of formulae, duality, tautological implications, principal disjunctive and conjunctive normal forms, inference calculus, and rules of inference.

Predicate Calculus: Predicative logic, free & bound variables, quantifiers, rules of inference.

Learning Outcomes:

At the end of this unit, the student will be able to

- evaluate the basic logic statements (including compound statements, implications, inverses, converses and contrapositives) using truth tables and the properties of logic. (L3)
- reduce the given proposition into normal forms using properties of equivalence and implications. (L3)
- express a logic statement in terms of predicates using quantifiers and logical connectives. (L2)
- apply rules of inferences to verify the consistence of data. (L3)

Unit II:

Graph theory : Introduction to relations, Graph, finite and infinite graphs, incidence and degree, types of Graphs, isomorphism, Adjacency Matrix, sub graphs, walk, path and circuit, connected and disconnected graphs, components, Euler graphs, Euler'stheorem, Hamiltonian paths and circuits, Shortest-path algorithm (Dijkstra's Algorithm), planar graphs.

Learning Outcomes:

At the end of this unit, the student will be able to

- Identify different types graphs. (L2)
- represent a graph using an adjacency matrix.(L2)
- construct Euler and Hamiltonian paths.(L3)
- implement Dijkstra's Algorithm for the given graph(L4)

Unit III:

Trees and Directed graphs (Theorems without Proof): Properties of trees, binary trees, spanning trees, minimal spanning trees, Kruskal's algorithm, Prim's algorithm, tree traversals, DFS, BFS, Binary search tree, directed graph, graph coloring, chromatic number for various graphs and trees.

Learning Outcomes:

At the end of this unit, the student will be able to

- construct the spanning tree and binary tree from the given graphs. (L3)

- build minimal spanning tree by using different algorithms. (L3)
- implement DFS, BFS algorithm for the given graph(L3)
- determine the chromatic number of a given graph/ tree. (L3)

Unit IV:

Algebraic Structures: (Theorems without Proof) : Algebraic Structures (semi groups, monoids, group and abelian groups), Sub groups, homomorphism, isomorphism, coset, Lagrange's theorem, normal subgroups, permutation groups and cyclic groups.

Applications: Group Codes

Learning Outcomes:

At the end of this unit, the student will be able to

- identity the given algebraic structure is a group or not.(L2)
- understand the concepts of sub groups, normal subgroups, cosets, cyclic groups, permutation groups, homomorphism and isomorphism of groups . (L2)
- apply error detection and correction techniques in the design of computer systems using group codes(L3)

Unit V:

Lattice Theory & Recurrence relations:

Lattice Theory: POSET, Hasse diagram, Lattice, Distributive lattice, Modular Lattice, complement, De-morgans laws, Boolean algebra(definition only)

Recurrence relations: Recurrence relations, substitution method, solving homogeneous linear recurrence relations by characteristic roots method, non – homogeneous linear recurrence relations.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the concept of Poset and Lattice(L2)
- apply the different properties of lattice to simplifying Boolean expressions(L3)
- formulate recurrence relations of the sequences.(L3)
- apply substitution method to solve recurrence relations.(L3)
- solve non-homogeneous linear recurrence relationsby characteristic roots method.(L3)

Text Books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 1997. (for Unit 1,4, 5 (Lattice theory))
2. Joe L. Mott, Abraham Kandel and T. P. Baker, Discrete Mathematics for computer scientists & Mathematicians, 2/e, Prentice Hall of India Ltd, 2012. (for Unit 2,3,5 (recurrence relations))

References:

1. Keneth. H. Rosen, Discrete Mathematics and its Applications, 6/e, Tata McGraw-Hill,2009.
2. Narsingh Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2006.
3. Susanna S. Epp, Discrete Mathematics with Application, Brooks/Colt Cengage learning, fourth edition.
4. Richard Johnsonburg, Discrete mathematics, 7/e, Pearson Education, 2008.
5. T. Koshy, Discrete Mathematics with Applications, Elsevier, New York, (2004).
6. J. A. Bondy, U. S. R. Murty, Graph Theory, Springer-Verlag, New York, (2008).
7. K. D. Joshi, Foundations of Discrete Mathematics, New Age International, (1989).

Course Code	Subject Name	L	T	P	C
R20CSE-PC2101	Database Management Systems Common to CSE & CSIT	3	0	0	3

Course objectives:

1. To understand the different issues involved in the design and implementation of a database system.
2. Understand the role of a database management system in an organization. to give a good formal foundation on the relational model of data
3. Understand basic database concepts, including the structure and operation of the relational data model.
4. Construct simple and compiles database queries using Structured Query Language (SQL).
5. Understand and successfully apply logical database design principles, including E-R diagrams and database normalization.
6. Design and implement a small database project using Microsoft Access.
7. Understand the concept of a database transaction and related database facilities, including concurrency control, backup and recovery, and data object locking and protocols.
8. Understand the role of the database administrator.

Course Outcomes:

1. Understand File Systems, databases and ER model of databases.
2. Implement queries on relational algebra, relational calculus, simple and nested queries using SQL.
3. Analyze schema refinement techniques..
4. Understand transaction management and recovery mechanism in DBMS.
5. Understand database organization using indexing and hashing

Introduction- Database Vs File System, RDBMS, Database Users, Data Models; Instance and Data Independence; Three Tier Schema Architecture, Database System Structure,

RDBMS Design: Introduction, Entities, Attributes Entity Set, Relationship Set, Specialization, and Generalization. Types of Keys

Learning outcomes:

Student will be able to

1. Distinguish between Database System and File System (L2)
2. Design a database relational model using ER diagrams. (L5)

UNIT-II

Relational operations & Basic SQL: Relational Algebra, Relational Operations, Relational Calculus, Tuple And Domain Relational Calculus.

PL/ SQL : Database Languages, Data Types, Integrity Constraints, Simple And Nested Queries, Implementation Of Different Types Of Joins, Stored Procedures

Learning Outcomes:

Student will be able to

1. Understand relational operations and calculus (L1)
2. Implement simple and complex queries for relational data (L3)

UNIT-III

Schema Refinement (Normalization): Types Of Anomalies, Concept Of Functional Dependency, Normalization, Advantages ,Types Of Normal forms(1NF, 2NF And 3NF), Boyce-Codd Normal Form(BCNF), Fourth Normal Form(4NF) .Lossless Join And Dependency Preserving Decomposition,.

Learning Outcomes:

Student will be able to

1. Identify anomalies and remove redundancies using Normal Forms (L2)

2. Understand lossy and lossless decomposition.(L3)

Unit-Iv

Transaction Management: Transaction, Transaction States, ACID Properties, Schedule, Serializability And Types, Concurrent Control, Concurrency Control Protocols, Crash Recovery: Introduction To ARIES, The Log, Write-Ahead Log Protocol, Recovering From A System Crash

Learning Outcomes:

Student will be able to

1. Understand transaction and serializability schedules. (L1)
2. Understand concurrency control protocols on transactions. (L1)

UNIT-V

File Organization and Indexing, Physical Storage Media, RAID, File Organization. Indexing, B & B+ Tree Index files, Hashing Vs Indexing

Learning Outcomes:

Student will be able to

1. Understand basic concepts of File Organization and storage (L1).
2. Understand Indexing and hashing for file processing.(L1)

Text Books:

1. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke,TMH
2. Database System Concepts,5/e, Silberschatz, Korth, TMH

Reference Books:

1. Database Management System, 6/e RamezElmasri, Shamkant B. Navathe, PEA
2. Database Principles Fundamentals of Design Implementation and Management, Carlos Coronel, Steven Morris, Peter Robb, Cengage Learning.
3. Introduction to Database Systems, 8/e C J Date, PEA..

Course Code	Subject Name	L	T	P	C
R20ECE-ES2101	Digital Logic Design Common to CSE & CSIT	3	0	0	3

Course Objectives:

1. Introduce the concept of different number systems and its complements
2. Be able to optimize the Boolean functions using Boolean theorems and Understand the minimization of logic functions using different levels of K- Maps.
3. Be able to design and analyze combinational logic circuits using logic gates
4. Familiarize the concepts of sequential circuits using flip-flops
5. Able to design different types of registers and counters using flip flops and PLDs for realization of Boolean expressions.

Course Outcomes: At the end of the course, the student will be able to

1. Understand different number systems, arithmetic operation of binary numbers, 2's Complement representation and its operations.operations
2. Familiarize Boolean algebra theorems and simplify the given logic function to the minimum number of literals. Minimization of logic functions by using different levels of k-Map methods and design using logic gates.Develop different combinational logic circuits for the realization of digital logic circuits.
3. Develop different combinational logic circuits for the realization of digital logic circuits.
4. Design various synchronous and asynchronous sequential circuits using Flip-Flops.
5. Design various registers and counters using different flip flops and also develop different programmable logic devices using logic circuits

UNIT I

Number Systems: Binary, Octal, Decimal, Hexadecimal Number Systems. Conversion of Numbers from One Radix To Another Radix, r's Complement and (r-1)'s Complement Subtraction of Unsigned Numbers, Signed Binary Numbers, Weighted and Non weighted codes. Applications: Binary number systems are widely used for electronic gates in electricity circuits and digital encoding .

Learning Outcomes: After completion of this unit student able to

• Summarize advantages of using different number systems

• Explain usefulness of different coding schemes and Complements

UNIT II

Logic Gates And Boolean Algebra: Basic Gates NOT, AND, OR, Boolean Theorms, Complement and Dual of Logical Expressions, Universal Gates, Ex-Or and Ex-Nor Gates, SOP,POS, Minimizations of Logic Functions Using Boolean Theorems, Two level Realization of Logic Functions Using Universal Gates **Gate Level Minimization**: Karnaugh Map Method (K-Map): Minimization of Boolean Functions maximum upto Four Variables, POS and SOP, Simplifications With Don't Care Conditions Using K-Map.

Applications:

1. Logic Gates are used in arithmetic logic units, microprocessors, computer memory and registers.
2. Gates are used to build square wave oscillators, as temperature heaters, parity generation and checking circuits.
3. Boolean functions are used in designing Integrated circuits.
4. Karnaugh maps are used for easy generation of error correcting codes.

Learning Outcomes: After completion of this unit student able to

• Apply basic laws & De Morgan's theorems to simplify Boolean expressions

• Explain the functionality of logic gates

• Minimize the logic functions using Karnaugh map method

Unit III

Combinational Logic Circuits: Design of Half Adder, Full Adder, Half Subtractor, Full Subtractor, Ripple Adders and Subtractors, Ripple Adder/Subtractor Using Ones and Two's

Complement Method. Design of Decoders, Encoders, Multiplexers, Demultiplexers, Higher Order Demultiplexers and Multiplexers, Priority Encoder, Code Converters, Magnitude Comparator.

Applications:

1. Combination logic is used in circuits to perform Boolean algebra on input signals and on stored data.
2. Combinational circuits are used in ALU's, data transmission, home alarm, car parking slot systems, multiple access techniques.

Learning Outcomes: After completion of this unit, student able to

• Apply Boolean algebra for describing combinational digital circuits
• Analyze standard combinational circuits such as adders, subtractors, multipliers, comparators etc.
• Design simple combinational logic circuits
• Implement logic functions with decoders and multiplexers

Unit IV

Introduction to Sequential Logic Circuits: Classification of Sequential Circuits, Basic Sequential Logic Circuits: Latch and Flip-Flop, RS- Latch Using NAND and NOR Gates, Truth Tables. RS, JK,T and D Flip Flops , Truth and Excitation Tables, Conversion of Flip Flops. Flip Flops With Asynchronous Inputs (Preset and Clear).

Applications:

1. Flip flops are used in multi vibrators, triggering circuits, frequency divider circuits, data storage and data transfer circuits.
2. Counters are used in Frequency counters, Digital clocks, Time measurement, A to D converters, Digital triangular wave generator.

Learning Outcomes: After completion of this unit student able to

• Describe behaviour of Flip-Flops and Latches
• Utilize concepts of state and state transition for analysis and design of sequential circuits

Unit V

Registers and Counters: Design of Registers, Buffer Register, Control Buffer Registers, Bidirectional Shift Registers, Universal Shift Register, Design of Ripple Counters, Synchronous Counters, variable Modulus Counters, Ring Counter, Johnson Counter. **Introduction to Programmable Logic Devices** (PLDs): PLA, PAL, PROM. Realization of Switching Functions Using PROM, PAL and PLA.

Applications:

1. Counters are used in Frequency counters, Digital clocks, Time measurement, A to D converters, Digital triangular wave generator.
2. Programmable Logic devices provide specific functions, including device-to-device interfacing, data communication, signal processing, data display, timing and control operations.

Learning Outcomes: After completion of this unit student able to

• Construct complex digital systems using components such as registers and counters
• Design different types of synchronous and asynchronous counters
• Define RAM, ROM, PROM, EPROM and PLDs
• Describe functional differences between different types of RAM & ROM
• Design simple digital systems using PLDs

Text Books

1. Digital Design ,4/e, M.Morris Mano, Michael D Ciletti, PEA
2. Fundamentals of Logic Design, 5/e, Roth, Cengage

Reference Books

1. Switching and Finite Automata Theory,3/e,Kohavi, Jha, Cambridge.
2. Digital Logic Design, Leach, Malvino, Saha,TMH
3. Modern Digital Electronics, R.P. Jain, TMH

Course Code	Subject Name	L	T	P	C
R20CIT-PC2102	Python Programming LAB Common to CSE,CSSE & CSIT	0	0	3	1.5

Course Objectives:

1. Understand Python Fundamentals
2. Implement Control Flow Constructs
3. Handle File Operations
4. Develop Problem-Solving and Debugging Skills
5. Explore Python Libraries

Course Outcomes:

1. Implement programs using datatypes and operators
2. Implement conditional and iterative statements
3. Create custom modules and functions to handle different operations.
4. Implement various data structures like lists, dictionaries and strings.
5. Implement Object oriented concepts through real time scenarios and handle errors

Experiment 1: Basic I/O

a. Demonstrate the python script by running in Interactive and Script Mode.
b. Write a python script to read using input() and display using print() functions.
c. Write a python script to make use of all conversion functions.

Experiment 2: Decision Making

a. Write a python script to take five subject marks and print the grade for the student.
b. Write the python script to print whether the roots are equal, distinct or complex for given coefficients a, b and c for quadratic equation.

Experiment 3: Loops

a. Write a program to take input as integer N and check whether N is Pronic Number or not. (Product of two consecutive numbers is pronic N(N+1): Eg 110 = 10*11)
b. Write a python script to take input as amount in rupees R and find out the least number of notes N that can be possible to store in a Wallet.(Hint Notes: 2000,500,200,100,50,20,10) Eg: R=2589, N=5
c. Write a program to check whether given number N is N-Series(Disarium) number or not**.** (Eg. 135 is N-Series Number because $1^1+3^2+5^3 = 135$ and some others are 89, 175, 518 etc)

Experiment 4: Nested Loops

a. Write a python script to take input as String S="LENDI", print the following:

```
L
 LEL
 LENEL
 LENDNEL
 LENDIDNEL
```

b. Write a python script to print the any alphabet shape using *s.

```
 * * *
*     *
* * * *
*     *
*     *
```

Experiment 5: Modules & Functions

a. Using Recursion, Write a program to take input as vehicle Number N and check whether N is Fancy number or not. (Folding of digits of number should be 9)
b. Create a module named “Lendi” and create functions addStudent, removeStudent, searchStudent. Access the above module using import statement.

c. Write a python script using lambdas, to take input as String, and sort the string SS in descending/ascending order according to their frequency of its occurrences of characters.(Eg.S='missisippi', SS=ispm)

Experiment 6: Permutations & Combinations

a. Write a python script to take input as number N, and find out the largest number L , that can be formed with N.Eg. N=679, P={679,697,769,796,967,976}, L = 976
b. Write a python script to take input as list, L and print output as largest number L and total combinations C for given N digit number formed by the combination of L.(Eg. L=[1,2,1,4], N=3, L=421,C=12).

Experiment 7: String &Regular Expressions

a. Write a python script to take two string S1 and S2 and do the following:
   i) Check S1 and S2 are anagrams or not.
   ii) Check S1 is Sub string of S2 or not.
   iii) S1 is palindrome or not
b. Write a python script to take input as multi-line string and find the sum of all numbers in that string using re module. (Eg. S="he11o they are 40students in97 room of 4th line", Sum= 152)

Experiment 8: Lists & Dictionary

a. Write a program to take input as String S and print frequency of each character in S using List data structure.
b. Write a program to take input as String S contains characters and special symbols, reverse the String S such that special symbols remains at same position. (Eg. S="m@d#u" , Output="u@d#m").
c. Write a python script to take input as String sentence S and print each word count using dictionary.

Experiment 9: OOPS

a. Using Python OOPS, create a class, constructor, method, __str__ and __repr__ for:
   i. Employee
   ii. Student

Experiment 10: Exceptions

a. Write a python program to implement Exceptions hierarchy.
b. Create a user defined Exception named "FundsLessException" and raise the exception when there are no enough funds in the bank account.

Experiment 11: Data Analysis

a. Using NumPy, implement different matrix operations in python.
b. Using pandas, read the data from anytext files.

Experiment 12: Plotting

a. Using MatPlotlib library, plot the graph with all different plot types.(Pie Chart, Area Plot, Scatter Plot, Histogram and Bar Graph)

APPLICATIONS:

- Web Application Development and Scraping
- Designing Games
- Machine Learning and AI based applications
- Data Science and Visualization
- Embedded and CAD Applications

Course Code	Subject Name	L	T	P	C
R20CSE-PC2102	Database Management Systems LAB Common to CSE & CSIT	0	0	3	1.5

Course Objectives:

- To provide a sound introduction to the discipline of database management as a subject in its own right, rather than as a compendium of techniques and product- specifictools.
- To familiarize the participant with the nuances of database environments towards an information-oriented data-processing orientedframework
- To give a good formal foundation on the relational model ofdata
- To present SQL and procedural interfaces to SQLcomprehensively
- To give an introduction to systematic database design approaches covering conceptual design, logical design and an overview of physicaldesign

Course Outcomes:

1. Implement DDL, DML, DCL and TCL commands with integrity constraints.
2. Implement aggregate functions, conversion functions..
3. Implement simple and nested queries
4. Implement group by, order by, and having clause.
5. Develop PL/SQLstored procedures,cursors and triggers.

List of Experiments:

SQL

1) a) Implement DDL, DML commands with integrity constraints.
   b) Implement DCL and TCL commands on a given table.
2) Create a view for a table and implement constraints on viewed table.
3) Create a sequence on a table for generating ids.
4) a) Implement aggregate functions on table.
   b) Implement string and conversion functions on a table
   c) Impement date and time stamp functions on a table.
5) Implement simple and nested queries using (ANY, IN, ALL, EXISTS, UNION, INTERSECT)
6) Implement a query for working on NULL values (ISNULL, NULLIF, COALESCE).
7) a) Write a query to implement group by and having clauses.
   b) Write a query to implement order by clause
   c) Write a query to implement LIKE clause.

PL/SQL

1) Create a PL/SQL block for implementing declare, begin and exception blocks.
2) Create a PL/SQL block for implement decision and looping statements.
3) Create a user defined exception and raise raise_application_error.
4) Create a procedure with in and out parameters.
5) Create a function and call the function using stored procedure.
6) Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
7) Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers.

Text Books/Suggested Reading:

1.Oracle: The Complete Reference by OraclePress
2.Nilesh Shah, "Database Systems Using Oracle", PHI,2007.
3.Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education,2007

Course Code	Subject Name	L	T	P	C
R20ECE-ES2102	Digital Logic Design LAB Common to CSE & CSIT	0	0	3	1.5

Course Objectives

- To design and realize basic digital combinational and sequential circuits.
- To verify the functionality of basic digital combinational and sequential circuits

Course Outcomes:

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

1. Acquire the knowledge of numbering systems and logic gates.
2. Design of logic gates using IC's.
3. Design of combinational circuits using IC's.
4. Design of Sequential circuits using IC's.
5. Design of synchronous and asynchronous counters using flip-flops.

List of Experiments:

1. Verify the Truth Tables of AND, OR, NOT, NAND, NOR EXOR Logic Gates
2. Realization of logic gates using Universal logic gates.
3. Realization of Boolean function using logic gates
4. Design and realization of Code conversion circuits- BCD to Excess-3 and vice-versa.
5. Design and verify the logic circuit of Half adder and subtractor using logic gates
6. Design and verify the logic circuit Full adder/ subtractor using two half adders
7. Design and implementation of encoder and decoder
8. Design and realization of 8x1 mux using two 4x1 mux.
9. Realization of Flip-Flops using logic gates
10. Design and implementation of shift register
11. Design and verification of 4 bit ripple counter and mod 10/mod 12 ripple counter Design
12. Design and implementation of 3 bit synchronous up/down counter

Course Code	Subject Name	L	T	P	C
R20CSE-SC2101	MAT Lab for Computational Mathematics (Skill Oriented Course)	1	0	2	2

Course Objectives:

- To familiarize the MATLAB Programming for numerical techniques.
- To impart knowledge in basic concepts and few programming techniques using MATLAB in relation to the engineering applications.
- Carry out computational projects within numerical methods using MATLAB.

Course Outcomes:

At the end of the course students will be able to

1. Construct and apply small programs in MATLAB to mathematical problems. (L3)
2. Develop a program to find a real root of an equation using various numerical methods.(L3)
3. Develop programs to find the interpolation values using Lagrange's and Newton's interpolation formulae for a given set of points.(L3)
4. Develop programs to find solutions of ordinary differential equations using various numerical methods. (L3)
5. Develop programs to solve system of linear equations using Gauss elimination and iteration methods.

Module 1. MATLAB Basics: Basics for MATLAB,Input and Output operations, arithmetic operations, recovering from problems, errors in input, aborting calculations, algebraic or symbolic computation, substituting in symbolic expressions, symbolic expressions, variable Precision and exact arithmetic, vectors and matrices, suppressing output, functions, built-in functions, user-defined functions, managing variables. Programs on MATLAB basics.

List of Programs:

1. Mathematical computing using Built-in functions.
2. Symbolic Mathematics using Built-in functions

Module 2. MATLAB Programming: Writing scripts and functions, loops, arrays, conditional statements. Programs using functions, loops, arrays and conditional statements. Two-Dimensional Plots.

List of Programs:

1. Script files and functions on Mathematical problems.
2. Programming using loops and conditional statements.
3. MATLAB Code for Two-Dimensional Plots.

Module 3. MATLAB Programming for Numerical Methods: Root finding, interpolation, numerical differentiation, numerical integration, numerical solutions of ordinary differential equations and MATLAB Solvers for differential equations and Numerical Methods.

List of Programs:

1. MATLAB Code for Bisection Method, Regula Falsi Method, Newton-Raphson Method and Iterative methods.
2. MATLAB Code for Newton forward, backward interpolation formula and Lagrange's interpolation formula
3. MATLAB Code for the first order and second order derivatives of the given data.
4. MATLAB Code for trapezoidal rule and Simpson's 1/3rd and 3/8 rules.
5. MATLAB Code for Euler methods modified Euler's methods and Runge-Kutta method of fourth order.
6. MATLAB Code for Gauss-Seidel iteration method.
7. MATLAB Code for solving engineering problems
8. MATLAB Solvers for differential equations and numerical methods.

Suggested Books:

1. B.S. Grewal, Numerical Methods in Engineering & Science, Khanna Publishers, 2014.

2. Steven Chapra, Applied Numerical Methods with MATLAB for Engineers and Scientists-McGraw-Hill Higher Education (2006).
3. Sastry, S.S, Introductory Methods of Numerical Analysis, 5th edition, Prentice Hall, 2017.
4. MiszaKalechman, Practical MATLAB Basics For Engineers, CRCPress (2008).
5. John H. Mathews, Kurtis D. Fink, Numerical methods using MATLAB, Prentice Hall (1998).
6. RudraPratap, Getting Started with MATLAB A Quick Introduction for Scientists and Engineers,Oxford University Press (2010).
7. Brian R. Hunt, Ronald L. Lipsman, Jonathan M. Rosenberg, A Guide to MATLAB for Beginners and Experienced Users, Cambridge University Press(2006).
8. S.R. Otto and J.P. Denier, An Introduction to Programming and Numerical Methods in MATLAB Springer-Verlag London Limited(2005).
9. YogeshJaluria, Computer Methods For Engineering With MatlabApplications,Taylor &Francis(2011).
10. William Bober, Introduction to Numerical and Analytical Methods with MATLAB for Engineers and Scientists, CRC Press(2014).
11. Rao V. Dukkipati, MATLAB: An Introduction with Applications, New Age International (P) Limited, Publishers(2010)

Course Code	Subject Name	L	T	P	C
R20BSH-MC2101	Constitution of India Common to CSE & CSIT	2	0	0	0

Course Objectives:

1. To understand the history of India and making and importance of constitution the constitution
2. To understand the structure of union government and roles and responsibilities executive bodies.
3. To describe the structure of state government and its administration in various levels
4. To examine the local government structure and roles of the authorized bodies from the grass roots of democracy
5. To identify the role and functions of election commission in conducting general body elections in India.

Course Outcomes: At the end of the semester/course, the student will be able to have a clear knowledge on the following:

1. Understand historical background of the constitution making and its importance for building a democratic India
2. Understand the functioning of three wings of the government ie., executive, legislative and judiciary
3. Understand the value of the fundamental rights and duties for becoming good citizen of India.
4. Analyze the decentralization of power between central, state and local self-government
5. Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

UNIT-I

Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

Learning Outcomes:

After completion of this unit student will be able to

- Understand the concept of Indian constitution (L2)
- Apply the knowledge on directive principle of state policy (L3)
- Analyze the History, features of Indian constitution (L3)
- Evaluate Preamble Fundamental Rights and Duties (L2)

Application:

Application of the fundamental rights and fundamental duties in present scenario.

UNIT-II

Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, LokSabha, RajyaSabha, The Supreme Court and High Court: Powers and Functions;

Learning Outcomes:-

After completion of this unit student will be able to

- Understand the structure of Indian government (L2)
- Differentiate between the state and central government (L2)
- Know the Structure of supreme court and High court (L2)

Application: Role play mock parliament in the class room to understand LokSabha and RajyaSabha.

UNIT-III

State Government and its Administration Governor - Role and Position - CM and Council of ministers, State Secretariat: Organization, Structure and Functions

Learning Outcomes:-

After completion of this unit student will be able to

- Understand the structure of state government (L2)
- Analyze the role Governor and Chief Minister(L3)
- Explain the role of state Secretariat (L2)
- Differentiate between structure and functions of state secretariat (L3)

Application:

- Study the lien of the hierarchy of ministries and list-out current ministers.

UNIT-IV

A Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zilla Panchayat, Elected officials and their roles, CEO ZilaPanchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy

Learning Outcomes:-

After completion of this unit student will be able to

- Understand the local Administration (L2)
- Compare and contrast district administration role and importance (L2)
- Analyze the role of Mayor and elected representatives of Municipalities (L2)
- Evaluate Zilla panchayat block level organization (L3)

Application: Compare and contrast the functionalities of two mayors of two districts.

UNIT-V

Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission- Functions and Commissions for the welfare of SC/ST/OBC and women

Learning Outcomes:-

After completion of this unit student will be able to

- Know the role of Election Commission apply knowledge (L3)
- Contrast and compare the role of Chief Election commissioner and Commissiononerate (L4)
- Analyze role of state election commission (L3)
- Evaluate various commissions of viz SC/ST/OBC and women (L5)

Application:

- Make a survey of the voters for local elections in your area.

Text Books:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi
2. SubashKashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government & Politics
4. D.C. Gupta, Indian Government and Politics

References:

1. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
2. J.C. Johari, Indian Government and Politics Hans
3. J. Raj Indian Government and Politics
4. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law,
5. Prentice – Hall of India Pvt. Ltd.. New Delhi
6. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

E-Resources:

1. nptel.ac.in/courses/109104074/8
2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution

II-Year –II Semester

Course Code	Subject Name	L	T	P	C
R20CIT-PC2201	Computer Organization and Architecture Common to CSE,CSSE & CSIT	3	0	0	3

Course Objectives:

1. Understand the architecture of a modern computer with its various processing units.
2. Also the Performance measurement of the computer system.
3. In addition to this the memory management system ofcomputer.

Course Outcomes:

1. Understand basic structure of computers and its development.
2. Understand assembly programming and register transfer language.
3. Analyze logical, shift, arithmetic operations and different addressing modes of an instruction
4. Analyze interrupt mechanisms and data transfer techniques on I/O interfaces.
5. Understand memory management and microprogram control.

UNIT -I:

Basic Structure of Computers: Functional unit, Basic Operational concepts, Bus structures, System Software, Performance, The history of computer development.

Learning Outcomes:

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

1. acquire the knowledge on basic structure of a computer [L2]
2. analyze the performance of a computer system [L4]

Applications:

- design application program interface of a system

UNIT -II:

Machine Instruction and Programs: Instruction and Instruction Sequencing: Register Transfer Notation, Assembly Language Notation, Basic Instruction Types, Addressing Modes, Basic Input/output Operations, The role of Stacks and Queues in computer programming equation.

Learning Outcomes:

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

1. create the assembly level programs [L6]
2. acquire knowledge on register transfer notations [L2]
3. analyze the role of a stack in real time programs [L5]

Applications:

- develop a micro level assembly program for high level languages
- design programs using stacks and queues

UNIT -III:

Type of Instructions: Component of Instructions: Logic Instructions, shift and Rotate Instructions, Arithmetic Instructions, Branch Instructions, Addressing Modes, Input/output Operations

Learning Outcomes:

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

1. Apply logical and shift instructions towards arithmetic operations [L3]
2. analyze the branch and jump instructions [L5]
3. analyze addressing mode of a specific instruction [L4]

Applications:

- design branch instructions using assembly level language

UNIT -IV:

Input/Output Organization: Accessing I/O Devices, Interrupts: Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access, Buses: Synchronous Bus, Asynchronous Bus, Interface Circuits, Standard I/O Interface: Peripheral Component Interconnect (PCI) Bus, Universal Serial Bus (USB)

Learning Outcomes:

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

1. analyze the interrupts, synchronous and asynchronous busses [L4]
2. apply data transfer techniques [l3]
3. explain I/O interfaces[L2]

Applications:

- develop interrupt programs for enabling input/ output interface

UNIT -V:

The Memory Systems: Basic memory circuits, Memory System Consideration, ReadOnly Memory: ROM, PROM, EPROM, EEPROM, Flash Memory, Cache Memories: Mapping Functions, INTERLEAVING. Secondary **Storage:** Magnetic Hard Disks, Optical Disks

Processing Unit: Fundamental Concepts: Register Transfers, Performing An Arithmetic Or Logic Operation, Fetching A Word From Memory, Execution of Complete Instruction, Hardwired Control, **Micro programmed Control**: Microinstructions, Microprogram Sequencing, Wide Branch Addressing Microinstructions with next –Address Field

Learning Outcomes:

Students will be able to

1. Analyze the difference between the functionality of RAM and ROM [L2]
2. Apply cache organization and different mapping techniques [L3]
3. Analyze the performance of different cache organizations in computer system [L2]
4. Acquire knowledge on how execution of an instruction [L2]
5. Analyze different types of control unit designs [L2]
6. Create a small micro-program to perform a specific task [L6]

Applications:

- design a cache level programs for different mapping techniques
- designing of a micro architecture
- designing of an instruction level architecture

Text Books:

1. Computer Organization, Carl Hamacher, ZvonksVranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

Reference Books:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition PHI/Pearson
3. Fundamentals or Computer Organization and Design, - SivaraamaDandamudi Springer Int. Edition.
4. “Computer Organization and Design: The Hardware/Software Interface” by David A. Patterson and John L. Hennessy. 5. J .P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.

Subject Code	Subject Name	L	T	P	C
R20CSE-PC2201	Software Engineering	3	0	0	3

Course Objectives:

1. Explain the phases of Software Development.
2. Teach the customer requirement gathering techniques.
3. Teach Software Design techniques
4. Demonstrate coding standards
5. Apply the testing techniques on software

Course outcomes:

Students will be able to:

1. Understand basic concepts of Software Development Life Cycle Models.
2. Analyze the software Requirements for the Development of software for given problem
3. Design the appropriate software architecture style for real-time software problems.
4. Develop the code and Testing Methodologies for real-time software Projects
5. Analyze Risk management and Software quality of the software products

UNIT-1

Introduction: Introduction to Software Engineering, Evolving role of Software, Software Crisis,Changing Nature of Software, Software myths, Process Models for Software Development, Waterfall, prototyping Evolutionary models: Incremental model, Spiral model, Agile developmental process.

Applications: Various models for different projects

Learning Outcomes:

At the end of the module, students will be able to:

1. List the steps involved in software development. (L1)
2. Explain myths of software. (L2)
3. Apply various software process models (L3)

UNIT-2

Software Requirements Engineering: Functional & Non-functional requirements, Feasibility studies, Requirements Elicitation and Analysis, requirements validation, Software Requirements Specification, Process and System Models, context models, behavioural model, Data model.

Applications: Finding Functional &Non-functional requirements for banking system

Learning Outcomes:

At the end of the module, students will be able to:

1. Explain software development model (L2)
2. Define functional and non-functional requirements for software development (L1)
3. Analyse user requirementsfor a software(L4)

UNIT-3

Design Engineering: Design concepts, data design, software architecture, Architectural styles and patterns, User interface design - Golden rules, User interface analysis and design, Effective Modular Design.

Applications: Data designing for banking system

Learning Outcomes:

At the end of the module, students will be able to:

1. List the software architecture style for the given problem. (L1)
2. BuildGoldenrulesfor the given problem (L3)
3. User Interface Analysis and Design (L5)

UNIT-4

Coding&**Testing:**Coding standards, code review and verification, Testing levels: Unit testing, integration testing, system testing – alpha and beta testing, black box and white box testing, debugging.

Applications: Applyingtesting techniques on any software project

Learning Outcomes:

At the end of the module, students will be able to:

1. Implementation of coding standards(L6)
2. Apply different Testing concepts (L3)

UNIT-5

Risk Management: Risk types, strategies, Estimation and Planning. Software Quality –McCall Quality factors, Six Sigma for Software Quality, Quality Assurance and its techniques.

Applications: analyze the risks in any software project

Learning Outcomes:

At the end of the module, students will be able to:

1. Evaluatedifferent Risk management techniques. (L5)

Text books:

1. Roger S. Pressman, Software Engineering, A practitioner's Approach, 7thEdition, McGraw-Hill International Edition, 2009
2. Rajib Mal, Fundamentals of software Engineering, 3rdEdition, Eastern Economy Edition, 2009

Reference books:

1. Sommerville, Software Engineering, 7thEdition, Pearson education, 2004
2. K KAggarwal and Yogeshsingh, Software engineering,3rd Edition,New age International publication,2008

Subject Code	Subject Name	L	T	P	C
R20CSE-PC2202	Object Oriented Programming through Java Common to CSE,CSSE & CSIT	3	0	0	3

Course Objectives:

1. To understand the structure and environment of Java.
2. To implement the relationship between objects.
3. To apply data hiding strategy in objects.
4. To implement text processing and error handling.
5. To organize data using different data structures.
6. To create multi threaded graphical user interface applications.

Course Outcomes:

1. Understand the environment of JRE and control structures.
2. Implement real world objects using class hierarchies and data hiding.
3. Implement generic data structures for distinct objects.
4. Implement exception and file handling through streams.
5. Design GUI applications for real time problems.

Unit I:

Java Environment and Program Structure: History of Java, Features, Applications, Java Installation - JDK and JRE, JVM Architecture, OOPS Principles, Class and Object, Naming Convention, Data Types, Type Casting, Type Conversion, Wrapper classes, Operators, instance of operator, Command Line Arguments, Decision making, Arrays, and Looping statements.

Learning Outcomes: Student will be able to

1. Understand architecture of Java Virtual Machine.(L2)
2. Understand the structure of java program and its environment. (L2)

Unit II:

Class Hierarchy & Data Hiding: Property, Method, Constructor, Inheritance (IS-A) , Aggregation and Composition (HAS-A), this and super, static and initialize blocks, Method overloading and overriding, static and final keywords, Types of Inheritance, Compile time and Runtime Polymorphism, Access Specifiers and scope, packages and access modifiers, Abstract class, Interface, Interface Inheritance, Achieving Multiple Inheritance, Class casting, Object Cloning, Inner Classes.

Learning Outcomes: Student will be able to

1. Understand the class hierarchy and their scope. (L2)
2. Implement relationship between objects. (L3)
3. Understand data hiding and nested classes. (L2)
4. Implement data type casting and cloning of objects. (L3)

Unit III:

Strings and Collections: String: Methods,StringBuffer and StringBuilder, StringTokenizer,

Collections: Exploring java.util.*, Scanner, Iterable, Collection Hierarchy, Set, List, Queue and Map, Comparable and Comparator, Iterators: foreach, Enumeration, Iterator and ListIterator.

Learning Outcomes: Student will be able to

1. Understand the usage of String and its properties and methods.(L2)
2. Understand data structures and Iterators. (L2)
3. Create the data structures and implement different utility classes. (L3)

Unit IV:

IO and Error Handling: IO Streams: Exploring java.io.*, Character and Byte Streams, Reading and Writing, Serialization and De-serialization,

Error Handling: Error vs Exception, Exception hierarchy, Types of Exception, Exception handlers, User defined exception, Exception propagation.

Learning Outcomes: Student will be able to

1. Understand character and byte streams. (L2)
2. Understand the hierarchy of errors and exceptions. (L2)

3. Implement data streams and exception handlers. (L3)

Unit V:

Threads and GUI: Multi Threading: Process vs Thread, Thread Life Cycle, Thread class and Runnable Interface, Thread synchronization and communication.

GUI: Component, Container, Applet, Applet Life Cycle, Event delegation model, Layouts, Menu, MenuBar, MenuItem.

Learning Outcomes: Student will be able to

1. Understand the Thread Life Cycle and its scheduling.(L2)
2. Implement the synchronization of threads. (L2)
3. Create graphical components using Abstract window toolkit. (L3)

Text Books:

1. The complete Reference Java, 8th edition, Herbert Schildt, TMH.
2. Programming in JAVA, Sachin Malhotra, SaurabhChoudary, Oxford.
3. Introduction to java programming, 7th edition by Y Daniel Liang, Pearson.
4. Java: How to Program, 9th Edition (Deitel) 9th Edition.
5. Core Java: An Integrated Approach, Java 8 by R. Nageswara Rao.

Reference Books:

1. Swing: Introduction, JFrame, JApplet, JPanel, Componets in Swings, Layout Managers in
2. Swings, JList and JScrollPane, Split Pane, JTabbedPane, JTree, JTable, Dialog Box.

Subject Code	Subject Name	L	T	P	C
R20CSE-PC2203	Operating Systems Common to CSE & CSIT	3	0	0	3

Course objectives:

1. Provide knowledge about the services rendered by operating systems.
2. Present detail discussion on processes, threads and scheduling algorithms.
3. Expose the student with different techniques of handling deadlocks.
4. Discuss various file-system implementation issues and memory management techniques.
5. Learn the basics of Linux system and Android Software Platform**.**

Course Outcomes:

1. Understand the importance of operating systems and system calls.
2. Analyze process scheduling algorithms and various IPC Mechanisms
3. Analyze the Process Synchronization and various ways for handling deadlocks in a computer system.
4. Analyze various memory mapping techniques and page replacement algorithms.
5. Understand storage, mass storage structures and basics of Android operating systems

UNIT-I:

Operating Systems Overview: Introduction: what is an operating system, Types of operating systems, operating systems concepts, operating systems services, Introduction to System call, System call types. Operating System Generation

Learning outcomes: Student should be able to

1. Understand operating system structure and functions. (L2).
2. Understand operating system services and system calls (L2).

UNIT–II:

Process Management: Process concept: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication.

Multithreaded Programming: Overview, Multithreading models, Threading Issues.

Process scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

Learning outcomes: Student should be able to

1. Identify various message sharing mechanisms used in IPC. (L2).
2. Understand how to handling multiple threads. (L2).
3. Differentiate between preemptive, non-preemptive and real time CPU scheduling (L2).

UNIT-III:

Synchronization: Process Synchronization, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors, Synchronization examples

Principles of deadlock – System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery form Deadlock

Learning outcomes: Student should be able to

1. Analyze various solutions for process synchronization. (L4).
2. Analyze the reasons for deadlocks and proposed solutions to detect, avoid, recovery from deadlocks(L4).

UNIT-IV:

Memory Management: Memory Management strategies: Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table.

Virtual Memory Management: Virtual Memory, Demand Paging, Page-Replacement Algorithms, Thrashing.

Learning outcomes: Student should be able to

1. Demonstrate the ability to implement various memory management techniques (L2)
2. Illustrate various demand paging techniques. (L2).

UNIT-V:

File system Interface- the concept of a file, Access Methods, Directory and Disk structure, File

system mounting.

File System implementation: File system structure, allocation methods, free-space management

Mass-storage structure: overview of Mass-storage structure, Disk scheduling, Device drivers

Android Software Platform: Android Architecture, Operating System Services, Android Runtime Application Development, Application Structure, Application Process management.

Learning outcomes: Student should be able to

1. Identify various file management and optimization techniques. (L2).
2. Understand how data streams are exchanged between I\O sub systems. (L2).
3. Analyze various storage structures to store the data in secondary memory. (L4).
4. Analyze different disk scheduling algorithms. (L4).
5. Understand Android operating system environment. (L2).

Text Books:

1. Silberschatz A, Galvin P B, and Gagne G, Operating System Concepts, 9th edition, Wiley, 2013.
2. Tanenbaum A S, Modern Operating Systems, 3rd edition, Pearson Education, 2008. (forInterprocess Communication and File systems).

References:

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

Subject Code	Subject Name	L	T	P	C
R20BSH-MA2202	Probability and Statistics Common to CSE,CSSE & CSIT	3	0	0	3

Course Objectives:

1. To familiarize the data Science concepts.
2. To impart knowledge in basic concepts and few techniques in probability and statistics in relation to the engineering applications.

Course Outcomes:

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

1. Evaluate correlation and regression for the given data. (L2)
2. Apply Baye's theorem to probabilistic experiments. (L3)
3. Apply discrete and continuous probability distributions to the real time problems. (L3)
4. Design the components of a classical hypothesis test. (L3)
5. Infer the statistical inferential methods based on small sampling tests. (L3)

Unit I:

Correlation and Regression: Correlation, correlation coefficient, rank correlation. Linear regression coefficients, principle of least squares, method of least squares, regression lines, multiple regression, Logistic regression.

Learning Outcomes:

At the end of this unit, the student will be able to

- Understand the various methods of central tendency and variability. (L2)
- evaluate correlation, correlation coefficient, rank correlation. (L2)
- apply method of least squares to find regression coefficients. (L3)

UNIT II:

Probability: Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem,

Learning Outcomes:

At the end of this unit, the student will be able to

- make use of probabilities of events in finite sample spaces from experiments. (L3)
- apply Baye's theorem to real time problems. (L3)

UNIT III:

Random Variables &Probability Distributions: Random variables (discrete and continuous), probability density functions, properties, mathematical expectation. Probability distribution - Binomial, Poisson distribution and normal distribution-their properties.

Learning Outcomes:

At the end of this unit, the student will be able to

- find the binomial, poisson and normal distribution of the given data data. (L2)

Unit IV:

Estimation and Testing of hypothesis, large sample tests: Introduction to Sampling, parameters, statistics, sampling distribution, point estimation, interval estimations, null hypothesis, alternative hypothesis, the critical & acceptance regions, level of significance, type-1 and type-2 of errors.

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.

Learning Outcomes:

At the end of this unit, the student will be able to

- explain the concept of estimation, interval estimation and confidence intervals. (L2)
- apply the concept of hypothesis testing for large samples. (L4)

Unit V:

Small sample tests: Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for Single varience, $\chi 2$ - test for goodness of fit, ANOVA(1-way).

Learning Outcomes:

At the end of this unit, the student will be able to

- apply the concept of testing hypothesis for small samples to draw the inferences. (L3)
- estimate the goodness of fit. (L3)
- apply ANOVA test to compare the data (L3)

Text Books:

1. Veerarajan T., Probability, Statistics and Random Processes, 3rd edition, Tata McGraw-Hill, New Delhi, 2008.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44/e, 2017.
3. Miller and John E. Freund, Probability & Statistics for Engineers, Prentice Hall of India.

References:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.
2. T. K. V. Iyengar, B. Krishna Gandhi and Others, Probability & Statistics, S. Chand & Company.
3. S. C. Guptha and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand and Sons Publications, 2012.
4. Sheldon M. Ross,Introduction to Probability and Statistics for Engineers and Scientists, Academic Press,2009.
5. Ronald E.Walpole, Sharon L.Myers, Keying Ye, Probability and Statistics for Engineers and Scientists, Pearson,2007.
6. Ravichandran, Probability and Statistics for Engineers, Wiley, 2019.

Subject Code	Subject Name	L	T	P	C
R20CSE-PC2204	Object Oriented programming through Java LAB Common to CSE,CSSE & CSIT	0	0	3	1.5

Course Objectives:

- To understand the structure and environment of Java.
- To implement the relationship between objects.
- To apply data hiding strategy in objects.
- To implement text processing and error handling.
- To organize data using different data structures.
- To create multi threaded graphical user interface applications.

Course Outcomes:

1. Develop classes and objects for real world entities.
2. Implement polymorphism and data abstraction concepts.
3. Implement the parent-child relationships between objects with access protection.
4. Implement generic and non-generic data structures and exception handling
5. Implement multi-threading and GUI applications

Exercise-1:

a. Write a Java program to create Class as Registration with properties as Full Name(String) , Gender(char), Age(int), Height(double), Phone Number(long), and isMarried(Boolean) and print their values.
b. Write a Java program to implement Type Casting and Conversion.
c. Write a Java program to implement Wrapper Classes.

Exercise-2:

a. Write a Java program to take input as Regd.No and print the branch depending upon the department code in that Regd.No using else-if and switch statements. (EgRegNo: 19KD1A0505, 8^{th} character is department Code, 5-CSE, 4-ECE, 3-MECH, 2-EEE etc.
b. Write a Java program to read input integers from Command Line Arguments and print first and second largest numbers.
c. Write a Java program to take input as Integer array and print even indexed even numbers and odd indexed odd numbers.

Exercise-3:

a. Write a Java program to take input as Decimal number and convert into Roman Number.
b. Write a Java program to check whether given number is Extension number. The extension number is the number which is present in the last digit(s) of its square.(Eg. N=25, 625 is Extension number since it contains 25).
c. Write a Java program to take input as Amount in rupees and print their denominations and total number notes.

Exercise-4:

a. Create a Class named Student with properties as Student Id, Student Name, gender, department, Age, Aggregate and methods as insertStudent() for inserting student details and displayStudent() for printing student details.
b. Create a class Student with same properties as above and create a constructor to insert student details and return the data using toString() method.

Exercise-5:

a. Design a Class named Transaction to transfer amount (double) in different ways using Account Number(int) , Phone Number(Long) and qr Code (String) as parameter into a method transferAmount() to achieve Method or Constructor OverLoading.
b. Design a super Class Account and sub Classes as LoanAccount, SavingsAccount and CurrentAccount and implement relationship between parent and child classes. (Implement Packages for the above classes)

Exercise-6:

a. Write a Java program to implement this and super keywords.

b. Write a Java program to implement Static property, method, block and package.
c. Write a Java program to implement final property, method and class.

Exercise-7:

a. Write a Java program to implement Data Abstraction using Abstract class and Interface.
b. Write a Java program to implement Multiple Inheritance through Interfaces.

Exercise-8:

a. Write a Java program to take input as String Sentence S and print largest and shortest word in S.
b. Write a Java program to take input as String S and remove the consecutive repeated characters from S. (Eg. S = Raaaamaaa then, Rama)
c. Write a Java program to take input as String Sentence S and print sentence again with all the words with the first letter as capital letter using StringBuffer.

Exercise-9:

a. Write a Java program to implement Map interface.
b. Write a Java program to implement Set Interface.
c. Write a Java program to implement List Interface.
d. Write a Java program to implement ComparatorInterface.

Exercise-10:

a. Write a Java program to read data from Employee file and print Highest salary employee information. (Employee File Contains: ID, name, Dept, Salary).
b. Write a Java program to implements Serializable Interface to read and write Objects to/from the file.

Exercise-11:

a. Write a Java program to implement try, catch, finally blocks.
b. Write a Java program to create user defined Exception and implement throw and throws handlers.

Exercise-12:

a. Write a Java program to create Thread using Thread Class and Runnable Interface.
b. Write a Java program to implement multi threading and synchronization.
c. Write a Java program to implement Inter Thread Communication.

Exercise-13:

a. Create an Applet that changes the Font and background Color depending upon the user selection from the input.
b. Write a Java program to implement Event Delegation model through AWT Components.
c. Write a Java program to implement Layout Manager with AWT components.

Subject Code	Subject Name	L	T	P	C
R20CSE-PC2205	Operating Systems LAB Common to CSE & CSIT	0	0	3	1.5

Course objectives:

1. Implement various process scheduling programs
2. Implement various memory management algorithms.
3. Identify various solutions for critical section problems and also implement different algorithms that are applied in virtual memory .
4. Implement various file allocation algorithms.
5. Describe and write shell scripts in order to perform basic shell programming.

Course Outcomes:

1. Simulate various process scheduling algorithms
2. Implement various system calls.
3. Implement different memory management techniques
4. Simulate banker's algorithm, page replacement algorithms and various file allocation algorithms
5. Implement effective synchronization in concurrent programming and multithreading concepts

Operating Systems

1. Simulate the following CPU scheduling algorithms
a) Round Robin b) SJF c) FCFS d) Priority
2. Multiprogramming-Memory management- Implementation of fork (), wait (), exec() and exit (), System calls
3. Simulate the following
a) Multiprogramming with a fixed number of tasks (MFT)
b) Multiprogramming with a variable number of tasks (MVT)
4. Simulate Bankers Algorithm for Dead Lock Avoidance
5. Simulate Bankers Algorithm for Dead Lock Detection.
6. Simulate the following page replacement algorithms.
a) FIFO b) LRU c) LFU
7. Simulate the following File allocation strategies
a) Sequenced b) Indexed c) Linked
8) . Write a C program to simulate producer and consumer problem usingsemaphores
6. Write a C program to simulate producer and consumer problem usingsemaphores
7. Write C program to create a thread using pthreads library and let it run its function.
8. Write a C program to illustrate concurrent execution of threads using pthreads library.

Text Books:

1. Operating System -Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley
2. The ultimate guide unix, Sumitan das.

Subject Code	Subject Name	L	T	P	C
R20CSE-PC2206	Software Engineering Lab	0	0	3	1.5

Courseb Objectives:

1. Students can be familiar with analysis in software engineering process.
2. Students can be familiar with Designing in software development process.
3. The Software Engineering lab will facilitate the students to develop a preliminary yet practicalunderstanding of software development process and tools.

Course Outcomes:

1. Develop SRS document for the Requirement Analysis Process of Software
2. Design the application model Using Entity- Relationship Diagrams (ERDs)
3. Design the application model Using DFDs, CFDs, Structured Charts.
4. Design the Test Cases for the Real-time applications.
5. Analyze the Risk related to the project and Develop Risk Mitigation, Monitoring, Management (RMMM) Plan, Version control and change control for software configuration items

Experiments:

Do the Following Exercises by choosing any one of the application.

1) Do the Requirement Analysis and Prepare SRS
2) Draw the Entity Relation Diagram.
3) Draw the Data Flow Diagrams at Level 0 & Level 1
4) Draw the Control Flow Diagram
5) Draw the Structured Charts for the developed DFD's
6) Design the Test Cases for the application
7) Analyze the Risk related to the project and prepare RMMM plan
8) Prepare Version control and change control for software configuration items.

Subject Code	Subject Name	L	T	P	C
R20CSE-SC2201	R- Programming (Skill Oriented Course)	1	0	2	2

Course Objectives:

Students will be able to:

1. To Apply the use of R for programming tasks..
2. To Apply and to extend the functionality of R by using add-on packages
3. To understand how to extract data from files and other sources and perform various data v manipulation tasks on them.
4. To Apply code for statistical functions in R.
5. To understand the use R Graphics and Tables to visualize results and apply on various statistical operations on data.
6. To Apply the knowledge of R gained to data Analytics for real life applications

Course Outcomes:

Students will be able to:

1. Apply suitable statistical and mathematical methods to real world problems
2. Visualize the datasets using suitable methodology.
3. Analyze the data sets to predict the solution of the real-world problems in different situations.
4. Interpret the solutions to the real-world datasets
5. Apply Statistical Methods on various Data sets to visualize the data

Module-I: Introduction, How to run R, R Sessions and Functions, Basic Math, Variables, Data Types: Vectors and Conclusion, Advanced Data Structures: Data Frames, Lists and Matrices.

1. Write a program to illustrate basic Arithmetic in R
2. Write a program to illustrate operations on a vector in R
3. Write a program to illustrate operations on matrix in R
4. Write a program to illustrate operations on Data Frame
5. Write a program to illustrate operations on List

Module-II: R Programming Structures, Control Statements, Loops, If-Else, and Functions.

1. Write a program to illustrate if-else-else if in R
2. Write a Program to illustrate While and For loops in R
3. Write a program to illustrate Functions in Quick sort implementation in R
4. Write a program to illustrate Function inside function in R

Module-III:R Programming implementation for basic Mathematics, Probability and Statistical methods, Correlation, Regression and Statistical Distributions.

1. Write a program to illustrate built-in function for mathematics in R.
2. Write a program to illustrate built-in function for probabilities in R.

3. Write a program to illustrate built-in function for correlation and regression lines in R.
4. Write a program to illustrate built-in function for statistical distributions in R.

Module-IV: Graphics, Creating Graphs, The Workhorse of R Base Graphics, the plot () Function – Customizing Graphs, Saving Graphs to Files. Import the data sets from excel, CSV to visualize the data and applying statistical methods.

1. Write a program to illustrate to create graphs and usage of plot() function in R
2. Write a program to illustrate Customising and Saving to Graphs in R.
3. Write a program to illustrate the data sets by applying statistical methods.
4. Write a program to illustrate the data sets by data visualization.

References:

1. Eric Goh Ming Hui, Learn R for Applied Statistics With Data Visualizations, Regressions, and Statistics,Apress,2019.
2. Thomas W. MacFarland, Introduction to Data Analysis and Graphical Presentation in Biostatistics with R,Springer,2014.
3. Peter Dalgaard, Introductory Statistics With R-Springer-Verlag New York ,2008.
4. Pierre Lafaye de Micheaux, Rémy Drouilhet, Benoit , The R SoftwareFundamentals of Programming and Statistical Analysis-Springer-Verlag New York, 2013

Course Code	Subject Name	L	T	P	C
R20BSH-MC2201	Employbility Skills-I	0	0	3	0

Course Objectives

1. Aims to help learners develop their English language skills, particularly those planning to appear for Competitive Exams that test their English Language abilities.
2. Gains the power of expression through rich Vocabulary.
3. Imparts critical reading strategies for comprehension of complex texts
4. Provides training and opportunities to develop fluency in English through participation in formal group discussions and Self Introductions.
5. Demonstrates good writing skills for effective Paragraph Writing, Essay Writing and formal correspondence through Emails.
6. Encourages use of a wide range of grammatical structures, Phrases, Clauses and Idioms in speech and writing.

Course Outcomes

1. Attain Language Proficiency & Accuracy through Contextualized Vocabulary, Verb forms, Tense and subject verb agreement, produce coherent expressions for professional writing, introduce themselves unhesitatingly with Task-Based Activities.
2. Develop the fluency and accuracy to write Technical Reports and Emails for professional communication by using appropriate vocabulary and participate confidently in any formal discussion.
3. Assimilate lifelong reading habit to comprehend a passage for its gist. Avoid the errors in both Speech & Writing and write Letters and Emails for official communication.
4. Realise the technical communicative competence and attainment of grammatically correct structures for formal communication.
5. Knowledge of working of basic communication systems and Networking

Unit 1

Vocabulary: How to talk about actions. **Grammar:U**sing and Identifying Parts of Speech accurately **. Writing:** Paragraph Writing and formal correspondence through Emails**. Speaking:**Background to Group discussions & Self-introductions.

Learning Outcomes

At the end of the module, the learner will be able to

- Acquire vocabulary and use it contextually(L2)
- identify parts of speech and use them flawlessly in both Speech and Writing (L3)
- write paragraphs and Emails in formal correspondence effectively (L3)
- participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

Unit 2

Vocabulary: How to talk about various speech habits.**Grammar**: Learning Verb forms, Tenses and Subject-verb agreement and using them accurately in both Speaking and Writing contexts. **Writing :**Essay Writing and formal correspondence through Emails. **Speaking:**Four major areas -Subject Knowledge, Oral Communication Skills, Leadership Skills and Team Management-of GD;Real time GDs for Evaluation.

Learning Outcomes

- At the end of the module, the learner will be able to
- Acquire vocabulary and use it contextually (L2)
- use Verb forms,Tense and subject verb agreement for effective speaking and writing (L3)
- produce coherent expressions for professional writing (L4)

participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

Unit 3

Vocabulary: How to insult your enemies**. Grammar:** Sentence Analysis & Synthesis - Voice, Degrees of Comparison, Reported Speech and Types & Forms of sentences. **Writing:** Report writing and Emails for formal correspondence**. Speaking:** Roles in structured GDs; real time GDs for practicing the above roles.

Learning Outcomes

- At the end of the module, the learner will be able to
- Acquire vocabulary and use it contextually(L2)
- identify the complexity in the structure of a sentence (L2)
- write technical reports and emails for professional communication (L3)
- participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

Unit 4

Vocabulary: How to flatter your friends**. Grammar**: Common errors and Correction of Sentences **Reading:**Reading Comprehension passages through Skimming and Scanning and understanding the gist or the specific purpose of them.. **Writing:** Letter writing and Emails. **Speaking:**Advantages of GDs for hiring process ; real time GDs for evaluating.

Learning Outcomes

At the end of the module, the learner will be able to

- Acquire vocabulary and use it contextually(L2)
- comprehend a passage and know its gist(L3)
- avoid the errors in both Speech and Writing (L2)
- write letters and emails for official communication(L3)
- participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

Unit 5

Vocabulary & Grammar: High-frequency words for all competitive exams, Clause ,Phrase & Idioms**. Reading:** Reading for Comprehending **Writing:**Business Letters and Emails **Speaking:**Group Discussions for Evaluation

Learning Outcomes

At the end of the module, the learner will be able to

- Acquire vocabulary and use it contextually(L2)
- use grammatically correct structures for formal communication (L3)
- write Business Letters effectively (L3)
- participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skilful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012. (Student Book, Teacher Resource Book, CD & DVD)
5. Word Power Made Easy by Norman Lewis