MANAKULA VINAYAGAR INSTITUTE OF TECHNOLOGY

(Autonomous Institution)

CURRICULUM & SYLLABUS

MASTER OF COMPUTER APPLICATIONS

REGULATIONS 2025 (R - 2025) FOR

MCA

(With effect from academic year 2025-26)

PONDICHERRY UNIVERSITY (A CENTRAL UNIVERSITY), PUDUCHERRY

MASTER OF COMPUTER APPLICATIONS (MCA)

COURSE STRUCTURE

S.No.	Course Category	PU R-2023	MIT Proposed R-2025
1	Core Courses	55	72
2	Domain Specific Elective Courses	12	09
3	Employability/ Skill Enhancement/ Certificate Courses	04	05
4	Bridge Courses	-	04
5	Out Reach Programme: (Conferences/Symposiums/Technical	01	-
	Total	72	81

M.C.A. CURRICULUM

BRIDGE COURSES			
Sl. No.	Course Code	Course Title	Hours
1	25PMCY01	Fundamentals of Computer Programming	15
2	25PMCY02	Introduction to Problem Solving	15
3	25PMCY03	Introduction to Computer Organization	15
4	25PMCY04	Fundamentals of Web Applications	15

SEMESTER I								Marks		
S.No	Course Code	Course Title	Category	L	T	P	Credi	IA	ESM	TM
THEORY										
1.	25PMCT11	Mathematical Foundation of Computer Applications	CC	3	0	0	4	40	60	100
2.	25PMCT12	Object oriented Programming in C++	CC	3	0	0	3	40	60	100
3.	25PMCT13	Database Technology	CC	3	0	0	3	40	60	100
4.	25PMCT14	Operating Systems	CC	3	0	0	3	40	60	100
5.	25PMCT15	Software Engineering	CC	3	0	0	3	40	60	100
PRACTICAL										
6.	25PMCP11	Object Oriented Programming in C++ Lab	CC	0	0	4	2	60	40	100
7.	25PMCP12	Database Technology Lab	CC	0	0	4	2	60	40	100
8.	25PMCP13	Operating Systems Lab	CC	0	0	4	2	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES										
9.	25PEET11	Career Development Skills	EEC	0	0	2	0	100	-	100
Total							22	480	420	900

SEMESTER-WISE CREDIT DISTRIBUTION

Semester	I	II	III	IV	Total Credits
Credits	22	24	23	12	81

Total number of credits required to complete Master of Computer Applications: 81 credits

SEMSTER-I

(THEORY)

Year	**I**	**Course Code:25PMCT11**	**Credits**	**4**
Sem.	**I**	**Course Title:Mathematical Foundation of ComputerApplications**	**Hours**	**60**
			Category	**CC**
Course Prerequisites, if any	Basic knowledge of algebra, logic, and introductory programming concept			
Internal Assessment Marks: 40	**End Semester Marks:60**	**Duration of ESA (Theory): 03 hrs.**		

Course Outcome

On the successful completion of the course students will be to

CO1	Apply matrix operations, determine rank, and compute eigen values / eigen vectors to solve systems of equations.	Apply (K3)
CO2	Understand and apply set theory relations functions and combinatorics in mathematical problem - solving	Apply (K3)
CO3	Construct and analyze logical row propositions using propositional and predicate calculus	Analyze (K4)
CO4	Classify grammars and apply formal language theory to understand language structure and their limitations	Analyze (K4)
CO5	Design and evaluate finite automata and prove equivalence between FDAs, NFAs and regular languages	Analyze (K4)

Unit No	**Course Content**	**Hours**
	Theory Component	
Unit I	**MATRIX ALGEBRA** Matrices - Rank of a matrix - Solving system of equations – Eigen values and Eigenvectors - Cayley - Hamilton theorem - Inverse of a matrix.	**12**
Unit II	**BASIC SET THEORY** Basic definitions - Venn diagrams and set operations - Laws of set theory - Principle of inclusion and exclusion – Partitions - Permutation and combination – Relations - Properties of relations - Matrices of relations - Closure operations on relations - Functions - Injective, subjective and objective functions.	**12**

Unit III	**MATHEMATICAL LOGIC** Propositions and logical operators -Truth table - Propositions generated by a set - Equivalence and implication - Basic laws - Some more connectives - Functionally complete set of connectives -Normal forms - Proofs in propositional calculus - Predicate calculus.	**12**
Unit IV	**FORMAL LANGUAGES** Languages and grammars - Phrase structure grammar - Classification of grammars -Pumping lemma for regular languages - Context free languages.	**12**
Unit V	**FINITE STATE AUTOMATA** Finite state automata - Deterministic finite state automata (DFA) - Non deterministic finite state automata (NFA) - Equivalence of DFA and NFA - Equivalence of NFA and Regular Language	**12**

TEXT BOOKS

1. Kenneth H. Rosen, "Discrete Mathematics and Its Applications", 7th Edition, McGraw Hill Education, 2017.
2. J.E. Hopcroft, R. Motwani, and J.D. Ullman, "Introduction to Automata Theory, Languages, and Computation", 3rd Edition, Pearson Education, 2008.

REFERENCE BOOKS

1. Seymour Lipschutz and Marc Lars Lipson, "Discrete Mathematics", Schaum's Outline Series, McGraw Hill Education, 2017.
2. C.L. Liu and D.P. Mohapatra, "Elements of Discrete Mathematics: A Computer Oriented Approach", 4th Edition, McGraw Hill, 2019.
3. Judith L. Gersting, "Mathematical Structures for Computer Science", 7th Edition, W.H. Freeman and Company, 2014.

EVALUTION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Project	Presentation & Viva	**5**
Attendance		**5**
Total		**40**

Year	**I**	**Course Code: 25PMCT12** **Course Title:Object Oriented Programming in C++**	**Credits**	**3**
Sem	**I**		**Hours**	**45**
			Category	**CC**
Course Prerequisites, if any	Basic knowledge of programming concepts and problem-solving using C language.			
Internal Assessment Marks: 40	**End Semester Marks: 60**	**Duration of ESA (Theory): 03 hrs.** **Duration of ESA (Practical): 03 hrs.**		

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand the basic concepts of Object-Oriented Programming and core C++ features.	Understand (K2)
CO2	Design and implement classes, objects, and related concepts such as static members, friend functions, and scope resolution in C++ programs.	Apply (K3)
CO3	Apply the concepts of constructors, destructors, and various types of inheritance in C++ to design and implement efficient, reusable, and well-structured object-oriented programs.	Apply (K3)
CO4	Apply dynamic memory management, pointers, and polymorphism concepts in C++ to design and implement efficient object-oriented programs.	Apply (K3)
CO5	Apply the concepts of templates and exception handling in C++ by designing and implementing generic classes/functions and robust error-handling mechanisms.	Apply (K3)

Unit No	**Course Content**	**Hours**
	Theory Component	
Unit I	**Introduction to Object Oriented Programming:** Object oriented paradigm-Differences between Object Oriented Programming and Procedure oriented programming, Basic concepts of Object-Oriented Programming, Encapsulation, Inheritance and Polymorphism, Benefits of OOP, Structure of a C++ program, namespace, Data types, C++ tokens, Identifiers, Variables, Constants, Operators,structures & Loops.	9

Unit II	**Functions, Classes and Objects:** Introduction of Classes, Class Definition, Defining a Members, Objects, Access Control, Class Scope- Scope Resolution Operator, Inline functions, Memory Allocation for Objects, Static Data Members,-Static Member Functions, Arrays of Objects, Objects as Function Arguments, Friend Functions.	9
Unit III	**Constructors, Destructors, Inheritance:** Introduction to Constructors, Default Constructors, Parameterized Constructors, Copy Constructors, Multiple Constructors in a Class, Destructors. **Inheritance:** Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi-level Inheritance, Hierarchical Inheritance, Hybrid Inheritance.	9
Unit IV	**Pointers, Virtual Functions and Polymorphism:** Introduction to Memory management, new operator and delete operator, Pointers to objects, Pointers to Derived Classes, Polymorphism, Compile time polymorphism, Run time polymorphism, Virtual Functions, Overloading- Function Overloading, Operator overloading.	9
Unit V	**Templatesand Exception handling:** Introduction to Templates, Class Templates, Class Templates with Multiple Parameters, Function- Templates, Function Templates with Multiple Parameters.	9

TEXT BOOKS

1. Object Oriented Programming with C++ by Balagurusamy, the Complete Reference, 4th Edition, Herbert Schildt, and TMH.

REFERENCE BOOKS

1. C++ Primer, 3rd Edition, S.B.Lippman and J.Lajoie, Pearson Education.
2. The C++ Programming Language, 3rd Edition, B.Stroutstrup, Pearson Education

EVALUATION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Project	Presentation & Viva	**5**
Attendance		**5**
Total		**40**

Year	**I**	**Course Code: 25PMCT13** **Course Title: DATABASE TECHNOLOGY**	**Credits**	**3**
Sem	**I**		**Hours**	**45**
			Category	**CC**
Course Prerequisites, if any	Basic knowledge of programming concepts			
Internal Assessment Marks: 40	**End Semester Marks:60**	**Duration of ESA (Theory): 03 hrs.** **Duration of ESA (Practical): 03 hrs.**		

Course Outcome

On the successful completion of the course, students will be able to

CO1	To understand the basic concepts and terminology related to DBMS and Relational Database Design	Understand (K2)
CO2	To the design and implement Relational Algebra	Design (K3)
CO3	To understand advanced DBMS techniques to construct tables and write effective queries, forms, and reports	Understand (K2)
CO4	To understandadvanced Database Application Development	Understand (K2)
CO5	To understand Internet Application.	Understand (K2)

Unit No.	**Course Content**	**Hours**
	Theory Component	
Unit I	**Data information and information processing** Introduction-definition of information-quality of information-information processing. Introduction to data base management systems-why database need-characteristics of data in a data base-database management system-why DBMS-types of database models-hierarchical model-network model-relational model-dataflow diagram (DFD).	9
Unit II	**Entity Relationship Model** Entity-Relationshipmodelling-introduction-ER model-components of an ER model-ER modeling symbols, data normalization-1NF, 2NF, 3NF, BOYCECODDNF, 4NF, 5NF.	9

Unit III	**Relational Model and SQL** RDBMS terminology-SQL Introduction-SQL Data types-DDL, DML, TCL, DCL-codd's rules-tables, views, indexes, null-queries & sub queries-aggregate functions-joins & unions.	9
Unit IV	**PL/SQL programming** PL/SQL Blocks-PL/SQL Architecture, variables, data types, control structures-cursors-exception-triggers-types of triggers-procedures and packages-QBE.	9
Unit V	**Introduction to Database applications** Clouding Computing, IOT (internet of things), BIGDATA-Data Mining-Distributed Databases-Mobile Databases- Spatial and Multimedia Databases.	9

TEXT BOOKS

1. Alexis leon& Mathews leon,(2002),*"Database Management Systems***",** Leon Vikas Publishing House, Chennai.
2. A. Silberschatz, H. Korth, S. Sudarshan, Database system concepts, 5/e, McGraw Hill, 2008.

REFERENCE BOOKS

1. G.K.Gupta(2001)*," Data Base Management System*",McGraw Hill Education,4th reprint 2015,Pearson Education Asia, Bangalore.
2. Ragu Rama krishnan and Johannes,(2003), *"Data Base Management System*", McGraw Hill International Edition, New Delhi.
3. Abraham Siberschatz, Henry F.Korth, S.Sundarshan(2016), *"Database System Concepts",* Tata Mc-graw Hill Publication (6th Edition). New Delhi.
4. Bibin Desai,(1990)*,"An introduction to Database System",*Tata Mc-graw Hill Publication (4th Edition). New Delhi.

EVALUATION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Project	Presentation & Viva	**5**
Attendance		**5**
Total		**40**

Year	**I**	**Course Code:** 25PMCT14 **Course Title:OPERATING SYSTEM**	**Credits**	**3**
Sem.	**I**		**Hours**	**45**
			Category	**CC**
Course Prerequisites, if any	Familiarity with fundamentals of computers			
Internal Assessment Marks: 40	**End Semester Marks: 60**	**Duration of ESA (Theory): 03 hrs.** **Duration of ESA (Practical): 03 hrs.**		

Course Outcome

- Ability to understand various functions of operating systems.
- Analyze various memory management and process management functions.

CO1	Describe the fundamental concepts, structures, and types of operating systems along with process management and CPU scheduling.	Understand (K2)
CO2	Analyze process synchronization problems, apply semaphores/monitors, and evaluate deadlock handling strategies.	Apply (K3)
CO3	Apply memory management techniques such as paging, segmentation, and virtual memory to optimize system performance.	Apply (K3)
CO4	Perform and apply disk scheduling algorithms, file system structures, and distributed file system mechanisms.	Apply (K3)
CO5	Apply and illustrate case studies of different operating systems (Linux, Windows, Android, Virtual Machines) with respect to design principles, process, and memory management.	Apply (K3)

Unit No.	**Course Content**	**Hours**
	Theory Component	
Unit I	**Introduction** Types of operating systems-operating systems Structures-Systems components operating systems services-System calls-Systems programs-Processes-process concept- process scheduling-operation on processes-co-operating processes-Inter process communicationsCPU Scheduling-Scheduling criteria-Scheduling algorithms-Multiple-processor Scheduling.	9
Unit II	**Process Synchronization** Critical Section problem – Semaphores-Classical problems of synchronization-criticalRegions-Monitors-Deadlock Characterization-Deadlock Handling-Deadlock PreventionDeadlock Avoidance-Deadlock Detection-Deadlock Recovery –Threads-	9

	Multithreading Models.	
Unit III	**Memory Management** Memory Management-Swapping-Contiguous Memory Allocation-Paging-SegmentationVirtual Memory-Demand Paging-Page Replacement-Thrashing.	9
Unit IV	**Disk Scheduling and Distributed Systems** Disk Structures-Disk Scheduling-File Systems Interface-File Concepts-Access MethodsDirectory Structures-File System Implementation-File Systems Structures-Directory Implementation-Allocation Methods-Free Space Management-Distributed File SystemsNaming and Transparency-Remote File Accesses- Stateful Versus Stateless Service-File replication.	9
Unit V	**Case Studies** Linux System-design Principles- process Management-File Systems- MS Windows -Systems Structures-Process management-memory Management-Android OS-Virtual machine OS.	9

TEXT BOOKS

1. Abraham Silberschatz Peter B Galvin, G. Gagne," Operating Systems Concepts", 7th Edition, Addison Wesley, 2010.
2. Andrew S. Tanenbaum, "Modern operating Systems", 3rd Edition, PHI Learning Pvt. Ltd., 2008.

REFERENCE BOOKS

1. William Stallings, "Operating Systems: Internals and Design Principles", 7thEdition, Prentice Hall, 2011.
2. H M Deital, P J Deital and D R Choffnes, "Operating Systems", 3rd Edition, Pearson Education, 2011.
3. D M Dhamdhere, "Operating Systems: A Concept-based Approach", 2nd Edition, Tata McGraw-Hill, 2007.

EVALUATION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Project	Presentation & Viva	**5**
Attendance		**5**
Total		**40**

Year	**I**	**Course Code: 25PMCT15** **Course Title: SOFTWARE ENGINEERING**	**Credits**	**3**
Sem.	**I**		**Hours**	**45**
			Category	**CC**
Course Prerequisites, if any	Basic knowledge of programming and object-oriented concepts			
Internal Assessment Marks: 40	End Semester Marks:60	Duration of ESA (Theory): 03 hrs.		

Course Outcome

On the successful completion of the course, students will be able to

CO1	Describe the fundamental principles of software engineering and compare various software process models.	Understand (K2)
CO2	Apply requirements engineering techniques and create basic UML diagrams for system modelling.	Apply (K3)
CO3	Design software architecture and components using design principles, patterns, and user interface guidelines.	Apply (K3)
CO4	Perform software testing, create test cases, and explain software maintenance and reengineering concepts.	Apply (K3)
CO5	Apply software project management principles including cost estimation, risk analysis, and quality assurance.	Apply (K3)

Unit No.	**Course Content**	**Hours**
	Theory Component	
Unit I	**INTRODUCTION TO SOFTWARE ENGINEERING** Definition and Characteristics of Software – Software Engineering – Software Process Framework – Process Activities – Software Development Life Cycle (SDLC) – Software Life Cycle Models: Waterfall, Incremental, Spiral, RAD, Agile – Software Process Assessment – Software Myths.	**9**
Unit II	**REQUIREMENTS ENGINEERING AND MODELING** Requirements Engineering Process – Types of Requirements: Functional and Non-functional – Requirements Elicitation Techniques – Software Requirement Specification (SRS) – Requirement Validation–Use Case Modeling – System Modeling: Data Flow Diagrams (DFD), Use Case Diagrams, Class Diagrams.	**9**

Unit III	**SOFTWARE DESIGN AND CODING PRACTICES** Design Concepts – Modularity, Abstraction, Coupling and Cohesion – Architectural Design – Design Patterns (Singleton, Factory, MVC) – User Interface Design – Component-Level Design – Coding Standards – Best Coding Practices – Code Documentation.	**9**
Unit IV	**SOFTWARE TESTING AND MAINTENANCE** Software Testing Objectives – Levels of Testing: Unit, Integration, System, Acceptance – Black-box and White-box Testing – Test Case Design – Debugging Techniques – Introduction to Automated Testing – Software Maintenance: Types and Challenges – Software Reengineering.	**9**
Unit V	**SOFTWARE PROJECT MANAGEMENT AND QUALITY ASSURANCE** Project Planning – Size, Effort and Cost Estimation – COCOMO Model – Scheduling and Risk Management – Configuration Management – Software Quality Assurance (SQA) – Software Metrics – ISO 9126 Quality Model – Capability Maturity Model (CMM/CMMI).	**9**

TEXT BOOKS

1. Ian Sommerville, "Software Engineering", 10th Edition, Pearson Education, 2022.
2. Roger S. Pressman & Bruce R. Maxim, "Software Engineering: A Practitioner's Approach", 8th Edition, McGraw Hill, 2019.

REFERENCE BOOKS

1. Pankaj Jalote, "An Integrated Approach to Software Engineering", 4th Edition, Narosa Publishing, 2020.
2. Rajib Mall, "Fundamentals of Software Engineering", 5th Edition, PHI Learning, 2021

EVALUATION

Assessment Methodology	Assessment Tools	Marks
Test		25
MCQ unit vise 10 questions	Moodle / Google Form	5
Assignment	Report	5
Attendance		5
Total		40

SEMSTER - I

(PRACTICAL)

Year	**I**	**Course Code: 25PMCP11** **Course Title: OBJECT ORIENTED PROGRAMMING IN C++ Lab**	**Credits**	**2**
Sem.	**I**		**Hours**	**45**
			Category	**CC**
Course Prerequisites, if any	Basic programming language.			
Internal Assessment Marks: 40	**End Semester Marks:40**	**Duration of ESA (Practical): 03 hrs.**		

Course Outcome

On the successful completion of the course, students will be able to

CO1	Understand and differentiate between procedural and object-oriented programming concepts.	Understand (K2)
CO2	Implement classes with constructors, destructors, and demonstrate inheritance types.	Apply (K3)
CO3	Use inline functions, scope resolution, and friend functions effectively in C++ programs.	Apply (K3)
CO4	Apply polymorphism through virtual functions and base class pointers for dynamic behaviour.	Apply (K3)
CO5	Develop generic programs using templates and handle errors using exception handling mechanisms.	Apply (K3)

LIST OF EXPERIMENTS

Practical Component

1. Write a program demonstrating the difference between procedural and object-oriented programming.
2. Implement inline functions and use scope resolution operator.
3. Demonstrate usage of friend functions accessing private data.
4. Write a class that demonstrates:

- Default constructor
- Parameterized constructor
- Copy constructor
- Destructor

Print messages when constructors and destructor are called.

5. Inheritance Types

Create a base class and implement:

a. Single inheritance

b. Multiple inheritance

c. Multilevel inheritance

Demonstrate access to base class members by derived classes.

6. Demonstrate runtime polymorphism via base class pointer.

7. Write a generic function template for swapping two values.

8. Write a class template for a simple container class (like Box) with multiple parameters.

9. Write a program demonstrating:

- Throwing and catching exceptions.
- Multiple exception types (e.g., integer, string).
- Rethrowing exceptions.
- Using exception specifications.

10. Micro Project

EVALUATION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Mini Project	Demo & Viva	**5**
Attendance		**5**
Total		**40**

Year	**I**	**Course Code: 25PMCP12** **Course Title: DATABASE TECHNOLOGY LAB**	**Credits**	**2**
Sem.	**I**		**Hours**	**45**
			Category	**CC**
Course Prerequisites, if any	Basic knowledge of programming constructs (like loops, conditionals) Fundamentals of relational algebra and data types Mathematical/logical reasoning skills from Higher Secondary Level			
Internal Assessment Marks: 40	**End Semester Marks:40**	**Duration of ESA (Practical): 03 hrs.**		

Course Outcome

On the successful completion of the course, students will be able to

CO1	Design and implement SQL queries for data creation, manipulation, and retrieval using different clauses.	Apply (K3)
CO2	Construct PL/SQL programs using control structures, loops, and exception handling mechanisms.	Apply (K3)
CO3	Develop and use cursors, procedures, functions, and database triggers in PL/SQL.	Apply (K3)
CO4	Design and execute mini applications like employee, student, and inventory database systems.	Apply (K3)
CO5	Apply key constraints and normalization techniques in real-time database projects.	Apply (K3)

LIST OF EXPERIMENTS

Practical Component

1. Create an employee table in SQL and process at least 10 queries.
2. Create a program using conditional control, iterative controls and sequential controls.
3. Create a program using exception handling.
4. Create a program using explicit cursors and implicit cursor.
5. Create a program using PL/SQL tables and records.
6. Create a program using data base trigger.
7. Create a program using sub queries having clauses.
8. Create a program using Aggregate functions sum, Average etc.
9. Create a program using primary key constraint and foreign key constraint.
10. Create a DFD(Data Flow Diagram) level 0 & level 1 program for student management system
11. Create a DFD level 2 program for inventory management system.

EVALUATION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Mini Project	Demo & Viva	**5**
Attendance		**5**
Total		**40**

Year	**I**	**Course Code: 25PMCP13**	**Credits**	**2**
Sem.	**I**	**Course Title: OPERATING SYSTEM (LAB)**	**Hours**	**45**
			Category	**CC**
Course Prerequisites, if any	Basic knowledge of programming constructs			
Internal Assessment Marks: 40	End Semester Marks:40	Duration of ESA (Practical): 03 hrs.		

Course Outcome

On the successful completion of the course, students will be able to

CO1	Demonstrate the ability to implement and test system calls and file management operations.	Apply (K3)
CO2	Apply knowledge of process synchronization techniques by simulating classical problems such as the Dining Philosophers and Producer-Consumer problems.	Apply (K3)
CO3	To Implement and analyze different CPU scheduling algorithms (FCFS, SJF,Round Robin, Priority) to understand their performance and efficiency.	Apply (K3)
CO4	Develop problem-solving skills in resource allocation and process management by applying operating system concepts through programming.	Apply (K3)
CO5	Evaluate and compare the effectiveness of various scheduling and synchronization algorithms in terms of fairness, throughput, and resource utilization.	Apply (K3)

LIST OF EXPERIMENTS

Practical Component

1. Implementation of System Calls
2. Implementation of File Permissions
3. Implementation of File Operations
4. Implementation of File Copy and Move
5. Implementation of Dining Philosophers Problem
6. Implementation of Producer-Consumer Problem
7. Implementation of First in First Serve Algorithm
8. Implementation of Shortest Job First Scheduling Algorithm
9. Implementation of Round Robin Scheduling Method
10. Implementation of Priority Scheduling Algorithm

EVALUATION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
MCQ unit vise 10 questions	Moodle / Google Form	5
Mini Project	Demo & Viva	5
Attendance		5
Total		40

Year	**I**	**Course Code:25PEET11**	**Credits**	**0**
Sem.	**I**	**Course Title: CAREER DEVELOPMENT SKILLS**	**Hours**	**50**
			Category	**EEC**
Course Prerequisites, if any	Basic communication skills and foundational knowledge of workplace behavior			
Internal Assessment Marks: 100				

Course Outcome After completing this course, the student will be able to		
CO1	Help students assess themselves, explore career options, and set actionable goals through structured planning.	Apply (K3)
CO2	Develop motivation, enhance personality effectiveness, and instill discipline for personal and professional growth.	Apply (K3)
CO3	Build awareness and practice of grooming, hygiene, positive attitudes, manners, and professional behavior.	Analyze (K4)
CO4	Strengthen self-awareness, time and stress management, and emotional intelligence for balanced personal development.	Analyze (K4)
CO5	Introduce students to higher education paths, competitive	Analyze (K4)
Unit No	**Course Content**	**Hours**
Theory Component		
Unit I	Career Planning: Introduction to Career Planning - Self-Assessment for Career Planning - Exploring Career Options - Developing a Career Plan Goal Settings: Understanding Goal Setting - Setting Effective Goals - Action Plan Development - Practical Exercises	**10**

Unit II	Motivation – I: Definition and Importance of Motivation - Types of Motivation - Theories of Motivation - Factors Affecting Motivation Personality Effectiveness: Components of Personality Effectiveness - Communication Skills - Interpersonal Skills - Practical Exercises Building Personality and Discipline: Introduction to Personality Development - Building Positive Habits - Discipline and Self-Control - Practical Application	**10**
Unit III	Grooming, Hygiene and Cleanliness: Personal Hygiene Practices - Body Grooming Techniques - Environmental Cleanliness - Mental and Social Impact of Grooming and Hygiene Attitudes, Manners and Behaviour: Understanding Attitudes - Developing Positive Attitudes - Manners and Etiquette - Procedures and Protocols	**10**
Unit IV	Self-Awareness & Self Confidence: Introduction to Self-Awareness - Understanding Strengths and Weaknesses - Building Self-Confidence - Practical Application Time Management: Introduction to Time Management - Planning and Prioritizing Tasks - Overcoming Procrastination - Practical Time Management Stress Management: Understanding Stress - Stress Management Techniques - Coping Strategies - Practical Application Emotional Intelligence: Introduction to Emotional Intelligence - Managing Emotions - Social Awareness and Relationship Management - Practical Exercises	**10**
Unit V	Introduction to Higher Education, Competitive Exams: Overview of Higher Education - Competitive Exams Overview - Exam Preparation Techniques Introduction to Entrepreneurship: Understanding Entrepreneurship - Developing a Business Idea - Business Planning	**10**
TEXT BOOKS		
1. Soft skills for Managers by Dr. T. KALYANA CHAKRAVATHI 2. Personal Development and Soft Skills by BARUN K MITRA, Oxford Higher Education		

REFERENCE BOOKS
3. The Emotionally Intelligent Workplace by DANIEL GOLEMAN 4. Communication skills and soft skills an integrated approach by E. SURESH KUMAR, P. SREEHARI, J SAVITHRI 5. Top Talking in English (international communication skills) by CHARLES T. RAJENDRA 6. Soft skills by RAJ LAKSHMI SURYAVANSHI, Gurucool Publishing

EVALUTION

Assessment Methodology	**Assessment Tools**	**Marks**
Assignment or Activity or Presentation		**50**
Report		**40**
Attendance		**10**
Total		**100**

SEMESTER II								Marks		
SI .No	**IA**	**IA**	**IA**	**L**	**T**	**P**	**Credits**	**IA**	**ESM**	**TM**
THEORY										
1.	25PMCT21	Data Structures and Algorithms	CC	3	0	0	3	40	60	100
2.	25PMCT22	Computer Networks	CC	3	0	0	3	40	60	100
3.	25PMCT23	JAVA Programming	CC	3	0	0	3	40	60	100
4.	25PMCT24	Artificial Intelligence	CC	3	0	0	3	40	60	100
5.	25PMCL21	EL I- Database Systems in Big Data	DSE	3	0	0	3	40	60	100
6.	25PMCL22	EL II -Web Services Computing	DSE	3	0	0	3	40	60	100
PRACTICAL										
7.	25PMCP21	Data Structures and Algorithms Lab	CC	0	0	4	2	60	40	100
8.	25PMCP22	Java Programming Lab	CC	0	0	4	2	60	40	100
9.	25PMCP23	Artificial Intelligence Lab	CC	0	0	4	2	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES										
10.	25PEET21	Personality Development Skill	EEC	0	0	2	0	100	-	100
11.	25PCCC21	Certificate Course - IBM - Block Chain	EEC	0	0	1	0	100	-	100
Total							**24**	**620**	**480**	**1100**

DOMAIN SPECIFIC ELECTIVE COURSES						
S.No	**Course Code**	**Course Title**	**L**	**T**	**P**	**Credits**
STREAM 1: INFORMATION SECURITY						
1.	25PMCLxx	Fundamentals of Cryptography	3	0	0	3
2.	25PMCLxx	Mobile and Digital Forensics	3	0	0	3
3.	25PMCLxx	Database and Application Security	3	0	0	3
4.	25PMCLxx	Information Security Management	3	0	0	3
5.	25PMCLxx	Ethical Hacking	3	0	0	3
STREAM 2: DATA ANALYTICS						
6.	25PMCLxx	Python Programming for Data Analytics	3	0	0	3
7.	25PMCLxx	Statistics for Business Analytics	3	0	0	3
8.	25PMCLxx	Marketing Analytics	3	0	0	3
9.	25PMCLxx	Social Network Analytics	3	0	0	3
10.	25PMCLxx	Database Systems in Big Data	3	0	0	3
11.	25PMCLxx	Video Processing and Analytics	3	0	0	3
STREAM 3: DISTRIBUTED COMPUTING						
12.	25PMCLxx	Principles of Distributed Computing	3	0	0	3
13.	25PMCLxx	Introduction to Parallel Computing	3	0	0	3
14.	25PMCLxx	Network Design and Management	3	0	0	3
15.	25PMCLxx	Web Services Computing	3	0	0	3
16.	25PMCLxx	Pervasive and Ubiquitous Computing	3	0	0	3
17.	25PMCLxx	Cloud Computing	3	0	0	3
STREAM 4: ARTIFICIAL INTELLIGENCE & INTERNET OF THINGS (AIoT)						
18.	25PMCLxx	Introduction to A.I. and Expert Systems	3	0	0	3
19.	25PMCLxx	Introduction to Machine Learning	3	0	0	3
20.	25PMCLxx	Data Visualization	3	0	0	3
21.	25PMCLxx	IOT Architecture & Protocol	3	0	0	3
22.	25PMCLxx	Industrial IoT	3	0	0	3
23.	25PMCLxx	Cloud and IOT Security	3	0	0	3

SEMSTER-II
(THEORY)

Year	**I**	**Course Code:25PMCT21**	**Credits**	**3**
Sem	**II**	**Course Title: DATA STRUCTURES AND ALGORITHMS**	**Hours**	**60**
			Category	**CC**
Course Prerequisites, if any	Introductory knowledge about Computing.			
Internal Assessment Marks: 40	**End Semester Marks:60**	**Duration of ESA (Theory): 03 hrs.**		

Course Outcome

- Ability to understand and apply various data structures such as arrays, queues, linked lists, stacks, trees and graphs

CO1	Describe the fundamental concepts of data structures, algorithms, and asymptotic notations for analyzing efficiency.	Understand (K2)
CO2	Apply linear data structures (arrays, stacks, queues, linked lists) to solve computational problems.	Apply (K3)
CO3	Implement and analyze tree and graph data structures along with traversal techniques and their applications.	Apply (K3)
CO4	Design and apply algorithmic techniques such as divide & conquer, greedy method, and dynamic programming to real-world problems.	Apply (K3)
CO5	Evaluate and compare different algorithms based on time and space complexity; explore NP-Hard and NP-Complete problems.	Apply (K3)

Unit No.	**Course Content**	**Hours**
	Theory Component	
Unit I	Data Structures: Basic Terminologies – Algorithms: Definition, Pseudocode Representation – Time complexity and space complexity - efficiency of algorithms - O-notation - Omega notation and Theta Notation Arrays: One dimensional & multidimensional arrays – Searching.	**9**
Unit II	Stacks: Representation - Operations – Applications. Queues: Representation – Operations – Applications. Linked List: Single Linked List, Double Linked List, Circular Linked List, Applications of Linked List	**9**

Unit III	Trees: Basic Terminologies - Binary trees: Representation, Operations, Traversals, Types - Applications of Trees. Graphs: Basic Terminologies, Representation, Operations, Traversals – Applications: Shortest path problem, Topological sorting, Minimum Spanning tree	**9**
Unit IV	Divide and Conquer: General method – binary search - merge sort - quick sort- Recursive algorithms, analysis of non-recursive and recursive algorithms, solving recurrence equations. Greedy Method: General method – knapsack problem – minimum spanning tree algorithms – single source shortest path algorithm – scheduling - Huffman codes	**9**
Unit V	Dynamic Programming: 0/1 Knapsack and Traveling salesman problem – Backtracking: n-Queen problem - Graph Colouring- Introduction to NP-Hard and NP-Completeness.	**9**

TEXT BOOKS

1. Ellis Horowitz and Sartaj Sahni Susan Anderson-Freed, Fundamentals of Data Structures in C (Second Edition), 2008.
2. Ellis Horowitz, Sartaj Sahni, Sangu Thevar, Rajasekaran, Fundamentals of Computer Algorithms, Galgotia Publications Pvt. Ltd., 2008.
3. Debasis Samanta, Classic Data Structures, Second Edition, Prentice-Hall of India, Pvt. Ltd., India, 2009.

REFERENCE BOOKS

1. Dinesh P Mehta & Sartaj Sahni, Handbook of Data Structures and Applications, Chapman and Hall. 2005.

EVALUTION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Project	Presentation & Viva	**5**
Attendance		**5**
Total		**40**

Year	**I**	**Course Code: 25PMCT22** **Course Title: COMPUTER NETWORKS**	**Credits**	**3**
Sem	**II**		**Hours**	**60**
			Category	**CC**
Course Prerequisites, if any	Basic knowledge in computers			
Internal Assessment Marks: 40	**End Semester Marks:60**	**Duration of ESA (Theory): 03 hrs.**		

Course Outcome

- Ability to understand the various hardware and software components of computer networks.

CO1	Describe the fundamental concepts of computer networks, network topologies, architectures, and reference models.	Understand (K2)
CO2	Apply error detection, correction techniques, and data link layer protocols including multiple access methods and IEEE 802 standards.	Apply (K3)
CO3	Analyze network layer functionalities such as routing algorithms, congestion control, and internetworking.	Apply (K3)
CO4	Apply transport layer protocols (TCP, UDP) and evaluate their performance in real-world scenarios.	Apply (K3)
CO5	Explain application layer services, domain name system, email, WWW, and apply cryptography techniques for network security.	Apply (K3)
Unit No.	**Course Content**	**Hours**
Theory Component		
Unit I	**INTRODUCTION TO NETWORKS** Network Topology - Network Architecture - Reference Models - Example Networks -APRANET, NSFNET, Internet - Physical Layer - Transmission media.	**9**
Unit II	**THE DATA LINK LAYER** Data Link Layer design issues - Error Detection and Correction Methods - Elementary DataLink Protocols - Sliding Window Protocols Protocol - Verification Methods - Channel	**9**

Unit III	**THE NETWORK LAYER** Network Layer design issues - Routing algorithms - Congestion Control algorithms -Internetworking Network Layer in Internet.	**9**
Unit IV	**THE TRANSPORT PROTOCOLS** Transport Service - Transport Protocols - Internet Transport Protocols - UDP - TCP -Performance issues.	**9**
Unit V	**THE APPLICATION LAYER** Application Layer design issues - Domain Name System - Electronic Mail - World Wide Web -Other Applications - Network Security - Basic Cryptography – Symmetric and AsymmetricCryptography.	**9**

TEXT BOOKS

1. Behrouz Forouzan, Data Communications and Networking, McGraw Hill, 4thEdition, 2017

REFERENCE BOOKS

1 Andrew S. Tanenbaum, Computer Networks, International Economy Edition, 5th edition, 2010.

2 William Stallings, Cryptography and Network Security: Principles and Standards, Prentice Hall India, 4th Edition, 2005.

EVALUTION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Project	Presentation & Viva	**5**
Attendance		**5**
Total		**40**

Year	**I**	**Course Code: 25PMCT23** **Course Title: JAVA PROGRAMMING**	**Credits**	**3**
Sem	**II**		**Hours**	**60**
			Category	**CC**
Course Prerequisites, if any	Basic knowledge in C programming			
Internal Assessment Marks: 40	**End Semester Marks:60**	**Duration of ESA (Theory): 03 hrs.**		

Course Outcome

On the successful completion of the course students will be to

CO1	Apply the concepts of classes and objects to solve simple problems	Apply (K3)
CO2	Develop programs using inheritance, packages and interfaces	Apply (K3)
CO3	Make use of exception handling mechanisms and multithreaded model to solve real world problems	Apply (K3)
CO4	Build Java applications with I/O packages, string classes, Collections and generics concepts	Apply (K3)
CO5	Integrate the concepts of event handling and JavaFX components and controls for developing GUI based applications	Apply (K3)
Unit No.	**Course Content**	**Hours**
Theory Component		
Unit I	**JAVA BASCIS** Overview of Java–Java Features- Java Platform- Expressions, Operators – Data Types, Variables and Arrays – Control Statements – Programming Structures in Java – Defining classes in Java – Classes and Objects, Constructors Methods -Access specifiers – Static members- Java Doc comments	**9**

Unit II	**INHERITANCE, PACKAGES AND INTERFACES** Overloading Methods – Objects as Parameters – Returning Objects – Static, Nested and Inner Classes. Inheritance: Basics – Types of Inheritance -Super keyword -Method Overriding – Dynamic Method Dispatch – Abstract Classes – final with Inheritance. Packages and Interfaces: Packages – Packages and Member Access – Importing Packages – Interfaces.	**9**
Unit III	**EVENT, EXCEPTION HANDLING** Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View-Controller design pattern – buttons – layout management – Swing Components – exception handling – exception hierarchy – throwing and catching exceptions.	**9**
Unit IV	**GENERIC PROGRAMMING** Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics – Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – Executors - synchronizers.	**9**
Unit V	**JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS** JAVAFX Events and Controls: Event Basics – Handling Key and Mouse Events. Controls: Checkbox, Toggle Button – Radio Buttons – List View – Combo Box – Choice Box – Text Controls – Scroll Pane. Layouts – Flow Pane – HBox and VBox – Border Pane – Stack Pane – Grid Pane. Menus – Basics – Menu – Menu bars – Menu Item.	**9**

TEXT BOOKS

1. Herbert Schildt, “Java: The Complete Reference”, 11th Edition, McGraw Hill Education, New Delhi, 2019
2. Herbert Schildt, “Introducing JavaFX 8 Programming”, 1st Edition, McGraw Hill Education, New Delhi, 2015
3. Deitel and Deitel, “JAVA How to Program”, Prentice Hall, 11th Edition, 2017.

REFERENCE BOOKS
1. Cay S. Horstmann, “Core Java Fundamentals”, Volume 1, 11th Edition, Prentice Hall, 2018. 2. Herbert Schildt and Dale Skrien, “Java Fundamentals– A Comprehensive Intro duction”, Tata Mc Graw Hill, 1st Edition, 2017. 3. Ralph Bravaco and Shai Simonson, “Java Programming: From the Ground Up”, Tata McGraw Hill, 2nd Edition, 2012.

EVALUTION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Project	Presentation & Viva	**5**
Attendance		**5**
Total		**40**

Year	**I**	**Course Code:25PMCT24** **Course Title: Artificial Intelligence**	**Credits**	**3**
Sem	**II**		**Hours**	**60**
			Category	**CC**
Course Prerequisites, if any	Basic Knowledge in Programming and logics			
Internal Assessment Marks: 40	**End Semester Marks:60**	**Duration of ESA (Theory): 03 hrs.**		

Course Objective

- To apply heuristic concepts to design efficient algorithms and knowledge representation schemes for typical AI problems.

CO1	To understand AI & its types, Problem space, its searching and implement heuristic concepts in real time applications.	Understand (K1)
CO2	To familiarize with knowledge representation schemes for typical AI problems.	Understand (K1)
CO3	To understand the concept of basics of reasoning under uncertainty, rule-based system and fuzzy logic.	Analyze (K3)
CO4	To understand the concepts of learning and planning.	Apply (K3)
CO5	To implement a typical AI applications using LISP & Prolog.	Analyze (K3)
Unit No.	**Course Content**	**Hours**
Theory Component		
Unit I	**INTRODUCTION:** Overview of AI, Problems, Problem space and searching techniques, Definition production system, Control strategies, Heuristic search techniques-Game Playing-Minmax search procedure-Adding alpha-beta cutoff Intelligent agents-Agents and environment–structure of agents and its functions-simple reflex agent-goal based agent–utility-based agent–learning agents, Knowledge Based Agent	**9**

Unit II	**KNOWLEDGE REPRESENTATION**: Approaches and issues in knowledge representation, Predicate logic, propositional logic, Forward and backward reasoning-Unification- Resolution- Weak slot-filler structure–Strong slot-filler structure.	**9**
Unit III	**REASONING UNDER UNCERTAINTY**: Logics of non-monotonic reasoning-Implementation- Basic probability notation-Bayes rule–Certainty factors and rule basedsystems-Bayesian networks–Dempster-Shafer Theory-Fuzzy Logic.	**9**
Unit IV	**PLANNING AND LEARNING:** Planning with state space search-partial order planning - planning graphs-conditional planning-continuous planning-Multi-Agent planning -Forms of learning-Learning from observation-Inductive learning–Decision trees –Explanation based learning–Statistical Learning methods- Reinforcement Learning -NeuralNet learning and Genetic learning	**9**
Unit V	**EXPERT SYSTEM & DECLARATIVE LANGUAGES:** Expert System-Representation -Expert System shells-Knowledge Acquisition-AI Languages-Introduction to LISP, expressions, functions, Recursion-Introduction to Prolog-Knowledge representation	**9**

TEXT BOOKS

1. ElaineRich, KevinKnight, Shivashankar and B.Nair, Artificial Intelligence, Tata McGrawHill,3rd Edition, 2017.
2. StuartJ.Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson Education Asia,4th Edition, 2022.
3. I.Bratko, Prolog: Programming for Artificial Intelligence, Addison-Wesley Educational PublishersInc.,4th Edition, 2011.

REFERENCE BOOKS

1. Deepak Khemani,"Artificial Intelligence", Tata McGraw Hill Education,2013.

Online Courses/NPTEL/SWAYAM:

1. https://nptel.ac.in/courses/106106184
2. https://nptel.ac.in/courses/106105216

EVALUTION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		**25**
MCQ unit vise 10 questions	Moodle / Google Form	**5**
Project	Presentation & Viva	**5**
Attendance		**5**
Total		**40**

ELECTIVE-I

Year	**I**	**Course Code:25PMCL21**	**Credits**	**3**
Sem	**II**	**Course Title: Database System in Big Data**	**Hours**	**60**
			Category	DSE
Course Prerequisites, if any		Basic knowledge of Computer Fundamentals		
Internal Assessment Marks: 40		**End Semester Marks:60**	**Duration of ESA (Theory): 03 hrs.**	

Outcomes:

- To understand the design of database in Big Data.

CO1	To Understand the fundamentals of NoSQL databases and the basic concepts of Apache Cassandra.	Understand (K2)
CO2	To Understand the Cassandra data model and apply basic CQL concepts for data organization.	Understand (K2)
CO3	ToUnderstand the distributed architecture of Cassandra and its mechanisms for availability and fault tolerance.	Understand (K2)
CO4	ToDesign a simple application using Cassandra and compare it with an RDBMS-based design.	Apply (K3)
CO5	ToUnderstand Cassandra and perform basic data manipulation operations using CQL.	Understand (K2)
Unit No.	**Course Content**	**Hours**
Theory Component		

Unit-I	**Getting Started with Cassandra** Introduction to Databases – Need for NoSQL – Definition of NoSQL – Types of NoSQL Databases – SQL vs NoSQL – ACID Properties – BASE Properties – ACID vs BASE Comparison – Advantages of NoSQL Databases – Applications of NoSQL Databases – Schema Concept – Schema in SQL vs NoSQL – Schema-less Databases – Brewer's CAP Theorem – Introduction to Apache Cassandra – Consistency Concepts.	**9**
Unit-II	**Understanding CassandraData Model** Use Cases for Cassandra – Introduction to Cassandra– Basic CLI Commands–Describing the Cassandra Environment –Reading Data from Cassandra – Relational Data Model (Basic Idea) – Cassandra Cluster – Keyspaces – Column Families –Wide Rows – Skinny Rows – Column Sorting – Cassandra Query Language (CQL) – Secondary Indexes (Basic Concept) – Denormalisation.	**9**
Unit-III	**Understanding Cassandra Architecture** System Keyspace– Peer-to-Peer Architecture – Node Communication (Overview) – Gossip Protocol (Basic Concept) – Failure Detection (Simple Explanation) – Read Operations in Cassandra (High Level) – Write Operations in Cassandra (High Level) – Data Replication (Basic Idea) – Fault Tolerance in Cassandra – Cluster Management (Basic) – Monitoring Cassandra (Overview) – Advantages of Peer-to-Peer Architecture.	**9**
Unit-IV	**Creating Sample Application** Database Design– Sample Application RDBMS Design – Sample Application Cassandra Design – Comparison of RDBMS Design vs Cassandra Design – Creating Database (Basic) –Basic Data Structures– Application Features – Introduction to Hadoop Cassandra and Hadoop Integration (Conceptual Overview).	**9**

Unit-V	**Configuring, Reading and Writing Data in Cassandra** Keyspaces – Replicas– Creating Cassandra Clusters (Conceptual) – Query Differences between RDBMS and Cassandra – Basic Write Properties – Basic Read Properties –Setting Up Cassandra – Introduction to CQL – CQL Data Manipulation Language (DML) Statements	**9**

TEXT BOOKS

1. Tom Plunkett, Brian Macdonald, Bruce Nelson, Oracle Big Data Handbook, (Oracle Press), Fujitsu
2. Madhu Jagadeesh, Soumendra Mohanty, Harsha Srivatsa, Big Data Imperatives: Enterprise Big Data
3. Warehouse, BI Implementations and Analytics, A press, First Edition,2013.
4. Frank J. Ohl horst, Big Data Analytics: Turning Big Data into Big Money, Wiley Publishers, 2012.

Reference Book:

1. Cristian Molaro, Surekha Parekh, Terry Purcell, DB2 11: The Database for Big Data & Analytics **Press, 2013.**

EVALUTION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
MCQ unit vise 10 questions	Moodle / Google Form	5
Assignment	Report	5
Attendance		5
Total		**40**

ELECTIVE-II

Year	**I**	**Course Code:25PMCL22** **Course Title: WEB SERVICES COMPUTING**	**Credits**	**3**
Sem	**II**		**Hours**	**60**
			Category	DSE
Course Prerequisites, if any	Basic knowledge in Web Technology and Computer Networks.			
Internal Assessment Marks: 40	**End Semester Marks:60**	**Duration of ESA (Theory): 03 hrs.**		

Outcomes:

- To understand the details of Web services technologies. To learn how to implement and deploy web service clients and servers.

CO1	Understand the fundamentals of web services and distributed systems	Understand (K2)
CO2	Explain web service protocols such as SOAP and REST	Understand (K2)
CO3	Implement RESTful and SOAP-based web services	Apply (K3)
CO4	Apply security mechanisms in web services	Apply (K3)
CO5	Develop web service applications for real-world scenarios	Apply (K3)
Unit No.	**Course Content**	**Hours**
Theory Component		

Unit I	**Fundamental Concepts and Theories** Introduction to Web Services — The definition of web services, basic operational model of web services, tools and technologies enabling web services, benefits and challenges of using web services. Web Services Architecture — Web services Architecture and its characteristics, core building blocks of web services, standards and technologies available for implementing web services, web services communication models, basic steps of implementing web services.	**9**
Unit II	**Service Oriented Architecture** Overview of Service Oriented Architecture — SOA concepts, Key Service Characteristics, Technical Benefits of a SOA. SOA and Web Services — Web Services Platform, Service-Level Data Models, Discovery, Security and Interaction Patterns, Atomic and Composite services, Service—level communication and alternative transports.	**9**
Unit III	**Web Services using SOAP** Fundamentals of SOAP — SOAP Message Structure, SOAP encoding, SOAP message exchange models, SOAP communication and messaging, SOAP security. Developing Web Services using SOAP — Building SOAP Web Services, developing SOAP Web Services using Java and Axis, limitations of SOAP.	**9**
Unit IV	**Tools and Technologies** **WSDL** Purpose of WSDL- Anatomy of WSDL document- WSDL bindings- Limitations **UDDI** Role in service discovery- UDDI Registries- UDDI Data Structures- Publishing & Searching in UDDI- Limitations	**9**

Unit V	**Web Services Interoperability** Web Services Interoperability — Means of ensuring Interoperability, Overview of .NET, Creating a. NTE client for an Axis Web Service, Creating java client for a web service, Challenges in Web Services Interoperability. Web Services Security — XML security frame work, Goals of Cryptography, Hash Cipher, Symmetric Cipher, Asymmetric Cipher, XML encryption, Digital signature, Digital Certificate, XML Encryption, SAML structure.	**9**

TEXT BOOKS

1.R. Nagappan, R. Skoczylas, R.P. Sriganesh, Developing Java Web Services, , Wiley India, 2008.

2. Eric Newcomer and Greg Lomow, Understanding SQA with Web Services, Pearson, 2009

3. James McGovern, Sameer Tyagi et.al., Java Web Service Architecture, Elsevier, 2009.

REFERENCE BOOKS

1. S. Graham, Building Web Services with Java, Pearson, Second Edition, 2008.
2. D.A. Chappell & T. Jewell, Java Web Services, O'Reilly, SPD.
3. McGovern, et al., Java Neb Services Architecture, Morgan Kaufmann Publishers, 2005

EVALUTION

Assessment Methodology	**Assessment Tools**	**Marks**
Test		25
MCQ unit vise 10 questions	Moodle / Google Form	5
Assignment	Report	5
Attendance		5
Total		**40**

SEMESTER-II

PRACTICAL

Year	**I**	**Course Code:25PMCP21**	**Credits**	**2**
Sem	**II**	**Course Title: DATA STRUCTURES AND ALGORITHMS LAB**	**Hours**	**60**
			Category	**CC**
Course Prerequisites, if any	Programming Language.			
Internal Assessment Marks: 60	**End Semester Marks: 40**	**Duration of ESA (Theory): 03 hrs.**		

Course Outcome

- Aims to build skills in selecting appropriate algorithmic strategies and implementing them using modern programming practices.

CO1	Design and implement basic and advanced data structures extensively	Understand (K2)
CO2	Design algorithms using graph structures	Apply (K3)
CO3	Design and develop efficient algorithms with minimum complexity using design techniques	Apply(k3)
CO4	Develop programs using various algorithms.	Analyze(k3)
CO5	Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.	Apply(k3)

LIST OF EXPERIMENTS

Practical Component

1. Implementation of recursive functions for tree traversal and Fibonacci
2. Implementations of iteration function for tree traversal and Fibonacci
3. Implementation of Merge Sort and Quick Sort
4. Implementation of a Binary Search Tree
5. Red-Black Tree Implementation
6. Heap Implementation
7. Fibonacci Heap Implementation
8. Graph Traversals
9. Spanning Tree Implementation
10. Shortest Path Algorithms (Dijkstra's algorithm, Bellman Ford Algorithm)
11. Implementation of Matrix Chain Multiplication

12. Activity Selection and Huffman Coding Implementation **(Total Periods:45)**

EVALUTION

Assessment Methodology	Assessment Tools	Marks
Test		**20**
Observation		**05**
Record		**05**
Attendance		**10**
Practical	Demo & Viva	**20**
Total		**60**

Year	**I**	**Course Code: 25PMCP22**	**Credits**	**2**
Sem	**II**	**Course Title: JAVA PROGRAMMING LABORATORY**	**Hours**	**60**
			Category	**CC**
Course Prerequisites, if any	Basic knowledge in C, C++ and Java Programming			
Internal Assessment Marks: 60	**End Semester Marks: 40**	**Duration of ESA (Theory): 03 hrs.**		

Course Outcome

- The Main objective of this Lab manual is to teach the students basics of JAVA programs and its execution.

CO1	Identify classes, objects, members of a class and the relationships among them for a Specific problem.	Understand (K2)
CO2	Develop programs using appropriate packages for Inter – thread Communication and Synchronization.	Apply (K3)
CO3	Develop GUI applications to handle events.	Apply(k3)
CO4	Develop client server-based applications.	Analyze(k3)
CO5	Design, develop, test and debug Java programs using object-oriented principles in Conjunction with development tools including integrated development environments.	Apply(k3)

LIST OF EXPERIMENTS

Practical Component

1. Program to implement classes and objects.
2. Program to implement constructors and destructors with array of objects.
3. Program to demonstrate function overloading
4. Program to implement different types of inheritances like multiple, Multilevel and hybrid
5. Program to implement AWT concepts.
6. Write a Java program to create an Applet that reads Employee information using parameters and displays name of employee, designation, salary and tax.
7. Write a Java program to demonstrate the mouse event handlers
8. Write a Java program to demonstrate the key event handlers.
9. write a Java program that displays 4buttons and also count Number of

buttonclicks on each button?

10. Program to implement swing concepts.
11. Program to demonstrate exception handling technique.

(Total Periods:45)

EVALUTION

Assessment Methodology	Assessment Tools	Marks
Test		**20**
Observation		**05**
Record		**05**
Attendance		**10**
Practical	Demo & Viva	**20**
Total		**60**

Year	**I**	**Course Code: 25PMCP23**	**Credits**	**2**
Sem	**II**	**Course Title: ARTIFICIAL INTELLIGENCE LAB**	**Hours**	**60**
			Category	**CC**
Course Prerequisites, if any	Programming Language.			
Internal Assessment Marks: 60	**End Semester Marks: 40**	**Duration of ESA (Theory): 03 hrs.**		

Course Outcome

- On the successful completion of the course, students will be able to

CO1	To understand the prediction of equipment failures using AI.	Understand (K2)
CO2	To understand the Predictive analytics used in forecast inventory needs.	Apply (K3)
CO3	To understand and analyze historical data in predicting future trends and patterns, allowing for better decision-making in the lab.	Apply (k3)
CO4	To understand Predictive analytics used in helping researchers to prioritize their efforts.	Analyze (k3)
CO5	To understand and predict the optimal conditions for an experiment.	Apply (k3)

LIST OF EXPERIMENTS

Practical Component

1. Implementation of Breadth First Search (BFS) Algorithm
2. Implementation of Depth First Search (DFS) Algorithm
3. Implementation of A Search Algorithm for Shortest Path Problem
4. Implementation of Minimax Algorithm with Alpha-Beta Pruning (Game Playing – Tic-Tac-Toe)
5. Implementation of Forward and Backward Chaining using Rule-Based System
6. Implementation of Unification and Resolution in Predicate Logic
7. Implementation of Bayesian Inference using Bayes Theorem

8. Implementation of Fuzzy Logic Control System

9. Implementation of Decision Tree Learning Algorithm (ID3)

10. Development of a Simple Expert System for Medical Diagnosis. **(Total Periods:45)**

EVALUTION

Assessment Methodology	Assessment Tools	Marks
Test		**20**
Observation		**05**
Record		**05**
Attendance		**10**
Practical	Demo & Viva	**20**
Total		**60**

SEMSTER-II

EMPLOYABILITY ENHANCEMENT COURSES

Year	I	Course Code:18HS34 Course Title: PERSONALITY DEVELOPMENT SKILLS	Credits	2
Sem	II		Hours	48
			Category	EEC
Course Prerequisites, if any	Basic proficiency in English communication Fundamental understanding of self–awareness and personal behaviour			
Internal Assessment Marks: 40	**End Semester Marks:60**	**Duration of ESA (Theory): 03 hrs**		

Course Objective

Enablestudents todevelop a well-roundedpersonalityby enhancing essential personal and professional skills. The course aims to foster self-awareness, effective communication, interpersonal abilities, emotional intelligence, confidence, leadership, and goal- setting strategies

CO1	Apply workplace etiquette and use MicrosoftOffice tools effectively for professional communication and documentation.	Apply (K2)
CO2	Demonstrate effective communication skills in business contexts including sales, negotiation, and customer service scenarios.	Apply (K2)
CO3	Apply structured decision-making and problem-solving techniques in professional and organizational settings.	Apply (K2)
CO4	Prepare for interviews and present one-self professionally with an effective resume, proper mannerisms, and behavioural skills.	Analyze (K3)
CO5	Demonstrate confidence and clarity in group discussions and interviews through guided practice and feedback.	Analyze (K3)
Unit No.	**Course Content**	**Hours**
Theory Component		
Unit I	**Work place and Email Etiquette:** Professional Behavior and Dress Code–Email and Meeting Etiquette **Microsoft office suite:** MS Word (Document Creation and Formatting)-MS Excel (Data Analysis and Functions) - MS PowerPoint (Creating Effective Presentations)	**10**

Unit II	**Business Communication:** Verbal and Non-Verbal Communication–Written Communication in Business. **Sales and Negotiations:** Sales Techniques and Strategies– Negotiation Tactics and Styles. **Customer Service**: Effective Communication Skills- Customer support channels and Tool	**10**
Unit III	**Decision Making:** Types of Decision Making – Decision Making models and Techniques – Cognitive Biases and Risk Assessment **Problem Solving**: Problem Identification and Analysis– Creative and Critical Thinking techniques – Implementation and Evaluation techniques	**10**
Unit IV	**Interview Skills:** Preparation and Research – Effective Communication and Presentation. **Resume Building**: Resume Formats and Structure – Tailoring Resumes for Specific Jobs. **Mannerism**: Body Language – Respect and Courtesy in Interactions. **Behavioral skills**: Emotional Intelligence–Adapted ability and flexibility.	**10**
Unit V	**Group Discussion:** Effective communication and Active Listening–Leadership and Participation skills – Critical Thinking and Topic Analysis **Monk Interview**: Common Interview Questions and Ideal Responses– Feedback and Self Assessment	**8**

TEXT BOOKS

1. Personal Development and Soft Skills By BARUNKMITRA, Oxford Higher Education.
2. Seven Habits of Highly Effective People by STEPHENCOVEY.

REFERENCE BOOKS

1. Communication Skills by SANJAY KUMA R, PUSHP, Oxford Higher Education

2. Communication Skills for Professionals by NIRAKONAR, PHI learning Pvt.Ltd.