Shirpur Education Society's

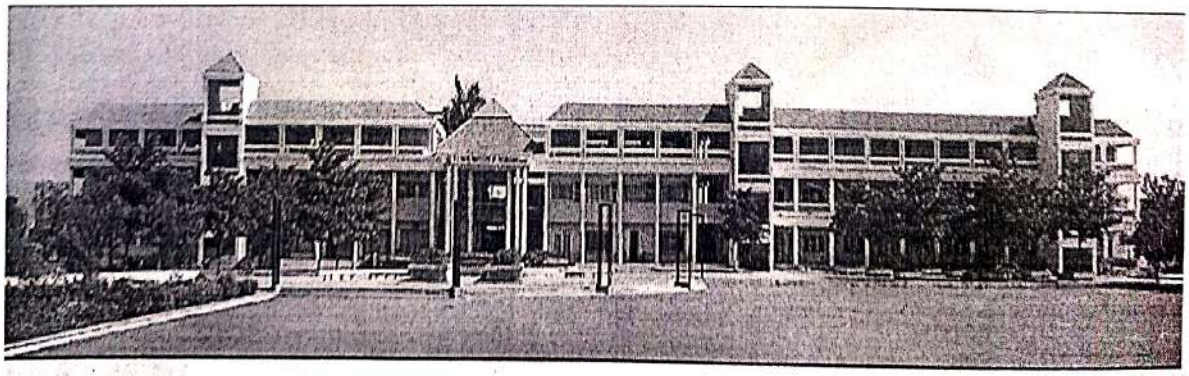
R. C. Patel Institute of Technology, Shirpur

(An Autonomous Institute)

Course Structure and Syllabus

First Year Master of Computer Application (MCA)

With effect from Year 2023-24



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Semester-I (w.e.f. 2023-24)													
Sr	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme						Credits
							Continuous Assessment (CA)				ESE	Total	
							TA	Term Test 1 (TT1)	Term Test 2 (TT2)	Avg. of (TT1 & TT2)			
				L	T	P	[A]			[B]	[C]	[A+B+C]	
1	BS	BSMC1010T	Probability and Statistics	2			20	20	20	20	60	100	2
2	BS	BSMC1010L	Probability and Statistics Laboratory			2	50					50	1
3	PC	PCMC1020T	Database Management Systems	2			20	20	20	20	60	100	2
4	PC	PCMC1020L	Database Management Systems Laboratory			2	25				25	50	1
5	PC	PCMC1030T	Computer Networks	2			20	20	20	20	60	100	2
6	PC	PCMC1030L	Computer Networks Laboratory			2	50					50	1
7	PC	PCMC1040T	Data Structures and Algorithms	3			20	20	20	20	60	100	3
8	PC	PCMC1040L	Data Structures and Algorithms Laboratory			2	25				25	50	1
9	PC	PCMC1050T	Java Programming	2			20	20	20	20	60	100	2
10	PC	PCMC1050L	Java Programming Laboratory			4	25				25	50	2
11	PC	PCMC1060L	Web Technologies	2		4	50				50	100	4
12	PJ	PJMC1070L	Semester Project			2	25				25	50	1
13	BS	BSMC1080	English Communication			2	50					50	1
14	BS	BSMC1090	Design Thinking	2			0					0	Audit Course
			Total	15		20	400			100	450	950	23

Semester-II (w.e.f. 2023-24)													
Sr	Course Category	Course Code	Course Title	Teaching Scheme			Evaluation Scheme					Total	Credits
							Continuous Assessment (CA)				ESE		
				L	T	P	TA/CA [A]	Term Test 1 (TT1)	Term Test 2 (TT2)	Avg. of (TT1 & TT2) [B]	[C]	[A+B+C]	
1	PC	PCMC2010T	Operating Systems	3			20	20	20	20	60	100	3
2	PC	PCMC2010L	Operating Systems Laboratory			2	50					50	1
3	PC	PCMC2020T	Software Engineering	3			20	20	20	20	60	100	3
4	PC	PCMC2020L	Software Engineering Laboratory			2	50					50	1
5	PC	PCMC2030L	Advanced Web Technologies			4	50				50	100	2
6	PC	PCMC2040T	Artificial Intelligence	3			20	20	20	20	60	100	3
7	PC	PCMC2040L	Artificial Intelligence Laboratory			2	50					50	1
8	PC	PCMC2050T	Advanced Java	3			20	20	20	20	60	100	3
9	PC	PCMC2050L	Advanced Java Laboratory			2	25				25	50	1
10	PC	PCMC2060L	Data Analysis with Python			4	50				50	100	2
11	PC	PCMC2070L	Mobile Application Development			2	50				50	100	1
12	HM	HMMC2080L	Employability Skill Development Program			2	50					50	1
13	PE	PEMC2090T	Department Elective-I	3			20	20	20	20	60	100	3
14	PE	PEMC2090L	Department Elective-I Laboratory			2	50					50	1
			Total	15		22	525			100	475	1100	26

Department Elective-I

Code	Name of the Course
PEMC20901T	Advanced Database Management System
PEMC20901L	Advanced Database Management System Laboratory
PEMC20902T	Internet of Things
PEMC20902L	Internet of Things Laboratory
PEMC20903T	Human Computer Interaction
PEMC20903L	Human Computer Interaction Laboratory

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Semester - I

Probability and Statistics (BSMC1010T)

Teaching Scheme
Lectures : 02 Hrs./week
Credits : 02

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: NIL

Course Objective:

This course aims to instill in students a sound knowledge of probability theory and statistical techniques. It equips the students with intermediate to advanced level concepts and tools in probability and statistics that help them tackle relevant problems within engineering domain.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Solve problems involving random variables, probability distributions and testing of hypothesis, correlation and regression.	L3	Apply
CO2	Identify suitable probability distribution and testing techniques to solve related problems.	L4	Analyze
CO3	Apply knowledge of random variables, probability distributions, measures of central tendency, correlation and regression to solve real life problems.	L3	Apply
CO4	Analyze data samples using statistical methods.	L4	Analyze

Course Contents

Unit-I Basic Probability — 03 Hrs.

Probability spaces, conditional probability, independence; Bayes theorem.

Unit-II Random variables and Probability Distributions — 06 Hrs.

Discrete random variables, probability mass function, cumulative distribution function, Independent random variables, Continuous random variables, distribution functions and densities, expectation, variance, raw and central moments of random variables, Binomial distribution, Poisson approximation to the binomial distribution, Normal distribution.

Unit-III Bivariate Distributions — 02 Hrs.

Definition of Bivariate Distribution and their properties, Conditional densities.

Unit-IV Basic Statistics — 02 Hrs.

Measures of Central tendency; Moments, Moment generating function, skewness, kurtosis.

Mean and variance of Binomial distribution & Poisson distribution, Moments, skewness & kurtosis for Normal distribution.

Unit-V Testing of hypothesis — 12 Hrs.

Point estimation, Interval estimate and Confidence interval, Criteria for good estimates, Null and Alternate hypothesis, Test Statistic, Type I and Type II errors, One-tailed and two-tailed test, Critical region, Large sample statistical test for mean, Large sample statistical test for proportion, t-test for small samples, Test for variance- F test, Chi-square test for Goodness of fit and independence of attributes, Analysis of variance.

Unit-VI Linear Statistical Models: — 05 Hrs.

Scatter diagram, Linear regression and correlation, Least squares method, Rank correlation, Multiple regression.

Text Books:

1. Veerarajan T, "Probability, Statistics and Random Processes", 4^{th} Edition, McGraw hill Education, 2017.

2. S. Ross, "A First Course in Probability", 9^{th} Edition, Pearson Education India, 2013.

Reference Books:

1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol.1, 3^{rd} Edition, John Wiley & Sons, 2017.

2. Devore,"Probability and Statistics for Engineering and Sciences", 2^{nd} Edition, Cengage Learning, 2009.

3. Irwin Miller, John E. Freund and R.A. Johnson, "Probability & Statistics for Enginees", 8^{th} Edition, Pearson Education India, 2015.

4. S.C. Gupta, V. K. Kapoor, "Fundamentals of Mathematical Statistics", 12^{th} Edition, Sultan Chand & Sons, 2014.

5. Murray R. Spiegel, John J. Schiller, R. Alu Srinivasn, "Probability and Statistics", 4^{th} Edition, McGraw Hill Education, 2013.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

Conduction of Term Test

20 Marks for the test (The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Probability and Statistics Laboratory (BSMC1010L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teacher Assessment : 50 Marks
Total : 50 Marks

Prerequisite: NIL

Course Objective:
To build a strong foundation in Statistics which can be applied to analyze data and make predictions.

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Outline different types of data and its visualization.	L2	Understand
CO2	Choose appropriate descriptive statistics measures for statistical analysis.	L3	Apply
CO3	Solve Confidence Interval for different parameters.	L3	Apply
CO4	Examine hypothesis test using various statistics.	L5	Analyze
CO5	Solve Correlation and Regression Data Analytical Methods.	L3	Apply

List of Laboratory Experiments:

1. To perform descriptive statistics on data.
2. To visualize descriptive statistics on data.
3. To calculate probability using probability distribution.
4. To verify Central Limit Theorem.
5. To calculate confidence interval for different parameters.
6. To perform hypothesis test using Z statistics.
7. To perform hypothesis test using t statistics.
8. To perform hypothesis test using F statistics.
9. To perform hypothesis test using Chi-Square statistics.
10. To perform Regression Analysis on given data.

Evaluation Scheme:

Laboratory:

Continuous Assessment (TA):

Laboratory work will be based on BSMC1010L with minimum 8 to 10 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Database Management Systems (PCMC1020T)

Teaching Scheme
Lectures : 02 Hrs./week
Credits : 02

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Nil

Course Objective:

The objective of the course is to provide a comprehensive introduction to the fundamental concepts for design and development of database systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a database management system.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe core concepts of database and model a database management system through ER modeling.	L2	Understand
CO2	Apply knowledge of relational algebra and structured query language to retrieve and manage data from relational database.	L3	Apply
CO3	Demonstrate the use of normalization for database design.	L3	Apply
CO4	Use modern database techniques such as NoSQL.	L5	Evaluate

Course Contents

Unit-I Introduction — 03 Hrs.

Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Data Models, Database Users and Administrator.

Unit-II Database Design and the E-R Model — 05 Hrs.

Overview of the Design Process, The Entity-Relationship Model, Constraints, Entity Relationship Diagrams, Reduction to Relational Schemas, Schema Diagrams , Entity-Relationship Design Issues, Extended ER features.

Unit-III Introduction to the Relational Model — 03 Hrs.

Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Basic operators of Relational Algebra, Modification of Databases using Relational Algebra, Database Constraints.

Unit-IV Structured Query Language — 06 Hrs.

Overview of the SQL Query Language, SQL Data Definition, SQL Constraints, Basic Structure of SQL Queries, Additional Basic Operations, DML operations, Set operations, Aggregate Functions, Nested Sub-queries, Joins, views.

Unit-V Relational Database Design — 05 Hrs.

Features of Good Relational Designs, Problems with bad design, Decomposition using concept of functional dependencies, Armstrong's axioms, Closure of functional dependency, Closure of attribute, Introduction to process of Normalization and de-normalization, Normal Forms- 1NF, 2NF, 3NF, BCNF, De-normalization.

Unit-VI Transactions — 04 Hrs.

What is Transactions? Properties of transaction, Transaction states, Issues with concurrent executions, Schedules, Serializability- Conflict and View.

Unit-VII Introduction to NoSQL — 04 Hrs.

Overview of NoSQL, characteristics of NoSQL, Storage types of NoSQL, Implementing NoSQL in MongoDB - Managing Databases and Collections from the MongoDB shell, Finding Documents in MongoDB collection from the MongoDB shell.

Text Books:

1. Hennery Korth and Abraham Silberschatz, "Database System Concepts", 7^{th} Edition, McGraw Hill, 2019

2. Gaurav Vaish, "Getting Started with NoSQL", 1^{st} edition, Packt Publication, March 2013.

3. Brad Daylel, "NoSQL with MongoDB in 24 Hours", 1^{st} edition, Sams Teach Yourself, January 2015.

Reference Books:

1. Elmarsi and Navathe, "Fundamentals of Database Design", 7^{th} Edition, Addison Wesley, 2019.

2. Bob Bryla, Kevin Loney, "Oracle Database 12C The Complete Reference", 1^{st} edition, Tata McGraw Hill, 2017.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

Conduction of Term Test

20 Marks for the test (The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Database Management Systems Laboratory (PCMC1020L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teacher Assessment : 25 Marks
End Sem Exam : 25 Marks
Total : 50 Marks

Prerequisite: Nil

Course Objective:

The objective of the course is to provide a comprehensive introduction to the fundamental concepts for design and development of database systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information from a database management system.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Design a database schema for a given problem domain.	L6	Create
CO2	Design a database for given application using DDL and DML commands.	L6	Create
CO3	Create query using SQL commands as solutions to a broad range of query and data update problems.	L6	Create
CO4	Apply integrity constraints on a database design.	L3	Apply

List of Laboratory Experiments:

1. Creating database tables and using data types.
2. Practical Based on Data Manipulation (1. Adding data with Insert, Modify data with Update, Deleting records with Delete).
3. Practical Based on Implementing the Constraints.
4. Practical for Retrieving Data Using following clauses (Simple select clause, Accessing specific data with where, Order by, Distinct, Group by).
5. Practical Based on Aggregate Functions.
6. Practical Based on implementing all String functions.
7. Practical Based on implementing Date and Time Functions.
8. Practical Based on implementing use of UNION, INTERSECTION,SET DIFFERENCE.
9. Implement Nested Queries and all types of JOIN operation.
10. Practical Based on performing different operations on a View (Inserting values into view, Update

view, Drop view).

Evaluation Scheme:

Laboratory:

Continuous Assessment (TA):

Laboratory work will be based on PCMC1020L with minimum 8 to 10 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 05 Marks
2. Journal Submission: 05 Marks
3. Viva-voce: 05 Marks
4. Subject Specific Lab Assignment/Case Study: 10 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

End Semester Examination (ESE):

Oral / Practical examination will be based on the entire syllabus including the practicals performed during laboratory sessions.

Computer Networks (PCMC1030T)

Teaching Scheme
Lectures : 02 Hrs./week
Credits : 02

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: NA

Course Objective: This course provides the fundamental knowledge of computer networks through the understanding of each layer of computer network architecture, computer hardware and transmission systems to network applications. It also focuses on congestion control techniques, protocols and application layer functions.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the concepts of computer networks, topologies and data communication.	L2	Understand
CO2	Analyze the various error detection and correction and medium access techniques.	L4	Analyze
CO3	Apply network layer addressing and routing techniques to different network topologies.	L3	Apply
CO4	Analyze the different protocols of the layered architecture of computer networks.	L4	Analyze

Course Contents

Unit-I Introduction 02 Hrs.

Computer networks and distributed systems, Classifications of computer networks, Preliminaries of layered network structures.

Unit-II Data communication and transmission medial 02 Hrs.

Representation of data and its flow, Network Topologies, Protocols and Standards, OSI and TCP/IP model, Transmission Media.

Unit-III Multiplexing techniques for Bandwidth utilization 02 Hrs.

Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

Unit-IV Data Link Layer and Medium Access Sub Layer 07 Hrs.

Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait ARQ, Go-back–N ARQ, Selective Repeat ARQ, Piggybacking, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.

Unit-V Network Layer 09 Hrs.

Switching, Logical addressing – IPV4 addressing, subnet mask, classless inter-domain routing (CIDR), IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols—shortest path algorithm, flooding, distance vector routing algorithm, Bellman-ford algorithm, Dijkstra's algorithm, link state routing, RIP, Open shortest path first protocol (OSPF).

Unit-VI Transport Layer 05 Hrs.

Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service (QoS), QoS improving techniques - Leaky Bucket and Token Bucket algorithms.

Unit-VII Application Layer 03 Hrs.

DNS, WWW, HTTP, FTP, SMTP, SNMP.

Text Books:

1. A. S. Tanenbaum, "Computer Networks", 5^{th} Edition, Pearson Prentice Hall, 2013.
2. W. Stallings, "Data and Computer Communications", 8^{st} Pearson Prentice Hall, 2017.

Reference Books:

1. Behrouz A. Forouzan and Sophia Chung Fegan, "TCP/IP Protocol Suite", 4^{th} Edition, McGraw Hill Higher Education, 2009 (Classic).
2. Alberto Leon-Garcia and Indra Widjaja, "Communication Networks: Fundamental Concepts and Key Architectures", 2^{st} edition, McGraw-Hill, 2004 (Classic).
3. Larry L. Peterson, Bruce S. Davie, "Computer Networks - A Systems Approach", 5^{st} edition, Elsevier, 2021.
4. Mark Dye, Rick McDonald, and Anton Rufi, "Network Fundamentals", 1^{st} edition, CCNA Exploration Companion Guide, 2012.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

Conduction of Term Test

20 Marks for the test (The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Computer Networks Laboratory (PCMC1030L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teacher Assessment : 50 Marks
Total : 50 Marks

Prerequisite: NA

Course Objective: To understand the working of various communication protocols and simulate the various topologies and protocols using Network Simulator NS2.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the concepts of computer networks, topologies, data communication and error detection and correction.	L2	Understand
CO2	Design wired and wirless topology using NS2.	L6	Create
CO3	Explain Stop and Wait, TCP scenarios in NS2.	L2	Understand
CO4	Analyze the network layer addressing and routing techniques to different network topologies.	L4	Analyze
CO5	Apply the different protocols of the layered architecture of computer networks.	L3	Apply

List of Laboratory Experiments:

1. Simulate and Understand IP forwarding within a LAN.
2. Installation and Configuration of Network Simulator (NS2) in Linux environment.
3. Write a program to implement Error Detection.
4. Write a program implement Stop and Wait protocol.
5. Write a program to implement Sliding Window Protocols- Selective Repeat and Go-Back-N.
6. Write a program to find out class of a given IP address, subnet mask and first and last IP address of that block.
7. Write a program to implement any one Routing Protocol.
8. Write a program to implement Leaky Bucket algorithm.
9. Understand the working of "Connection Establishment" in TCP using a network simulator.
10. TCP/IP Sockets: Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the

Evaluation Scheme:

Laboratory:

Continuous Assessment (TA):

Laboratory work will be based on PCMC1030L with minimum 8 to 10 experiments to be incorporated.

The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Data Structures and Algorithms (PCMC1040T)

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hrs./week	Term Test : 20 Marks
Credits : 03	Teacher Assessment : 20 Marks
	End Sem Exam : 60 Marks
	Total Marks : 100 Marks

Prerequisite: Programming for Problem Solving.

Course Objective: This course imparts knowledge of data structures and algorithms so as to identify and implement appropriate data structure and determine the computational complexity of the given application.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the concept of data structures and computational complexity.	L2	Understand
CO2	Identify and implement appropriate linear data structure for the given problem.	L3	Apply
CO3	Identify and implement appropriate non-linear data structure for the given problem.	L3	Apply
CO4	Differentiate various searching and sorting algorithms.	L2	Understand

Course Contents

Unit-I Introduction — 04 Hrs.

Introduction to data structure and its importance, Classification of data structures, Basic operations., Abstract data type, Performance analysis- time and space complexity, Asymptotic Notations.

Unit-II Linear Data Structure I — 10 Hrs.

Representation of arrays in memory, Operations on arrays -Traversal, Insertion, Deletion. Introduction to Stacks, Operations on Stacks, Applications of stacks - Expression conversion and evaluation (Polish notation), Balanced parenthesis checker, Recursion, Introduction to Queue, Operation on Queues, Linear queue Circular queue, Priority queue, Application of Queues.

Unit-III Linear Data Structure II — 07 Hrs.

Introduction to linked list, Representation of linked list in memory, Singly linked list and its operations, Introduction to Doubly Linked list Linked list representation of Stack and Queues, Applications of linked list – Polynomial Addition.

Unit-IV Non-Linear Data Structures - I — 10 Hrs.

Introduction, Binary tree terminologies, Representation of Binary trees in memory, Binary Tree traversal algorithms, Construction of Binary Tree from traversals, Binary Search Tree: Insertion, Deletion, Applications of tree data structure: Expression trees, Huffman trees.

Unit-V Non- Linear Data Structures - II — 06 Hrs.

Introduction, Graph theory terminology, Representation of graph: Adjacency Matrix, Adjacency List, Graph Traversal: Breadth first search, Depth first search, Applications of Graphs (Problem Solving): Shortest path (Dijkstra's algorithm), Minimum Spanning Tree.

Unit-VI Searching and Sorting — 08 Hrs.

Linear Search, Binary Search, Selection Sort, Insertion sort, Merge sort, Introduction to Hashing.

Text Books:

1. Seymour Lipschutz, "Data structures with C", 1st Edition, Schaum's Outlines, 2017.
2. Reema Thareja, "Data Structures using C", 2nd Edition, Oxford University Press, 2014.
3. Y. Langsam, M.J. Augenstein, A.M. Tenenbaum, "Data Structures using C and C++", 2nd Edition, PHI, 2015.

Reference Books:

1. Richard F. Gillberg, Behrouz A. Forouzen, "Data Structures – A Pseudo Approach with C", 2nd Edition, Cengage Publication, 2004 (Classic).
2. Mark Allen Weiss, "Data Structures and Algorithm analysis in C++", 4th Edition, PHI, 2013.
3. Thomas, H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, "Introduction to Algorithms", 3rd Edition,MIT Press, 2009.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

Conduction of Term Test

20 Marks for the test (The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Data Structures and Algorithms Laboratory (PCMC1040L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teacher Assessment : 25 Marks
End Sem Exam : 25 Marks
Total : 50 Marks

Prerequisite: Programming for Problem Solving.

Course Objective: To introduce students the concepts of various data structures, their operations and applications for Solving real time complex problems.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Compare various searching techniques in terms of their efficiency.	L2	Understand
CO2	Illustrate Various Operations on Linear Data Structures.	L3	Apply
CO3	Apply the concepts of binary trees and binary search trees to perform tree traversals and BST operations.	L3	Apply
CO4	Implement and compare different sorting algorithms.	L2	Understand

List of Laboratory Experiments:

1. Program to implement Array operations (Insertion, Deletion, Traversing, Addition, Substraction).
2. Program to implement Stack operations (Push, Pop, Peek) and Queue operations (Enqueue, Dequeue, isEmpty, isFull).
3. Program to implement Singly and Doubly linked list operations (Insert, Delete, Search).
4. Program to Binary tree traversing (Pre-order, Post-order).
5. Program to implement the Depth First Search.
6. Program to implement the Breadth First Search.
7. Program to find the shortest path using Dijkstras Algorithm.
8. Program to implement Bubble sort and Insertion sort (Asc or Dsc).
9. Program to implement Selection Sort (Asc or Dsc).
10. Program to implement Merge sort and Quick sort (Asc or Dsc).
11. Program to find the specified number from a sorted array using the Linear Search and Binary Search.

Evaluation Scheme:

Laboratory:

Continuous Assessment (TA):

Laboratory work will be based on PCMC1040L with minimum 8 to 10 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 05 Marks
2. Journal Submission: 05 Marks
3. Viva-voce: 05 Marks
4. Subject Specific Lab Assignment/Case Study: 10 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

End Semester Examination (ESE):

Oral / Practical examination will be based on the entire syllabus including the practicals performed during laboratory sessions.

Java Programming (PCMC1050T)

Teaching Scheme	**Examination Scheme**
Lectures : 02 Hrs./week	Term Test : 20 Marks
Credits : 02	Teacher Assessment : 20 Marks
	End Sem Exam : 60 Marks
	Total Marks : 100 Marks

Prerequisite: NA.

Course Objective:

This course will impart knowledge of object-oriented programming, building graphical user interface and database connectivity using Java.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Implement programs using object-oriented programming paradigm.	L3	Apply
CO2	Implement programs using collection and generics concepts.	L3	Apply
CO3	Develop GUI application with database connectivity.	L6	Create

Course Contents

Unit-I Java Fundamentals 02 Hrs.

Overview of Java, Using Blocks of code, Lexical Issues, Java Class Libraries, Data Types, Variables and Arrays, Operators, Control Statements, Command Line Arguments.

Unit-II Classes and Methods 04 Hrs.

Class fundamentals, Declaring Objects, Constructors, Methods, Overloading of methods, Access control, Static and final variables.

Unit-III Inheritance 04 Hrs.

Inheritance Basics, method overriding, using abstract classes, using final with inheritance.

Unit-IV Packages and Interfaces 03 Hrs.

Packages, Access Protection, importing packages, Interfaces: Defining an Interface, Implementing Interfaces, Applying Interfaces, Variables in Interfaces.

Unit-V Exception Handling 02 Hrs.

Exception handling fundamentals, exception types, uncaught exceptions, using try and catch, throw, throws, finally, Java's built-in exceptions, creating your own exceptions.

Unit-VI Programs using String Handling 02 Hrs.

String Constructors, Special String operators, Character Extraction, String Comparison, Searching Strings and Modifying Strings, Buffer class, and its methods.

Unit-VII Generics and Collections 05 Hrs.

Generics: Introduction, A Generic class with Type Parameters, General Form of a Generic class, Bounded Types, Using wildcard arguments, Creating a Generic Method, Generic class Hierarchies, Collection: Collection Framework, ArrayList class, List Iterator interface, Linked List class, TreeSet class.

Unit-VIII GUI design and Event Handling using Java FX 05 Hrs.

Introduction, JavaFX Architecture, application structure, JavaFX, Text, Effect, Anim, UI controls. Types of Events, Processing Events in JavaFX, Event Delivery Process, Event Handlers.

Unit-IX Java and Database Programming 03 Hrs.

JDBC Architecture, Types of Drivers, JDBC components, JDBC classes and Interfaces, steps for

querying the database with JDBC, Database connection, querying and updating database tables, passing parameters to a statement.

Text Books:

1. Herbert Schildt, "Java The Complete Reference", 11^{th} Edition, Oracle Press, 2020.
2. Sergey Grinev, "Mastering JavaFX10", Packt Publishing, 2018.

Reference Books:

1. Cay Horstmann, "Core Java Volume I- Fundamentals", Pearson Education Inc., 2020.
2. Carl Dea, Gerrit Grunwald, José Pereda, Sean Phillips, Mark Heckler, "JavaFX 9 by Example", 3^{rd} Edition, Apress, 2017.

Evaluation Scheme:

Theory :

Continuous Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Continuous Assessment (B):

Conduction of Term Test

20 Marks for the test (The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Java Programming Laboratory (PCMC1050L)

Practical Scheme
Practical : 04 Hrs./week
Credit : 02

Examination Scheme
Teacher Assessment : 25 Marks
End Sem Exam : 25 Marks
Total : 50 Marks

Prerequisite: NA.

Course Objective:

This course will impart knowledge of object-oriented programming, building graphical user interface and database connectivity using Java.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Implement programs using object-oriented programming.	L3	Apply
CO2	Implement Interface programming.	L3	Apply
CO3	Implement programs using String Handling, collection and generics concepts.	L3	Apply
CO4	Develop GUI application with database connectivity.	L6	Create

List of Laboratory Experiments:

1. To understand and implement basic concepts like Data types, Variables and Operators in Java.
2. To understand and implement concepts like control statements and arrays in Java.
3. To understand and implement concepts like classes, methods, objects, constructors and overloading of methods for given scenario.
4. To implement the concept of Inheritance.
5. To implement the concept of Packages and Interface.
6. To implement the concept of Exception Handling.
7. To implement various String operations.
8. To implement concept of Generics in Java.
9. To implement concept of Collections in Java.
10. To implement concept of GUI using JavaFX and JDBC connectivity.

Evaluation Scheme:

Laboratory:

Continuous Assessment (TA):

Laboratory work will be based on PCMC1050L with minimum 8 to 10 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 05 Marks
2. Journal Submission: 05 Marks
3. Viva-voce: 05 Marks
4. Subject Specific Lab Assignment/Case Study: 10 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

End Semester Examination (ESE):

Oral / Practical examination will be based on the entire syllabus including the practicals performed during laboratory sessions.

Web Technologies (PCMC1060L)

Teaching Scheme
Lectures : 02 Hrs./week
Practical : 04 Hrs./week
Credits : 04

Examination Scheme
Teacher Assessment : 50 Marks
End Sem Exam : 50 Marks
Total Marks : 100 Marks

Prerequisite: Basic Programming knowledge

Course Objective: This course is designed to enable students to develop front end and back end with database of real time web applications using technologies like HTML, CSS, Javascript, PHP.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Design responsive front end of the web applications.	L6	Create
CO2	Develop business logic using server side scripting.	L6	Create
CO3	Implement database connectivity.	L3	Apply

Course Contents

Unit-I HTML5 — 05 Hrs.

Introduction to Hypertext Markup Language, Web Page Structure, Basic Tags, attributes, heading, paragraphs, formatting, images, Links, Lists, Frames, Tables, Forms, HTML5- new elements, Input Types, media.

Unit-II CSS3 — 04 Hrs.

Introduction to styles, Syntax and Rules, External, Internal/Embedded, Inline Style Sheets, conflicting styles, Property Value Forms, Font Properties, List Properties, Color and Background Properties, Text Properties, Image as bullets, Introduce different Box Model, CSS3- Backgrounds, Text effects, 2D and 3D transforms, transitions, animations. Responsive Websites design with HTML5 and CSS3.

Unit-III JavaScript and JQuery — 06 Hrs.

JavaScript Introduction, variables, operators, data types, functions, objects, condition and looping structures, functions, string, arrays, Java Script Objects, Events handling. Form validations using Java Script. JQuery Introduction, Syntax, Selectors, Events, JQuery Effects.

Unit-IV BootStrap4 — 03 Hrs.

Introduction, Grids, Tables, Images, Dropdowns, Jumbotrons.

Unit-V PHP – Server Side Programming — 08 Hrs.

Introduction, variables, data types, constants, decision and control statements, PHP functions, Arrays, Form Handling, form validations, Pattern Matching, cookies, Session Tracking, Error handling.

Unit-VI Database Access with PHP — 04 Hrs.

Introduction to MySQL database system, PHP and MySQL database connectivity (Create, connect, select, insert, update, delete, where clause, group by clause, Order by clause).

Text Books:

1. Kogent Learning Solutions Inc, "HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)", 2nd Edition, Dreamtech Press,2016.

2. Dayley Brad, Dayley Brendan, "AngularJS, JavaScript, and j Query",1st Edition, Pearson Education, 2016.

3. Jacob Lett, Bootstrap 4: "Responsive Web Design and Development", Bootstrap Creative, 1st Edition, Dream Tech Press, 2018.

4. Deane Barker, "Web Content Management Systems: Features and Practices", 1st Edition,O'Reily Media Inc, 2016.

Reference Books:

1. Ben Frain, "Responsive Web Design with HTML5 and CSS", 3rd Edition, Packt Publishing, 2020.

List of Laboratory Experiments:

1. To understand basic concepts and observing a Website. Study about its content, structure.
2. Write a HTML program to create homepage for any website using HTML tags.
3. Write a HTML program to create class time table using Tables in HTML.
4. Write a HTML program to Design Login and Registration Forms using HTML.
5. Write a program to apply styling to a web page having audio, video, Iframes by using Inline, Internal and external CSS.
6. Write a program to apply styling to HTML5 featured web page by using External CSS3 functionalities.
7. Write a javascript program to validate USER LOGIN page.
8. Write a javascript program for validating REGISTRATION FORM.
9. Write an HTML page including any required JavaScript that takes a number from text field in the range of 0 to 999 and shows it in words. It should not accept four and above digits, alphabets and special characters.
10. Implement the following web applications using PHP.

i. A web application that takes a name as input and on submit it shows a hello (name) page where name is taken from the request. It shows the start time at the right top corner of the page and provides a logout button. On clicking this button, it should show a logout page with Thank You (name) message with the duration of usage (hint: Use session to store name and time).

ii. Write a PHP Program to display current Date, Time and Day using PHP Script.

Evaluation Scheme:

Laboratory:

Teacher Assessment (TA):

Laboratory work will be based on PCMC1060L 8 to 10 experiments (and a practicum where applicable) based on the syllabus. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

End Semester Examination: Oral/Practical examination based on the entire syllabus including, the practicals performed during laboratory sessions.

Semester Project (PJMC1070L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Teacher Assessment : 25 Marks
End Sem Exam : 25 Marks
Total : 50 Marks

Course Objectives:

Students are expected to design, simulate/implement a project based on the knowledge acquired from current semester subjects.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Conduct a survey of several available literatures in the preferred field of study.	L4	Analyze
CO2	Demonstrate various/alternate approaches to complete a project.	L2	Understand
CO3	Ensure a collaborative project environment by interacting and dividing project work among team members.	L3	Apply
CO4	Present their project work in the form of a technical report / paper and thereby improve the technical communication skill.	L3	Apply
CO5	Demonstrate the ability to work in teams and manage the conduct of the research study.	L2	Understand

Semester Project:

The purpose of introducing semester project at second year level is to provide exposure to students with a variety of projects based on the knowledge acquired from the semester subjects. This activity is supposed to enrich their academic experience and bring enough maturity in student while selecting the project. Students should take this as an opportunity to develop skills in implementation, presentation and discussion of technical ideas/topics. Therefore, proper attention shall be paid to the content of semester project report which is being submitted in partial fulfillment of the requirements of the Second Year and it is imperative that a standard format be prescribed for the report.

Each student shall work on project approved by departmental committee approved by the Head of Department, a group of 03 to 05 students (max allowed: 5 students in extraordinary cases, subject to the approval of the department committee and the Head of the department) shall be allotted for each Semester Project. Each group shall submit at least 3 topics for the Semester Project. The departmental committee shall finalize one topic for every group. Semester Project Title or Theme should be based on knowledge acquired during semester. The project work shall involve sufficient work so that students get acquainted with different aspects of knowledge acquired from semester subjects.

Student is expected to:

- Select appropriate project title based on acquired knowledge from current semester subjects.
- Maintain Log Book of weekly work done(Log Book Format will be as per Table 1).
- Report weekly to the project guide along with log book.

Assessment Criteria:

- At the end of the semester, after confirmation by the project guide, each project group will submit project completion report in prescribed format for assessment to the departmental committee (including project guide).
- Assessment of the project (at the end of the semester) will be done by the departmental committee (including project guide).

Prescribed project report guidelines:

Size of report shall be of minimum 25 pages. Project Report should include appropriate content for:

- Introduction
- Literature Survey
- Related Theory
- Implementation details

- Project Outcomes
- Conclusion
- References

Assessment criteria for the departmental committee (including project guide) for Continuous Assessment:

Guide will monitor weekly progress and marks allocation will be as per Table 2.

Assessment criteria for the departmental committee (including project guide) for End Semester Exam:

Departmental committee (including project guide) will evaluate project as per Table 3.

Each group shall present/publish a paper based on the semester project in reputed/peer reviewed Conference/Journal/TechFest/Magazine before end of the semester.

Table 1: Log Book Format

Sr	Week (Start Date:End Date)	Work Done	Sign of Guide	Sign of Coordinator
1				
2				

Table 2: Continuous Assessment Table

Sr	Exam Seat No	Name of Student	Student Attendance	Log Book Maintenance	Literature Review	Depth of Understanding	Report	Total
			5	5	5	5	5	25

Table 3: Evaluation Table

Sr	Exam Seat No	Name of Student	Project Selection	Design/ Simulation/ Logic	Hardware/ Programming	Result Verification	Presentation	Total
			5	5	5	5	5	25

English Communication (BSMC1080)

Teaching Scheme
Practical : 02 Hrs./week
Credits : 01

Examination Scheme
Teacher Assessment : 50 Marks
Total Marks : 50 Marks

Prerequisite: NIL.

Course Objective: The objective of the course is to develop students' competency in the English language in relation to listening, speaking and reading.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Use their knowledge of vocabulary and grammar to articulate their ideas effectively.	L2	Understand
CO2	Demonstrate effective listening and speaking skills in oral communication situations such as speeches, conversations, power-presentations, etc.	L4	Analyze
CO3	Apply different reading techniques as needed to read passages effectively.	L3	Apply

Course Contents

Unit-I Vocabulary Building through Literature 06 Hrs.

Introduction to root and affixes, Synonyms and antonyms, Idioms and phrasal verbs, Commonly confused words, Words: denotation, connotations and usage.

Unit-II Useful Practices of Grammar 06 Hrs.

Articles and Prepositions, Subject-verb agreement, noun-pronoun agreement, Personal Pronouns (First Person, Second Person, Third Person), Modifiers – Errors in Modifiers (Misplaced, Dangling, Squinting), Redundancies and clichés, Tenses, Parallelism, Punctuation, Sentences, clauses and phrases, Active and passive voice, direct and indirect speech.

Unit-III Oral Communication 06 Hrs.

Listening skills, Public speaking, impromptu speaking, Situational dialogues.

Unit-IV Comprehension through Short Fiction 06 Hrs.

Fast Reading, Skimming, Scanning, Active Reading, Cloze Reading, SQ3R Technique.

Unit-V Presentations 06 Hrs.

Planning – occasion, audience, purpose, Outlining – introduction, main body, conclusion, Visual slide design, Verbal, non-verbal communication.

Text Books:

1. Meenakshi Raman and Sangeeta Sharma, "Technical Communication: Principles and Practice", 3rd Edition, Oxford University Press, 2015.
2. Mark Lester and Larry Beason, "The McGraw-Hill Education Handbook of English Grammar and Usage", 3rd Edition, McGraw Hill, 2019.

Reference Books:

1. Bovee Courtland and John Thill, "Business Communication Today", 14th Edition, Pearson Education, 2017.
2. John Seely, "Oxford Guide to Effective Writing and Speaking", 3rd Edition, Oxford University Press, 2013.
3. Michael Swan, "Practical English Usage", 4th Edition, Oxford University Press, 1995.
4. F.T Wood, "Remedial English Grammar", Macmillan. 2007.

List of Laboratory Experiments:

1. Group discussion activity
2. Technical description of an object activity
3. Picture describing activity
4. News writing activity
5. Role play activity
6. Expansion of an idea activity
7. Incident describing activity
8. Paragraph summarizing activity
9. Extempore activity
10. Mock press activity

Evaluation Scheme:

Laboratory:

Teacher Assessment (TA):

Laboratory work will be based on BSMC1080 with minimum 8 to 10 Practical activities based on the syllabus. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Design Thinking (BSMC1090)

Teaching Scheme
Lectures : 02 Hrs./week
Credits : Audit Course

Prerequisite: NA.

Course Objective:
The objective of this course is to understand the concept of Design thinking through engaging the students in projects/ assignments that illustrate the various pillars of Design thinking.Imbibe the higher order skill of Design thinking which they will be able to apply in various projects during their course, to create new products & services.

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Develop a human-centric approach towards problem solving.	L6	Create
CO2	Apply design thinking principles to come up with innovative solutions to problems and challenges.	L3	Apply

Course Contents

Unit-I Introduction to Design Thinking — 02 Hrs.

Design Thinking as 'Experience Innovation'

Concepts of Customer Desirability, Technological Feasibility, Business Viability and their significance.

Unit-II Case Study — 02 Hrs.

Case Study: Discussion on HBR article Design Thinking by Tim Brown (Pre-Read based analysis of all four case studies covered in article).

Unit-III Mindset Creation — 02 Hrs.

Growth Mindset vs. Fixed Mindset

Essential elements of Design Thinking Mindset

Case Study: Jeff Bezos-Amazon's approach of being Customer Obsessed.

Unit-IV Pillars of Design Thinking — 02 Hrs.

Introduction to Stages of Design Thinking based on Stanford d. School.

Unit-V Case Study for Application of Design Thinking — 02 Hrs.

IDEO Shopping Cart (Case Video followed by debrief/class discussion).

Unit-VI Empathy [A] — 02 Hrs.

Introduction to empathy

Decoding Customer Behaviour using DT (using case study method).

Unit-VII Empathy [B] — 04 Hrs.

Tools: Understanding Consumer's Unmet Needs & Pain Points: (Observation, Focused Interviews, Shadowing, Journey Mapping)

Rules and tips for each specific tool (Class activity based learning for each tool).

Unit-VIII Empathy [C] — 02 Hrs.

Debrief of Class Activity for Journey Mapping

Empathy Case Study: 'Embrace- Infant Incubator'.

Unit-IX Define — 02 Hrs.

Analysis of data gathered from Empathy stage through tools like Clustering & Affinity Diagrams.

Building Problem Statements & understanding POV.

Tools: Framing problems as 'How Might We?' questions.

Unit-X Ideate 02 Hrs.

Concept of Semi-structured approach to Ideation in DT.

Rules of Ideation.

Tools: Brainstorming, Brainwriting, Dot Voting.

Unit-XI Ideate 02 Hrs.

Class Activity to demonstrate Brainstorming & Dot Voting.

Case Study for Out of the Box Idea Generation: Steelcase.

Unit-XII Prototype 02 Hrs.

Introduction to concept of prototyping & basic techniques of rapid prototyping.

Introduction to Low fidelity vs. High fidelity prototypes and their significance in the Design Thinking process.

General information on user testing & MVPs.

Case Study for Prototyping & User Testing: Nordstorm Innovation Lab.

Unit-XIII Term End Group Project 04 Hrs.

Analysis of Design Thinking success stories from across various domains – Students are expected to build a presentation based on the design thinking led success story of their chosen company/organization.

Text Book and Reference Book:

1. Idris Mootee, "Design Thinking for Strategic Innovation", Wily, 2014.

Evaluation Scheme:

Teacher Assessment (TA):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

1. Student should submit a report on the case study declared by teacher.
2. Audit point shall be awarded, subject to submission of report of the case study declared by teacher.

Semester - II

Operating Systems (PCMC2010T)

Teaching Scheme
Lectures : 03 Hrs./week
Credits : 03

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Programming, Computer Organization and Architecture, Data Structures and Algorithms.

Course Objective:

The objective of this course is to provide an introduction to functions of the computer Operating system.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe the fundamental concepts of the operating system.	L2	Understand
CO2	Apply process scheduling strategies.	L4	Analyze
CO3	Analyze memory, I/O and file management strategies.	L2	Understand
CO4	Relate the basic concepts for an advanced operating system.	L3	Apply

Course Contents

Unit-I Operating System Overview — 02 Hrs.

Operating system objectives and functions, evolution of operating system, basic concepts: Processes, Files, System calls, Layered structure v/s Monolithic structure of OS.

Unit-II Process and Process Scheduling — 06 Hrs.

Process description, Process control block, Threads, thread management, comparison between Processes and threads, Process scheduling: Types, Study and comparison of various scheduling algorithms.

Unit-III Process concurrency — 05 Hrs.

Principles of concurrency, Mutual exclusion- hardware approaches, Semaphores, Monitors. Message passing. Classical IPC problems-Readers/Writers Problem, Producer/Consumer problem.

Unit-IV Deadlock — 04 Hrs.

Principles of deadlock, Deadlock prevention, Deadlock avoidance: Banker's algorithm, Deadlock detection and recovery, Dining Philosopher problem.

Unit-V Memory Management System — 06 Hrs.

Memory management requirements, memory partitioning, Paging, Segmentation, Page replacement algorithms.

Unit-VI I/O Management and Disk Scheduling — 03 Hrs.

I/O devices, organization of the I/O function, I/O buffering, disk structure and disk scheduling algorithms.

Unit-VII File Management — 02 Hrs.

Overview, File organization, File directories, File sharing.

Unit-VIII Advanced Operating System — 02 Hrs.

Real time operating system, Distributed Operating System.

Text Books:

1. Silberschatz A. Galvin, "Operating Systems Principles", 10^{th} Edition, P Wiley Publications, 2018.

2. William Stallings, "Operating Systems: Internals and Design Principles", 8^{th} Edition, Pearson Education, 2015.

Reference Books:

1. Andrew S. Tannenbaum, Modern Operating System, 4^{th} Edition, PHI, 2014.

2. https://www.vsbec.com/oldwebsite/wp-content/uploads/2019/02/OS-LAB.pdf

Evaluation Scheme:

Theory :

Teacher Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Teacher Assessment (B):

Conduction of Term Test

20 Marks for the test(The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Operating Systems Laboratory (PCMC2010L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Continuous Assessment : 50 Marks
Total : 50 Marks

Prerequisite: Programming, Computer Organization and Architecture, Data Structures and Algorithms.

Course Objective:

The objective of this course is to understand commands of Linux and shell script, process,thread concepts and disk sheduling algoritham concepts.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Demonstrate the fundamental of Unix commands and system calls.	L3	Understand
CO2	Solve the scheduling algorithms for given problems.	L3	Apply
CO3	Explain the synchronous concept using process and threads.	L2	Understand
CO4	Illustrate an algorithm to detect and avoid deadlock.	L4	Apply
CO5	Demonstrate the various disk scheduling algorithms.	L2	Understand

List of Laboratory Experiments:

1. Hands on UNIX commands.
2. Basic Shell Program.
3. Shell programming for file handling.
4. Write a program to implement CPU scheduling algorithm First Come Firs Serve (FCFS)..
5. Write a program to implement CPU scheduling algorithm Shortest Job First (SJF).
6. Write a program to implement page replacement algorithm (optimal page replacement algorithm).
7. Write a program for banker's algorithm.
8. Write a Program to implement algorithm for deadlock detection.
9. Write a program to implement memory management algorithm (Best fit).
10. Write a program to implement memory management algorithm (First fit).
11. Write a program to implement Disk Scheduling algorithms First Come First serve.
12. Write a program to implement disk scheduling algorithms Shortest Seek Time First.

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PCMC2010L with minimum 10 to 12 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Software Engineering (PCMC2020T)

Teaching Scheme
Lectures : 03 Hrs./week
Credits : 03

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Programming for Problem Solving.

Course Objective:

The objective of the course is to familiarize the students with Software engineering principles, practices and standards required to develop a quality software. The course also intends to develop the ability and skills for the task of requirement analysis, design and modelling.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain the characteristics of various process models used in the development of a Software project.	L2	Understand
CO2	Demonstrate an understanding of various Analysis and Design models that provide a basis for the software development.	L2	Understand
CO3	Apply UML concepts for modeling software functionality for a given scenario.	L3	Apply
CO4	Create test cases for validating the working of the software developed.	L6	Create

Course Contents

Unit-I Importance of Software Engineering — 03 Hrs.

Role of Software, Categories of Software, Legacy Software, Software Myth.

Unit-II Prescriptive Process Models — 07 Hrs.

Process Framework, Capability Maturity Model Integration, Waterfall Model, Incremental and RAD Models, Prototyping, Spiral Model, Concurrent Development Model.

Agile Process Models

Agility, Agile Process, Extreme Programming, Adaptive Software Development, SCRUM.

Unit-III UML Modeling — 08 Hrs.

Visual modeling with UML, Use case model, Modeling with classes, Identifying classes and objects of real world problems, Defining events and attributes, process of creating class diagram.

State diagram, Activity diagram, Modeling interaction and behaviour, Sequence and Collaboration Diagram.

Unit-IV Requirement Analysis and Design — 03 Hrs.

Requirement Engineering tasks, Elements of Analysis Model, Data Modeling Concepts, Data Flow Model, and Control Flow Model.

Unit-V Architectural Design — 03 Hrs.

Software Architecture, Data Design, Architectural Styles, Representing System in Context, Refining Architecture into Components, Mapping Data Flow into a Software Architecture.

Unit-VI User Interface Design — 02 Hrs.

Golden Rules for User Interface Design, Interface Analysis and Design, Interface Design Steps.

Unit-VII Testing Strategies and Software Quality — 04 Hrs.

Test Strategies for Software, Verification and Validation Testing, Unit Testing, Integration Testing, System Testing.

McCall's Software Quality Factors, ISO 9126 Quality Factors, Process and Project Metrics, Metrics for Software Quality, SQA Activities, CMMI.

Text Books:

1. Pressman and Roger S., "Software engineering: a practitioner's approach", 9^{th} Edition, McGraw Hill, 2019.

Reference Books:

1. Sommerville and Ian., "Software engineering", 10^{th} Edition, Pearson Education, 2017.

Evaluation Scheme:

Theory :

Teacher Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Teacher Assessment (B):

Conduction of Term Test

20 Marks for the test(The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Software Engineering Laboratory (PCMC2020L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Continuous Assessment : 50 Marks
Total : 50 Marks

Prerequisite: Programming for Problem Solving

Course Objective:

The objective of this course is to Provides a measure of the resource requirement of a software product in an efficient way and Reusability makes sure that the module can be used in multiple applications.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand and Demonstrate basic knowledge in Software Engineering.	L2	Understand
CO2	Identify requirements, analyse, design and develop the software project.	L3	Apply
CO3	Plan, schedule and track the progress of the projects.	L3	Apply
CO4	Identify risks, manage the configuration and change in software.	L3	Apply
CO5	Apply testing principles on software projects.	L3	Apply
CO6	Apply latest tools and techniques on software projects.	L3	Apply

List of Laboratory Experiments:

1. Prepare detailed statement of problem for the selected / allotted mini project and identify suitable process model for the same with justification.
2. Develop Software Requirement Specification (SRS) document in IEEE format for the project.
3. Use project management tool to prepare schedule for the project.
4. Prepare RMMM plan for the project.
5. Identify scenarios and develop UML Use case and Class Diagram for the project.
6. Identify and study and usage of any Design phase CASE tool.
7. Draw DFD (upto 2 levels) and prepare Data Dictionary for the project.
8. Develop Activity / State Transition diagram for the project.
9. Develop Sequence and Collaboration diagram for the project.
10. Develop test cases for the project using testing techniques.

11. Develop test cases for various white box and black box testing Techniques.
12. Develop a tool which can be used for quantification of all the non-functional requirements.

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PCMC2020L with minimum 10 to 12 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Advanced Web Technologies (PCMC2030L)

Practical Scheme
Practical : 04 Hrs./week
Credits : 02

Examination Scheme
Continuous Assessment : 50 Marks
End Sem Exam : 50 Marks
Total Marks : 100 Marks

Prerequisite: Web Technologies

Course Objective:

This course is designed to enhance and enrich skills in Web programming. Students will learn to develop Web applications using advanced technologies like Angular JS, AJAX, Node JS and database programming with Mysql and MongoDB.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Construct front end GUI using client-side scripting.	L6	Create
CO2	Develop web applications using server-side scripting.	L6	Create
CO3	Design backend database for web application.	L6	Create

Course Contents

Unit-I React JS — 10 Hrs.

Introduction, Render HTML, Components – Class and Function, Props, Events, Forms, Hooks, React Router

Unit-II JSON — 03 Hrs.

Introduction, Syntax, JSON vs XML, Data Types, Parse, Stringify, objects, Arrays, JSON HTML.

Unit-III AJAX (Asynchronous JavaScript and XML) — 03 Hrs.

Introduction, Use of Ajax in Web Applications, XML, Http Request and Response, Ajax XML file.

Unit-IV Node JS — 05 Hrs.

Introduction, Modules, HTTP module, URL module, File system, NPM, Events and Event Emitter, Exception handling.

Unit-V MYSQL database with Node.js — 04 Hrs.

Introduction, Express.js, create database, create table, insert, update select, delete, where, order by, drop table.

Unit-VI MongoDB — 05 Hrs.

Introduction to NoSQL databases, MongoDB Overview, data types, data modeling, CRUD Operations in MongoDB, Indexing and Aggregation, MongoDB with Node JS.

Text Books:

1. Amos Q. Haviv, Adrian Mejia, Robert Onodi, "Web Application Development with MEAN", Illustrated Edition,Packt Publishing,2017.

2. Colin J Ihrig , Adam Bretz, "Full Stack JavaScript Development With MEAN: MongoDB, Express, AngularJS, and Node.JS",1st Edition, Sitepoint Publishers, 2015.

Reference Books:

1. David Stokes, "MySQL and JSON: A Practical Programming Guide", 1st Edition, Mc Graw Hill, 2017.

2. Greg Lim, "Beginning Node JS, Express and Mongo Development", 1st Edition, 2019.

3. DT Editorial Services, "HTML5 Black book, covers CSS 3, Javascript, XML, XHTML, AJAX, PHP and JQuery", 2nd Edition, Dreamtech Press, 2016.

List of Laboratory Experiments:

1. Write a Program of React Using JavaScript and HTML.
2. Write a program to creat a Form using React.
3. Write a Program on a JSON, a JSONArray, a JSONObject, and a JSONPair.
4. Design and develop dynamic web application using AJAX and HTML.
5. Create a react application for the student management system having registration, login, contact, about pages and implement routing to navigate through these pages.
6. Create a upload file form using Node js.
7. Design a email page using Ract and Node js.
8. implement http request and response using AJAX.
9. implement database connectivity using node js.
10. implement database connectivity using mongoDB and Node js
11. Perform CURD operation using mongoDB.
12. implement aggregation function using mongoDB.
13. Mini Project

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PCMC2030L 10 to 12 experiments (and a practicum where applicable) based on the syllabus. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks

2. Journal Submission: 10 Marks

3. Viva-voce: 10 Marks

4. Subject Specific Lab Assignment/Case Study/Mini Project: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

End Semester Examination: Oral/Practical examination based on the entire syllabus including, the practicals performed during laboratory sessions.

Artificial Intelligence (PCMC2040T)

Teaching Scheme
Lectures : 03 Hrs./week
Credits : 03

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Data Structure and Algorithms, Programming for Problem Solving.

Course Objective: To impart knowledge of the fundamental theories, methods and techniques in the field of Artificial Intelligence and to design and develop AI systems.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Explain agents and environment in AI	L2	Understand
CO2	Apply various heuristic and searching strategies to solve problems in the AI domain	L3	Apply
CO3	Design knowledge base using expert systems and game playing	L6	Create
CO4	Implement supervised and unsupervised learning approaches to solve problems in the AI domain	L3	Apply

Course Contents

Unit-I Introduction to Artificial Intelligence — 04 Hrs.

Definitions of AI, Applications of Artificial Intelligence, Concept of Modeling, Inference and Learning. Introduction to Machine learning and Deep learning as a subset of AI. Intelligent agents, concept of rationality, structure of agents, Environment, Properties of task environment. Real world Examples of agents and environments.

Unit-II Solving problems by Searching — 07 Hrs.

Problem solving agents, searching for solutions. Uninformed Search: Breadth first search, Depth first search, Uniform cost search Informed Search: Informed search strategies, Greedy Best First Search, A* search, Hill climbing, problems with hill climbing such as Local Maxima, Plateau, Ridge, Genetic Algorithm. Adversarial Search: Introduction to the Domain of a game, optimal decisions in games, minimax algorithm, Alpha-beta pruning.

Unit-III Knowledge Representation — 06 Hrs.

Propositional logic, Theory of first order logic, Inference in First order logic, Forward and Backward chaining, Resolution.

Unit-IV Constraint satisfaction Problem (CSP) — 05 Hrs.

Constraint satisfaction problems, Backtracking search for CSPs, variables and value ordering, propagating information through constraints, Intelligent backtracking, Local search for CSP. Case study on CSP.

Unit-V Learning — 05 Hrs.

Inductive learning, Types of learning, supervised - decision trees classification, unsupervised learning – K-means clustering.

Unit-VI Expert system — 03 Hrs.

Definition, model, characteristics, architecture, development process, limitations, examples of expert systems.

Text Books:

1. Stuart Russel and Peter Norvig, Artificial Intelligence: A Modern Approach, 4th edition, 2021, Pearson.

2. Dan W. Patterson, Introduction to Artificial Intelligence and Expert System, Pearson, 2015.

Reference Books:

1. Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition, Tata Mc-Graw Hill, 2015.

2. Patrick H. Winston, Artificial Intelligence, 3rd edition, Pearson,2002.

Evaluation Scheme:

Theory :

Teacher Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Teacher Assessment (B):

Conduction of Term Test

20 Marks for the test(The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Artificial Intelligence Laboratory (PCMC2040L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Continuous Assessment : 50 Marks
Total : 50 Marks

Prerequisite: Data Structure and Algorithms, Programming for Problem Solving.

Course Objective: To impart knowledge of the fundamental theories, methods and techniques in the field of Artificial Intelligence and to design and develop AI systems.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Explore the methods of implementing algorithms using artificial intelligence techniques.	L2	Apply
CO2	Illustrate search algorithms	L3	Apply
CO3	Demonstrate building of intelligent agents	L2	Understand
CO4	Design and implement search strategies.	L3	Apply

List of Laboratory Experiments:

1. Introduction to Artificial Intellegiance and its Application.
2. AI Intelligent Agent and Environment.
3. Problem Solving by searching - BFS.
4. Problem Solving by searching - DFS.
5. Heuristic Search Algorithm.
6. Min Max Algotithm.
7. Write a Program to find the solution for travelling salesman Problem.
8. Write a program to implement 8 puzzle problem.
9. Write a program to implement A* Algorithm.
10. Write a program to implement Hill Climbing Algorithm.
11. To Implement Forward Chaining Algorithm.
12. To Implement Backward Chaining Algorithm.

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PCMC2040L with minimum 10 to 12 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Advanced Java (PCMC2050T)

Teaching Scheme
Lectures : 03 Hrs./week
Credits : 03

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Basic Java Programming

Course Objective: The objective of this course is to help students to develop web application using Servlets and JSP. Learning Hibernate and Spring frameworks will make students ready for the industry.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Design and Develop the Web based application	L6	Create
CO2	Develop Java application to interact with database	L6	Create
CO3	Develop applications using Java Frameworks	L6	Create

Course Contents

Unit-I Servlet — 05 Hrs.

Overview of Servlet Technology, Servlet life cycle, Downloading the Java Servlet Development Kit, the Servlet API, Handling HTTP GET Requests, Handling HTTP POST Requests, Cookies, Session Tracking.

Unit-II JSP — 05 Hrs.

Basics of JSP, Life cycle of JSP, JSP API, Scripting elements, Implicit Objects, Directive Elements, Action Elements.

Unit-III Hibernate Framework — 06 Hrs.

Introduction, ORM, Hibernate Architecture, Hibernate Application, Persistent classes and mapping, , Hibernate CRUD, Inheritance and Collection Mapping, Hibernate Query Language (HQL), HCQL, Hibernate Caching.

Unit-IV Spring Fundamentals — 02 Hrs.

Introduction to Spring Framework, Spring Architecture, Inversion of Control (IoC) and Spring Core Container, Dependency Injection.

Unit-V Spring AOP — 03 Hrs.

Introduction to Aspect Oriented Programming (AOP), Spring Advice API, working with Spring Point cut and Advisors, Spring 2.0 AOP support.

Unit-VI Spring JDBC and DAO Module — 04 Hrs.

Data Access Object (DAO), DAO support in Spring Framework, Introduction Spring JDBC modules, JdbcTemplate and execute SQL queries, Implementing Hibernate with spring, Spring Boot JDBC.

Unit-VII Spring Web MVC Framework — 05 Hrs.

Introduction, Spring Web MVC Architecture, Understanding the Spring MVC Project Structure, Understanding DispatcherServlet and Request Processing workflow, Controllers and Validations, Describing View- Resolver and View, Configuring Spring Web MVC using Annotations.

Text Books:

1. Santosh Kumar K, "Spring and Hibernate", 2nd Edition, McGraw Hill Education, 2017.
2. Joel Murach, Michael Urban, "Murach's Java Servlets and JSP," 3rd Edition, Shroff/Mike Murach Associates, 2016

Reference Books:

1. Luliana Cosmina, Rob Harrop, Chris Schaefer, Clarence Ho, "Pro Spring 5: An In-Depth Guide to the Spring Framework and Its Tools", Apress., 2017.
2. Kogent Learning Solutions Inc. "Java Server Programming Java EE 7, Black book", Dreamtech Press, 2014.

Evaluation Scheme:

Theory :

Teacher Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Teacher Assessment (B):

Conduction of Term Test

20 Marks for the test(The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.
2. Total duration allotted for writing the paper is 3 hrs.

Advanced Java Laboratory (PCMC2050L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Continuous Assessment : 25 Marks
End Sem Exam : 25 Marks
Total : 50 Marks

Prerequisite: Basic Java Programming

Course Objective: The objective of this course is to help students to develop web application using Servlets and JSP. Learning Hibernate and Spring frameworks will make students ready for the industry.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Create dynamic web pages, using Servlets and JSP.	L6	Create
CO2	Develop MVC frameworks, which gives the opportunity to reuse the codes for quick development.	L6	Create
CO3	Develop dynamic web application with database connectivity.	L6	Create
CO4	implement Java classes and object associations to relational database tables with Hibernate mapping files.	L3	Apply

List of Laboratory Experiments:

1. Write a JAVA Servlet Program to implement and demonstrate get() and Post methods(Using HTTP Servlet Class).

2. Write a JAVA Servlet Program using cookies to remember user preferences.

3. Design a registrationform.jsp page with all user registration information and after filling all the details, transfer all the filled information to registrationsuccess.jsp page.(use Implicit objects)

4. Write a JAVA JSP program to print 10 even and 10 odd numbers.

5. Write a JAVA JSP program to implement verification of a particular user login and display a welcome page.

6. Write JSP Program to demonstrate the Implicit objects (Predefined objects).

7. To implement simple hibernate program.

8. To implement spring application using eclipse IDE.

9. Write a java program to demonstrate AOP(Aspect Oriented Programming).

10. To develop a program using MVC framework.

11. Write a java program to create a employee data and display it using MVC Framework.
12. To implement database operation using hibernate.
13. Mini Project

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PCMC2050L with minimum 10 to 12 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 05 Marks
2. Journal Submission: 05 Marks
3. Viva-voce: 05 Marks
4. Subject Specific Lab Assignment/Case Study/Mini Project: 10 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

End Semester Examination (ESE):

Oral / Practical examination will be based on the entire syllabus including the practicals performed during laboratory sessions.

Data Analysis with Python (PCMC2060L)

Practical Scheme
Practical : 04 Hrs./week
Credits : 02

Examination Scheme
Continuous Assessment : 50 Marks
End Sem Exam : 50 Marks
Total Marks : 100 Marks

Prerequisite: Knowledge of Programming

Course Objective:

The course is designed to provide basic knowledge of Python programming and how to analyze and visualize data using Python programming.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand the basic syntax and data structures.	L2	Understand
CO2	Implement database connectivity in python.	L3	Apply
CO3	Identify appropriate data analysis and visualization technique for given scenario.	L4	Analyze

Course Contents

Unit-I Introduction to Python — 03 Hrs.

Installation, Features, Python Interpreter and its working, Syntax and Semantics, comments, imports, indentation, variables, data types, math arithmetic, operators (comparison, logical, bitwise), expressions, print, formatting print, generating random numbers.

Unit-II Python Data Structures and Flow Control — 04 Hrs.

Strings, Lists, Dictionaries, Tuples, Sets; Slicing; properties, operations and methods of these data structures. Conditional blocks using if, else and elif, Simple For loop, For loop using Ranges, While loops, Loop manipulation using Pass, Continue, Break List and dictionary comprehension.

Unit-III Python Functions — 03 Hrs.

Defining and calling functions, return, scope, function arguments (args and kwargs), recursive functions; Built-in functions: Lambda, Map, Filter, Reduce, Zip, Enumerate.

Unit-IV Database connectivity using Python — 04 Hrs.

Database connectivity using SQLite3 and performing basic CRUD operations.

Unit-V Data Analysis using numpy and pandas — 10 Hrs.

Introduction Numpy Array, Difference between list and Numpy Array, Operations on 1-D and 2-D Numpy Array, Introduction to Pandas and DataFrame, Understanding Data, Importing and Exporting Data, Preprocessing of Data, Data cleaning, Data normalization in python, Exploratory data Analysis, Groupby in Python.

Unit-VI Data Visualization — 06 Hrs.

Introduction to Data Visualization, Introduction to Matplotlib and line plot.

Basic Visualization tools

Area Plot, Histogram and bar charts.

Advanced Visualization tools

Waffle Charts, World Cloud, Seaborn and Regression Plot.

Text Books:

1. Dr. R. Nageswara Rao, "Core Python Programming", 2nd Edition, Dreamtech Pres, Wiley Publication, 2018.
2. Paul Barry, "Head first Python: A Brain Friendly guide",2nd Edition, O'Reilly publication, 2016.
3. Martin C. Brown, "Python: The Complete Reference",4th Edition, McGrawHill Education, 2018.

Reference Books:

1. Bill Lubanovic, "Introducing Python Modern computing in simple packages", 3rd Edition, O'Reilly publication, 2019.
2. Wes McKinney, "Python for Data Analysis", 2nd Edition,O'Reilly publication, 2017.
3. Jeeva Jose, P. Sojan Lal, "Introduction to Computing and Problem Solving with Python", 1st Edition, Khanna Publication, 2019.

List of Laboratory Experiments:

1. Data Types, Data Scope, Input / Output Statements and Operators (Arithmetic, Relational, Logical, Bitwise).
2. Conditional Statements (if, if...else, nested if), Looping Statements (while, for, nested loops, break, continue).
3. Programs on data structures.
4. Data Analysis with data structures.
5. Programs using python functions.
6. Basic programs on Data base connectivity .
7. Application development using Data base connectivity.
8. Built-in Package: Numpy (1-d, 2-d array).
9. Built-in Package: Pandas (dataframes).
10. Data analysis- Preprocessing, Cleaning, Normalization.
11. Data analysis- Exploratory data analysis.
12. Data Visualization.
13. Mini Project

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PCMC2060L, 10 to 12 experiments (and a practicum where applicable) based on the syllabus. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study/Mini Project: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

End Semester Examination: Oral/Practical examination based on the entire syllabus including, the practicals performed during laboratory sessions.

Mobile Application Development (PCMC2070L)

Practical Scheme
Practical : 04 Hrs./week
Credits : 02

Examination Scheme
Continuous Assessment : 50 Marks
End Sem Exam : 50 Marks
Total Marks : 100 Marks

Prerequisite: Knowledge of Programming

Course Objective:

The objective of this course is to gain insights into the Android and IOS Operating systems and to understand the components and layouts of these applications. It will also help the students to implement database connectivity with real-time databases and further develop an Android/ IOS based application.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Design user interfaces using Android Studio and Flutter.	L6	Create
CO2	Implement file handling using text and images.	L3	Apply
CO3	Implement database connectivity and location tracking.	L3	Apply
CO4	Develop a full-fledged Android/ IOS application.	L6	Create

Course Contents

Unit-I Configuration of Development Platform — 02 Hrs.

Starting an Android Application project/IOS Application Project: Installing the Application Development Kit (Android Studio / IOS).

Unit-II Understanding the different components for application design — 10 Hrs.

Screen Layout, Simple Controls, Creating and Configuring an Android Emulator, Communicating with the Emulator. Controls and the User Interface: Check Boxes, Radio Buttons, Spinner, Date Picker, Touch Listener, Graphics. Multiscreen Applications: Stretching the Screen, Pop-up Dialog Boxes and Toasts, Menus.

Unit-III Inputting Images and File handling — 04 Hrs.

Displaying Images, Using Images stored on the Android Device, File handling using .txt and .csv files.

Unit-IV Location Tracking — 02 Hrs.

Location Tracking using Google maps.

Unit-V Introduction to Flutter — 04 Hrs.

Understanding the configuration and UI development using Flutter.

Unit-VI Processing using Databases — 05 Hrs.

Database connectivity using SQLite 3 and Firebase.

Unit-VII Application publishing — 03 Hrs.

Client-Server Applications and Publishing your application.

Text Books:

1. James C. Sheusi, "Android Application Development for Java Programmers", 1st Edition, Delmar Cengage Learning, 2012.

2. Reto Meier, "Professional Android 2 Application Development", 1st Edition, Wiley India Pvt Ltd.

Reference Books:

1. Jonathan Simon, "Head First Android Development", 1st Edition, O'Reilly Media, 2012.

2. Barry Surd, "Android Application Development All in one for Dummies", 3rd Edition, July 2020.

3. Mark L Murphy, "Beginning Android", 1st Edition, Apress, 2009.

List of Laboratory Experiments:

1. Create an application to design a Visiting Card.
2. Create an application for SIGN up activity with Username and Password.
3. Create an application like a phone dialler with CALL and SAVE buttons.
4. Develop an application that uses GUI components, Font and Colours.
5. Develop an application that uses Layout Managers and event listeners.
6. Write an application that draws basic graphical primitives on the screen.
7. Develop an application that makes use of databases.
8. Develop a native application that uses GPS location information.
9. Implement an application that writes data to the SD card.
10. Develop a mobile application to send an Email.
11. Develop a Mobile application for simple Calculator.
12. Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.
13. Mini Project

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PCMC2070L 10 to 12 experiments (and a practicum where applicable) based on the syllabus. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks

2. Journal Submission: 10 Marks

3. Viva-voce: 10 Marks

4. Subject Specific Lab Assignment/Case Study/Mini Project: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

End Semester Examination: Oral/Practical examination based on the entire syllabus including, the practicals performed during laboratory sessions.

Employability Skill Development Program (HMMC2080L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Continuous Assessment : 50 Marks
Total : 50 Marks

Prerequisites: Basic Mathematics, Basic knowledge of C programming.

Course Objectives:

1. To enhance the problem solving skills with real life examples.
2. To enable the students to express their thoughts and knowledge on various platforms.
3. Able to describe the basic database management system.
4. Able to implement basic programming project using python.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Analyze and solve the logical problem based on words, venn diagram etc.	L4	Analyze
CO2	Understand and solve the English comprehension, Sentence completion, Sentence Correction problems.	L2 and L4	Understand, Analyze
CO3	Understand and illustrate the concept of Exception Handling, Garbage collection.	L2 and L3	Understand, Apply
CO4	Understand and describe the fundamental of DBMS, NoSql, MongoDB.	L2	Understand

Course Contents

Unit-I 10 Hrs

Reasoning : Data sufficiency, Logical Deductions, Logical Sequence of Words, Logical Venn Diagrams, Statement and Arguments, Statement and Assumptions, Statement and Conclusions Syllogism.

English: Reading Comprehension, Para Jumbles, Cloze Test, Tenses/ Voice/ Speech, Prepositions/ SVA/ Articles, Vocab /Verbal Analogy, Sentence completion, Sentence Correction.

Unit-II 10 Hrs

Modules: Introduction, Importance of Modularity programming, Import keyword, User defined modules creation, Function based modules, Classes based modules, Connecting modules, 'from' keyword.

Files Handling: Reading file char by character, Reading file line by line, Modes of files, Writing into file, Append data to a file, Reading CSV file, Pickling and Un pickling **Garbage collection:** Introduction, Importance of manual GC, Self-referenced objects, 'gc' module, Collect() method, Threshold function.

Unit III 8 Hrs

Collections Framework: Introduction to collection of data types, Importance of Data processing, DS algorithms introduction. **List:** Create a list, Adding elements, Deleting elements, Pre-defined functionality of List, Nested List, Immutability and Mutability of List. **Set:** The functionality of Set object, Frozen set, Dictionaries, Create a dictionary, Adding elements **Dict:** Pre-defined functions of Dict class, Programs using Collection types.

Unit IV 8 Hrs

Tkinter: – GUI Types of Layouts , Create Labels and Display images, Create Buttons, Create Events, StringVar class, Calculator program using GUI.

Basic ML AI including Projects: Iterators, Nested functions, Generators, Closures,Decorators, Basic ML and AI, PIP, Visualization etc...

Project Domain(Per domain 1 or 2 project).

- ML/AI Based Projects
- Data Analysis Based projects
- Test Summarization based projects
- web scrapping and crawling

Unit V 10 Hrs

DBMS Using Python: Introduction to Mysql, Mysql – Python connectivity, DDL, DRL, DML, Transaction management examples (rollback and commit), GUI –Database connectivity.

NoSql Using Python: Installation and Configuration, MongoDB Tools, Collection and Documents, CRUD and the MongoDB Shell, Introduction to CRUD, Introduction to the MongoDB API, Creating a Database, Collection and Documents.

Data Modelling and Schema Design: MongoDB Database References Model Tree Structures, MongoDB Analysing Queries, Atomic Operations, Map Reduce, Text Search, Regular Expression, Capped Collections Administration MongoDB Deployment and Cluster setup, MongoDB GridFS, Trident Spout, Working with Replica Sets, MongoDB Sharding.

Text Books:

1. Dr. R. Nageswara Rao, "Core Python Programming", 2^{nd} Edition, Dreamtech Pres, Wiley Publication, 2018.
2. Hennery Korth and Abraham Silberschatz, "Database System Concepts", 7^{th} Edition, McGraw Hill, 2019
3. Brad Daylel, "NoSQL with MongoDB in 24 Hours", 1^{st} edition, Sams Teach Yourself, January 2015.

Reference Books:

1. Dr. R S Aggarwal, "Quantitative Aptitude for Competitive Examinations", S Chand Publication.
2. M. G. Venkateshmurthy, "Programming Techniques through C", Pearson Publication.
3. Behrouz Forouzan, "A Computer Science Structure Programming Approaches using C", Behrouz Forouzan, Cengage Learning.
4. Yashwant Kanetkar, "Let Us C", Yashwant Kanetkar, BPB Publication.

Evaluation Scheme:

Continuous Assessment(CA):

Continuous Assessment (CA) will carry weightage of 50 marks. The components of CA and the distribution of marks for term work shall be as follows:

1. MCQ Test based on Aptitude: 20 Marks
2. MCQ Test based on Programming skills: 20 Marks
3. Mock Interview: 10 Marks
4. Total Marks: 50 Marks

Any other component recommended by BOS and approved by Dean Academics.

Advanced Database Management System (Elective-I) (PEMC20901T)

Teaching Scheme
Lectures : 03 Hrs./week
Credits : 03

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Database Management Systems

Course Objective: This course involves study of advanced aspects of database systems like parallel and distributed Databases, webbase systems, object-oriented database systems. This also imparts knowledge on the design and implementation of database systems based on the client-server architecture and distributed database systems.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Describe concepts of advanced database systems	L2	Understand
CO2	Explain database administration processes	L2	Understand
CO3	Design and implement advanced relational databases	L6	Create
CO4	Implement parallel, distributed databases on the web for advanced applications.	L3	Apply

Course Contents

Unit-I The Extended Entity Relationship Model and Object Model 05 Hrs.

The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, subclasses, super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Relationship types of degree higher than two.

Unit-II PL/SQL Programming 06 Hrs.

Introduction, Compare with SQL, PL/SQL block structure, conditional control, EXIT Statement, Iterative control, GOTO Statements, Exception Handling.

Unit-III Cursors, Procedures and Functions 06 Hrs.

Concept of a cursor, Types of cursors (Implicit, Explicit) cursor for loops, Procedure: Concept, creating procedures, IN-OUT variables, altering and dropping procedures, Functions: Concept, creating, altering and dropping functions, View: concept, types, creating, altering and dropping views, Trigger: Creating, altering and dropping Triggers.

Unit-IV Object-Oriented Databases 03 Hrs.

Overview of Object-Oriented concepts, object identity, object structure and type constructions, Database schema design for OODBMS, OQL, Systems comparison of RDBMS, OODBMS, ORDBMS.

Unit-V Parallel and Distributed Databases and Client-Server Architecture 05 Hrs.

Architectures for parallel database, Parallel query evaluation; Parallelizing individual operations, Sorting, Joins; Distributed database concepts, Data fragmentation, Replication, and allocation techniques for distributed database design; Query processing in distributed databases; concurrency control and Recovery in distributed databases. An overview of Client-Server architecture.

Unit-VI Information Retrieval & XML data 05 Hrs.

Overview of XML; XML Semi structure Model (Tree Model), XML DTD; XML Schema, Querying XML Data (XPath, XQuery).

Text Books:

1. Elmasri and Navathe, "Fundamentals of Database Systems", 7^{th} Edition, Pearson Education, 2016.

2. Evan Bayross, "SQL, PL/SQL the Programming Language of Oracle", BPB, 2003.

Reference Books:

1. Korth, Silberchatz, Sudarshan, "Database System Concepts", 6^{th} edition, McGraw-Hill, 2011.

2. R. Ramakrishnan, "Database Management Systems", McGraw Hill, 3^{rd} edition, 2003.

3. Ivan Bayross, Oracle Developer , BPB, 2000.

Evaluation Scheme:

Theory :

Teacher Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Teacher Assessment (B):

Conduction of Term Test

20 Marks for the test(The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Advanced Database Management System Laboratory (Elective-I) (PEMC20901L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Continuous Assessment : 50 Marks
Total : 50 Marks

Prerequisite: Database Mangement System

Course Objective:

The objective of this course is to understand professional and commercial databases, Implement query optimization and Design distributed database system to perform fragmentation.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Design distributed database system to perform fragmentation.	L3	Create
CO2	Illustrate query optimization.	L2	Apply
CO3	Apply integrity constraints on database design.	L3	Apply

List of Laboratory Experiments:

1. To perform practical Based on performing different operations on a View.
2. To perform practical based on implementing use of Procedures.
3. Practical Based on implementing use of functions.
4. Write a PL/SQL block to calculate the incentive of an employee whose ID is 110.
5. Write a PL/SQL block to describe the usage of LIKE operator including wildcard characters and escape character.
6. To find the total strength of students using functions present in different sections in a school .
7. Write a PL/SQL Program to Find Factorial of a Number using function.
8. Practical Based on implementing use of Triggers.
9. Practical Based on implementing Cursor.
10. To perform fragmentation on database.
11. Implementation of Replication transparency in DDB.
12. Crate Query Execution on XML Database.

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PEMC20901L with minimum 10 to 12 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Internet of Things (Elective-I) (PEMC20902T)

Teaching Scheme
Lectures : 03 Hrs./week
Credits : 03

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Computer Networks, Basic Programming Skills, Basic Electronics

Course Objective: Students will gain advanced knowledge of key theories and concepts of the Internet of Things. They will acquire specialized problem-solving skills, being able to analyse and design new solutions based on Internet of Things technology.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Understand introduction to IoT architecture and M2M technology	L2	Understand
CO2	Understand IoT protocols	L2	Understand
CO3	Identify and analyse the various cloud components for IoT	L4	Analyze
CO4	Understand the security issues in IOT	L2	Understand

Course Contents

Unit-I Introduction to IoT — 04 Hrs.

IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals.

Unit-II IoT Fundamentals — 06 Hrs.

IoT reference Model - IoT Reference Architecture Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views, Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service (XaaS), M2M and IoT Analytics, Knowledge Management.

Unit-III IoT protocols — 05 Hrs.

Networking Architectures: Star, Mesh, Tree, Networking Protocols: TCP/IP, 6LowPan, RPL, Thread, IoT Devices Application-Level Protocols: MQTT, CoAP, REST.

Unit-IV IoT and Cloud — 06 Hrs.

IoT Devices and Cloud access, Cloud components, Device to Gateway –Short Range Wireless (Cell Phone as Gateway, Dedicated Wireless Access Point), Gateway to Cloud- Long Range connectivity (Wired, Cellular, Satellite, WAN), Direct Device to Cloud connectivity, IoT Device Power Constraints, Powered and Unpowered Sensors, Power Harvesting, Energy Storage Technologies.

Unit-V IoT Security — 06 Hrs.

Security Requirements in IoT Architecture - Security in Enabling Technologies - Security Concerns in IoT Applications. Security Architecture in the Internet of Things - Security Requirements in IoT - Insufficient Authentication/Authorization - Insecure Access Control - Attacks Specific to IoT, Encryption standards-AES, DES, RSA, Hashing, Authentication.

Unit-VI Case study — 03 Hrs.

Smart Cities, Smart Home Industrial Control, Smart Social Networks, Big Data Analytics.

Text Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014.

2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014

Reference Books:

1. Peter Waher, "Learning Internet of Things", 1st Edition, PACKT publishing.

2. Bernd Scholz-Reiter, Florian Michahelles,"Architecting the Internet of Things" , ISBN 978-3-642- 19156-5, e-ISBN 978-3-642-19157-2, 1st Edition, Springer, 2011.

3. Brian Russel, Drew Van Duren, "Practical Internet of Things Security (Kindle Edition)", 1st Edition, Packt publishing, 2016.

4. Francis da Costa, "Rethinking the Internet of Things: A scalable Approach to Connecting Everything", 1st Edition, Apress Publications , 2013

Evaluation Scheme:

Theory :

Teacher Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Teacher Assessment (B):

Conduction of Term Test

20 Marks for the test(The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Internet of Things Laboratory (Elective-I) (PEMC20902L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Continuous Assessment : 50 Marks
Total : 50 Marks

10 to 12 experiments (and a practicum where applicable) based on the syllabus.

Suggested Experiments:

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PEMC20902L with minimum 10 to 12 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.

Human Computer Interaction (Elective-I) (PEMC20903T)

Teaching Scheme
Lectures : 03 Hrs./week
Credits : 03

Examination Scheme
Term Test : 20 Marks
Teacher Assessment : 20 Marks
End Sem Exam : 60 Marks
Total Marks : 100 Marks

Prerequisite: Software Engineering.

Course Objective: This course gives an introduction to Human Computer Interface and provides an understanding of user centered design process. It will help students to design and evaluate interactive systems keeping users in mind.

Course Outcomes:

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

CO	Course Outcomes	Blooms Level	Blooms Description
CO1	Discuss the importance of good interface design for human computer interaction	L2	Understand
CO2	Apply design principles, models and evaluation techniques to user interface design	L3	Apply
CO3	Identify various aspects of user experience and design thinking in HCI	L4	Analyze
CO4	Design user interface application using HCI concept	L6	Create

Course Contents

Unit-I Introduction — 04 Hrs.

Introduction to HCI, Importance of good interface design, Notions-Human, Computer & Interaction. Multi-disciplinary Applications of HCI.

Unit-II Design Process & Interaction — 05 Hrs.

Introduction of design, Types of design: User-centered design, Participatory design, Scenario based design, Interaction design basics, users & persona, scenario.

Unit-III Design Rules — 06 Hrs.

Cognitive psychology – Visual perception, Ergonomics, Memory Models, Shneiderman's design rules, Norman's 7 principles for designing.

Unit-IV HCI Models — 03 Hrs.

GOMS model, Hierarchical Task Analysis.

Unit-V Evaluation Techniques in HCI — 06 Hrs.

Need of evaluation in interface designing, introduction to quantitative and qualitative research methods in designing, Types of evaluation techniques-Heuristics evaluation model, Experimental evaluation model.

Unit-VI User Experience — 04 Hrs.

Basic understanding of UX in HCI, Role of UI and UX in HCI designing, Elements of UX.

Unit-VII Designing for Emerging Technologies — 02 Hrs.

Voice based UI, designing for wearables.

Text Books:

1. Helen Sharp, Jennifer Preece, Yvonne Rogers, "Interaction Design: Beyond Human-Computer Interaction", 5^{th} Edition, Wiley Publication, 2019.

2. Alan Dix, Janet Finlay, Gregory Abowd, Russel Beale, "Human–Computer Interaction", 4^{th} Edition,Pearson Education, 2009.

Reference Books:

1. Ben Shneiderman, "Designing the User Interface: Strategies for Effective Human- Computer Interaction", 3^{rd} Edition, Pearson Education, 2014.

2. Follett Jonathan (Ed), "Designing for Emerging Technologies", 1^{st} Edition, O'Reilly, 2014.

3. Levy Jaime, "UX Strategy: How to Devise Innovative Digital Products that People Want", 1^{st} Edition, O'Reilly, 2015.

Evaluation Scheme:

Theory :

Teacher Assessment (A):

Subject teacher will declare Teacher Assessment criteria at the start of semester.

Teacher Assessment (B):

Conduction of Term Test

20 Marks for the test(The Two-term tests will be conducted of 30 Marks each, considering an average of these marks and scaled down to 20 Marks)

Term Test (TT) (for 20 Marks)

End Semester Examination (C):

1. Question paper based on the entire syllabus, summing up to 60 marks.

2. Total duration allotted for writing the paper is 3 hrs.

Human Computer Interaction Laboratory (Elective-I) (PEMC20903L)

Practical Scheme
Practical : 02 Hrs./week
Credit : 01

Examination Scheme
Continuousr Assessment : 50 Marks
Total : 50 Marks

10 to 12 experiments (and a practicum where applicable) based on the syllabus.

Suggested Experiments:

Evaluation Scheme:

Laboratory:

Continuous Assessment (CA):

Laboratory work will be based on PEMC20903L with minimum 10 to 12 experiments to be incorporated. The distribution of marks for term work shall be as follows:

1. Performance in Experiments: 10 Marks
2. Journal Submission: 10 Marks
3. Viva-voce: 10 Marks
4. Subject Specific Lab Assignment/Case Study: 20 Marks

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work.