

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM, THALAMBUR, PERIYAPALAYAM-CHENNAI
ACCREDITED BY NAAC WITH 'A++' GRADE

POSTGRADUATE DEGREE PROGRAMME

M.Sc., INFORMATION TECHNOLOGY

(1 Year for PG Diploma / 2 Years for Degree)

CURRICULUM & SYLLABUS

REGULATION 2024

Choice Based Credit System (CBCS)

&

Learning Outcomes Based Curriculum Framework (LOCF)

Effective from the Academic Year

2024 -2025

Department of Information Technology
School of Computing Sciences



INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)
(Deemed to be University Estd. u/s 3 of the UGC Act, 1956)
PALLAVARAM, THALAMBUR, PERIYAPALAYAM-CHENNAI
ACCREDITED BY NAAC WITH 'A++' GRADE

DEPARTMENT OF INFORMATION TECHNOLOGY

VISION OF THE DEPARTMENT

To produce globally competent graduates, skilled intellectual professionals, and a successful entrepreneur in the field of computer science and Information Technology to meet the current challenges in the fast-growing IT industry.

MISSION OF THE DEPARTMENT

M1	To provide a strong theoretical and practical knowledge to the students in computer science discipline.
M2	To equip our students to attain a skill set imperative to harness the opportunities present in this dynamic environment.
M3	To Provide technical & skill-based quality training to the students in the field of Information Technology.
M4	To empower the Youth in rural communities with computer knowledge.
M5	To inculcate knowledge about socio-economic duties & responsibilities, human & ethical values to become an optimistic global citizen and a life-long learner.
M6	To provide environmental education to empower knowledge on ecological issues and to protect and conserve invaluable natural resources for healthy and sustainable livelihoods.

PROGRAMME EDUCATIONAL OUTCOMES (PEO)	
PEO1	Graduates are prepared to be employed in IT industries by providing expected domain Knowledge.
PEO2	Graduates are provided with practical training, hands-on and project experience to meet the industrial needs.
PEO3	Graduates are motivated in career and entrepreneurial skill development to become Global leaders.
PEO4	Graduates are trained to demonstrate creativity, develop innovative ideas and to work in teams to accomplish a common goal.
PEO5	Graduates are addressed with social issues and guided to operate problems with Solution.

PROGRAMME OUTCOMES (PO)	
PO1	**Critical Thinking:** Apply knowledge of Cyber Security to identify, analyses problems and to provide effective solution in the area of Computing.
PO2	**Computing Skills and Ethics:** Analyze a problem, and identify and define the Computing requirements appropriate to its solution.
PO3	**Analytical skill:** Ability to design, develop algorithms and provide software solutions to cater the industrial needs.
PO4	**Modern Tool Usage:** Use current techniques, skills, and tools necessary for computing practices.
PO5	**Employability Skills:** Inculcate skills to excel in the fields of Information Technology and its Enabled services, Government and Private sectors, Teaching and Research.
PO6	**Ethics:** Insists ethical responsibilities, human and professional values and make their Contribution to the society.
PO7	**Self-Directed and Life-long Learning:** Engaged in lifelong learning to equip them to the changing environment and be prepared to take-up mastering programmes.
PO8	**Individual and Team Work:** Function effectively as an individual, and as a member or a leader in diverse team and multidisciplinary settings.

PO9	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO10	**Project management and finance:** Demonstrate knowledge and understanding of the problem and management principles and apply these to one's own work, as a member and engineering and management principles and apply these to one's own work, as a member.
PO11	**Conduct investigations of complex problems:** Use research-based knowledge research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO12	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PROGRAMME SPECIFIC OUTCOMES (PSO)	
PSO1	Professionally trained in the areas of programming, multimedia, and animation, web designing, and networking to acquire knowledge in various domain-based electives.
PSO2	Abet students to communicate effectively and to improve their competency skills to solve real time problems.
PSO3	The ability to employ modern computer languages and applications for their successful career, to create platforms to become an entrepreneur and a relish for higher studies.

BOARD OF STUDIES

List of Members

Department of Information Technology

S. No	Name & Designation	Address	Board of studies - Designation
1.	Dr. R. Sivakumar,	Dean, School of Computing Sciences, VISTAS	
2.	Dr. P. Magesh Kumar	Director, School of Computing Sciences, VISTAS	Chairperson
3.	Dr.S.Gopinathan, Associate Professor And Head	Department of Computer Science, University of Madras, Chennai.	External Member (Academic Expert)
4.	Mr. John Britto Chris, Senior Manager-Projects	Cognizant Technologies (P) Ltd., Chennai	External Member (Academic Expert)
5.	Dr. P.Sujatha, Professor and Head	Department of Information Technology, VISTAS	Internal Member
6.	Dr. T. Kamalakannan, Professor	Department of Information Technology, VISTAS	Internal Member
7.	Dr. Y. Kalpana, Professor	Department of Information Technology, VISTAS	Internal Member
8.	Dr. K.Rohini, Professor	Department of Information Technology, VISTAS	Internal Member
9.	Dr. B.Booba, Professor	Department of Information Technology, VISTAS	Internal Member
10.	Dr. R.Devi, Associate Professor	Department of Information Technology, VISTAS	Internal Member
11.	Dr. K. Dharmarajan Associate Professor	Department of Information Technology, VISTAS	Internal Member

12.	Dr.S Sathya Assistant Professor	Department of Information Technology, VISTAS	Internal Member
13.	Dr.A Vidhya Assistant Professor	Department of Information Technology, VISTAS	Internal Member
14.	Mr. PV Vishnu, Chief Innovation Officer	Xerago, Digital Impact Consulting & Services, Chennai	Alumni, VISTAS

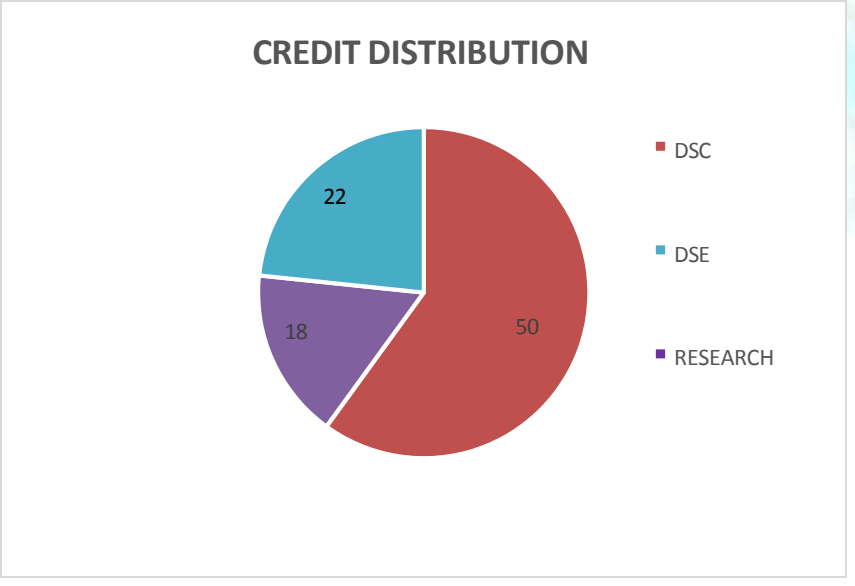
CREDIT DISTRIBUTION

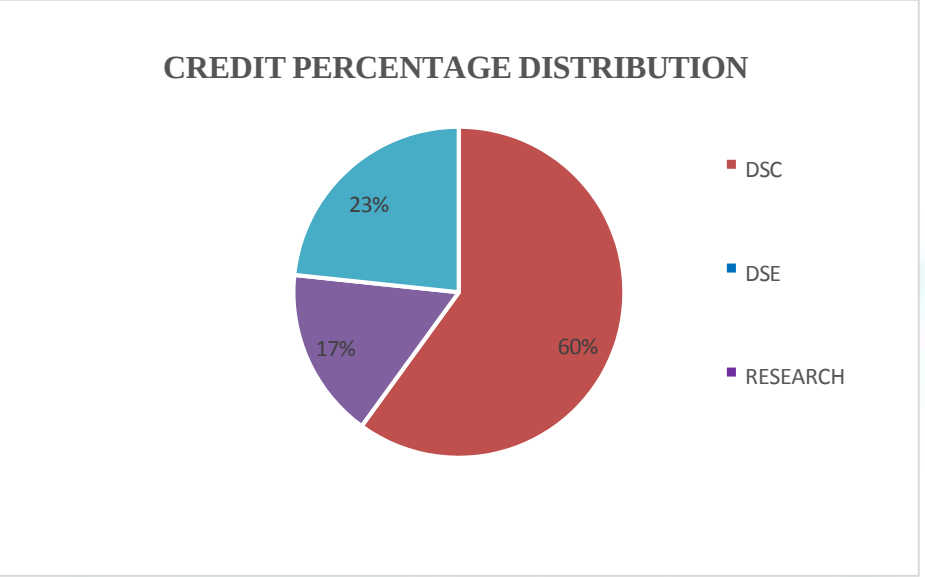
M.Sc., Information Technology

Minimum credits to be earned: 90

(1 Year for PG Degree / 2 Years for PG Degree)

Component	I Sem	II Sem	III Sem	IV Sem	Total Credits
DSC	16	20	10	5	51
DSE	6	4	8	3	21
RESEARCH	-	-	6	12	18
Total Credits	22	24	24	20	90





ABBREVIATIONS

DSC	Disciplinary Specific Core
DSE	Disciplinary Specific Elective
RM	Research Methodology

CURRICULUM STURCTURE

M.Sc., Information Technology

Total number of Credits: 90

	M.Sc., IT PG Degree minimum credits to be earned 90									
	SEMESTER 1									
			Hours/Week				Maximum Marks			
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
DSC	24CMIT11	Object Oriented Programming using Java	4	0	0	2	4	40	60	100
DSC	24CMIT12	Data Structures	4	0	0	2	4	40	60	100
DSC	24CMIT13	Relational Data Base Management Systems	4	0	0	2	4	40	60	100
DSC	24PMIT11	Object Oriented Programming using Java Lab	0	0	4	1	2	40	60	100
DSC	24PMIT12	Relational Database Management Systems Lab	0	0	4	1	2	40	60	100
DSE	24DMIT1--	DSE 1	3	0	0	2	3	40	60	100
DSE	24DMIT1--	DSE 2	3	0	0	2	3	40	60	100
			18	**-**	**8**	**-**	**22**	-	-	-

CIA - Continuous Internal Assessment **SEE - Semester End Examination**

***L – Lecture, *T- Tutorial, *P- Practical, *O - Outside the class effort / self-study**

SEMESTER 2										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
DSC	24CMIT21	Software Testing Techniques and Tools	4	0	0	2	4	40	60	100
DSC	24CMIT22	Programming in Python using Django	4	0	0	2	4	40	60	100
DSC	24CMIT23	Cryptography & Network Security	4	0	0	2	4	40	60	100
DSC	24CMIT24	Advanced Operating Systems	4	0	0	2	4	40	60	100
DSC	24PMIT21	Software Testing Techniques and Tools Lab	0	0	4	1	2	40	60	100
DSC	24PMIT22	Programming in Python using Django Lab	0	0	4	1	2	40	60	100
DSE	24DMIT2--	DSE 3	3	1	0	2	4	40	60	100
			19	**0**	**8**	-	**24**	-	-	-

SEMESTER 3										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
DSC	24CMIT32	Deep Learning	4	0	0	2	4	40	60	100
DSC	24CMIT33	DevSec Ops Tools and Techniques	4	0	0	2	4	40	60	100
DSC	24PMIT31	DevSec Ops Tools and Techniques Lab	0	0	4	1	2	40	60	100
RM	24RMIT31	Research Methodology	4	0	0	2	4	40	60	100
RM	24IMIT31	Internship	0	0	0	4	2	40	60	100
DSE	24DMIT3--	DSE 4	3	1	0	2	4	40	60	100
DSE	24DMIT3--	DSE 5	3	1	0	2	4	40	60	100
		TOTAL	**19**	**0**	**8**	**-**	**24**		**-**	**-**

SEMESTER 4										
Category	**Code**	**Course**	**L**	**T**	**P**	**O**	**C**	**CIA**	**SEE**	**Total**
DSC	24CMIT41	Industrial Internet of Things	4	0	0	2	4	40	60	100
RP	24RMIT41	Research Project	0	0	10	5	12	40	60	100
DSE	24DMIT4--	DSE 6	3	0	0	2	3	40	60	100
DSC	24PMIT41	Data Visualization Lab	0	0	2	2	1	40	60	100
			7	**-**	**12**	**11**	**20**	**-**	**-**	**-**

DISCIPLINE SPECIFIC CORE COURSES

Category	Code	Course	L	T	P	O	C
DSC 1	24CMIT11	Object Oriented Programming using Java	4	0	0	2	4
DSC 2	24CMIT12	Advanced DBMS	4	0	0	2	4
DSC 3	24CMIT13	Fundamentals of Data Science	4	0	0	2	4
DSC 4	24PMIT11	Python Programming Lab	0	0	4	1	2
DSC 5	24PMIT12	Advanced DBMS Lab	0	0	4	1	2
DSC 6	24CMIT21	Software Testing Techniques and Tools	4	0	0	2	4
DSC 7	24CMIT22	Programming in Python using Django	4	0	0	2	4
DSC 8	24CMIT23	Cryptography &Network Security	4	0	0	2	4
DSC 9	24CMIT24	Advanced Operating Systems	4	0	0	2	4
DSC 10	24PMIT21	Software Testing Techniques and Tools Lab	0	0	4	1	2
DSC 11	24PMIT22	Programming in Python using Django Lab	0	0	4	1	2
DSC 12	24CMIT32	Deep Learning	4	0	0	2	4
DSC 13	24CMIT33	DevSec Ops Tools and Techniques	4	0	0	2	4
DSC 14	24PMIT31	DevSec Ops Tools and Techniques Lab	0	0	4	1	2
DSC 15	24CMIT41	Industrial Internet of Things	4	0	0	2	4
DSC 16	24PMIT41	Data Visualization Lab	0	0	2	2	1

DISCIPLINE SPECIFIC ELECTIVE COURSES

Category	Course code &Title	L	T	P	O	C
DSE 1	24DMIT11- Object Oriented Software Engineering 24DMIT14 - Scripting Languages 24DMIT13- Compiler Design	3	0	0	2	3
DSE 2	24DMIT12- Data Mining &Data Warehousing 24DMIT15- Mobile Computing 24DMIT16- Soft Computing	3	0	0	2	3
DSE 3	24DMIT21- Natural Language Processing 24DMIT22 Cloud Computing 24DMIT23- Neural Networks	3	1	0	2	4
DSE 4	24DMIT31- Block Chain Technology 24DMIT32- Embedded Systems 24DMIT33- Green Computing	3	1	0	2	4
DSE 5	24DMIT34- Big Data Analytics 24DMIT35- Quantum Computing 24DMIT36- Theory of Computation	3	1	0	2	4
DSE 6	24DMIT41- Parallel & Distributed Computing System 24DMIT42- Cyber Security 24DMIT43- Security Issues in Machine Learning	3	0	0	2	3

RESEARCH METHODOLOGY (RM)

Category	Code	Course	L	T	P	O	C
RM	24IMIT31	Internship	0	0	0	4	2
RM	24RMIT31	Research Methodology	4	0	0	2	4
RP	24RMIT41	Research Project	0	0	10	5	12

SEMESTER I

24CMIT11 OBJECT ORIENTED PROGRAMMING USING JAVA

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

This course is to develop object-oriented programming skills in java. It will focus on more sophisticated features such as design of classes, interfaces, packages and APIs. To design and implementation of both GUI applications and standalone applications.

UNIT I - INTRODUCTION TO OOP AND JAVA 12

Overview of OOP – Object oriented programming paradigms – Features of Object-Oriented Programming – Java Buzzwords – Overview of Java – Data Types, Variables and Arrays – Operators – Control Statements – Programming Structures in Java – Defining classes in Java – Constructors Methods -Access specifiers – Static members- Java Doc comments

UNIT II - INHERITANCE, PACKAGES AND INTERFACES 12

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.

UNIT III EXCEPTION HANDLING AND MULTITHREADING 12

Exception handling basics – Multiple catch Clauses – Nested try Statements – Java's Built- in Exceptions – User defined Exception. Multithreaded Programming: Java Thread Model– Creating a Thread and Multiple Threads – Priorities – Synchronization – Inter Thread Communication- Suspending –Resuming, and Stopping Threads –Multithreading. Wrappers – Auto boxing.

UNIT IV I/O, GENERICS, STRING HANDLING 11

I/O Basics – Reading and Writing Console I/O – Reading and Writing Files. Generics: Generic Programming – Generic classes – Generic Methods – Bounded Types – Restrictions and Limitations. Strings: Basic String class, methods and String Buffer Class.

UNIT V JAVAFX EVENT HANDLING, CONTROLS AND COMPONENTS 13

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.

Total: 60 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Describe java features and explain the supporting OOPs concepts **CO2:** Develop the Java Classes make use of Constructors and Inheritance. **CO3:** Create and import user defined Packages.

CO4: Analyze exceptions and handle them effectively

CO5: Analyze about multi-threading and thread synchronization

CO6: Apply String handling functions and file handling

CO7: Develop GUI applications using javaFX events and controls.

Text Books:

1. M.T. Somashekara, D.S. Guru, K.S. Manjunatha (2017), Object Oriented Programming with Java, First Edition ,PHI Learning .

2. Daniel Liang(2004) ,Introduction to Java Programming (Comprehensive Version), Eighth Edition, Pearson.

Reference Books:

1. Herbert Schildt (2014), Java The complete reference, 8th editon, , TMH.

2. Horstmann & Cornell(2007) ,Core Java Volume-I Fundamentals, Eight Edition,Pearson Education.

Web Sites:

1. www.javapoint.com
2. www.geeksforgeeks.org
3. www.w3schools.com
4. www.tutorialspoint.com

Web Sources:

1. https://www.electronicshub.org/basics-of-embedded-c-program/
2. https://www.mygreatlearning.com/blog/embedded-c/

24CMIT12 **DATA STRUCTURES**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

1. Knowledge about the importance of data structures.
2. To impart knowledge in application of data structures.

UNIT I LISTS 12

Abstract Data Types (ADTs) – List ADT – Array-based implementation – Linked list implementation – Singly linked lists – Circularly linked lists – Doubly-linked lists – Applications of lists – Polynomial operations.

UNIT II STACKS AND QUEUES 12

Stack ADT – Operations – Applications –Evaluating arithmetic expressions- Infix to Postfix conversion – Queue ADT – Operations – Circular Queue – DeQueue – Applications of Queues.

UNIT III TREES 12

Tree ADT – Tree Traversals – Binary Tree ADT – Expression trees – Binary Search Tree ADT – AVL Trees –. B-Tree – B+ Tree.

UNIT IV MULTIWAY SEARCH TREES AND GRAPHS 12

Graph Definition – Representation of Graphs – Types of Graph – Breadth-first traversal – Depth- first traversal — Bi-connectivity –Dijkstra's algorithm – Minimum Spanning Tree – Prim's algorithm – Kruskal's algorithm.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 12

Searching – Linear Search – Binary Search. Sorting – Bubble sort – Selection sort – Insertion sort – Shell sort –. Merge Sort – Hashing – Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

Total: 60 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Apply different linear and nonlinear data structures in problem solving

CO2: Understand and create Abstract data types

CO3: Use stack and Queue concepts in computer applications **CO4:** Analyse and Practice Tree concept in day to day applications **CO5:** Realize and exercise graph traversal methods.

CO6: Develop Applications using shortest path methods

CO7: Generate solutions for common problems using tree traversal concepts

CO8: Understand and use searching and hashing techniques in real time applications

Text Books:

1.Alfred V. Aho, Jeffrey D. Ullman,John E. Hopcroft (2002), Data Structures and Algorithms, 1st edition, Pearson.

2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein (2010), Introduction to Algorithms, Third Edition, PHI Learning.

3. Robert Lafore (2002), Data Structures and Algorithms in Java, second Edition,SAMS publications.

Web Sources:

1. https://www.shiksha.com/online-courses/articles/data-structures-and-algorithms-in-java/
2. https://www.coursera.org/learn/algorithms-part1
3. https://onlinecourses.nptel.ac.in/noc23_cs85/preview

24CMIT13 RELATIONAL DATA BASE MANAGEMENT SYSTEMS

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To impart the knowledge of basic concepts of Database systems. Establish a basic understanding of background materials needed for technical support using MySQL. To understand the fundamental concepts of MySql.

.

UNIT I - INTRODUCTION TO DATABASE SYSTEM 12

Introduction (Basic Concepts: Data, Database, Database systems, Database Management Systems), Characteristics of Database Approach, Advantages of using the DBMS approach Database System Concepts and Architecture: Data Models, Schemas, Instances, the three schema architectures and data independence, Database Languages and interfaces, Database System environment, Centralized and client / Server Architecture for DBMS, Classifications of Database Management Systems.

UNIT II - ENTITY RELATIONSHIP MODELLING 12

Entity, Entity Sets, Attributes and keys – Super Key, Primary Key, Candidate Key, Alternate Key, Relationship Types, Composite entities, Weak entity, Subclass, Super class with Attribute inheritance, Generalization and Specialization. Relational Database design by ER and EER to Relational Mapping, Mapping EER model construct to Relations.

UNIT III DATABASE DESIGN 12

Informal Design Guidelines for Relational Schema, Functional Dependencies, Normal Forms based on Primary keys, General definitions of 1NF, 2NF and 3NF, Boyce-Codd Normal Forms (BCNF), Multi- valued Dependency and Fourth Normal Form.

UNIT IV SQL & MySQL 12

SQL: Commands – Data types – DDL - Selection, Projection, Join and Set Operations – Aggregate Functions – DML – Modification - Truncation - Constraints – Subquery. Basics of MySQL Features of MySQL, Data types, Difference between SQL and MySQL, Integrity Constraints-(Primary key, Foreign key, unique key, not Null, default, check)DDL, DML, DCL, TCL Commands, Select Statement with Clauses-Where, Having, ORDERBY and GROUPBY.

UNIT V FUNCTIONS AND JOINS IN MYSQL 12

Functions in MySQL-Aggregate functions, String Functions, Math Functions, Date and Time Functions, Joins and Sub queries in MySQL, MySQL control statements and stored procedures, MySQL Triggers.

Total: 60 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Grasp the foundational principles of database systems, including their purpose, components, and importance in data management.

CO2: Understand the concepts of Entity Relationship Model

CO3: Able to understand and design simple ER model

CO4: Apply normalization techniques to ensure database efficiency.

CO5: Apply normalization techniques, including identifying functional dependencies and normal forms, to design efficient and well-structured databases.

CO6: Analyze various types of SQL statements and their applications.

CO7: Understand and describe the basic concepts of Mysql

CO8: Able to write queries using Mysql

Text Books:

1. Ramez Elmsari, Shamkant B Navathe(2007), Fundamentals of Database Systems,7th Edition, Pearson Education.

2. VaswaniVikram(2004),MySQL: The Complete Reference, Tata McGrawHill.

Reference Books:

1. Abraham Silberchatz, Henry F. Korth, S. Sudarshan, (2019), Database System Concepts,7th Edition ,Tata McGrawHill,.

2. Alexis Leon & Mathews Leon,(2014), Fundamentals of DBMS, 2nd Edition,Vijay Nicole Publications,

Web Sites:

1. www.w3schools.com
2. www.tutorialspoint.com
3. www.javapoint.com

Web Sources:

1. www.guru99.com
2. www.youtube.com/watch?v=D6Q_wHrzxDs

24PMIT11 OBJECT ORIENTED PROGRAMMING USING JAVA LAB

L	T	P	O	C
0	0	4	1	2

COURSE OBJECTIVES:

This course gives practical training in java programming. It will focus on more sophisticated features such as design of classes, interfaces, packages and javaFX applications. Provide the foundation of good programming skills by discussing keys issues to the design of object-oriented software.

APPLICATIONS

1. Program to define a structure of a basic JAVA program
2. Program to define the data types, variable, operators, arrays and control structures.
3. Program to define class and constructors. Demonstrate constructors.
4. Program to define class, methods and objects. Demonstrate method overloading.
5. Program to define inheritance and show method overriding.
6. Program to demonstrate Packages.
7. Program to demonstrate Exception Handling.
8. Program to demonstrate Multithreading.
9. Program to demonstrate I/O operations.
10. Program to demonstrate Calendar class and Vector class manipulations.
11. Program to create javaFX application to display welcome message
12. Program to create javaFX application to display 2D shapes

Total: 30 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Develop simple java application using java features and OOPs concepts.

CO2: Develop Java application for Constructors **CO3:** Develop Java application for method Overriding **CO4:** Create packages and to import them

CO5: Create user-defined Exceptions and to handle exceptions

CO6: Perform Multi-Threading and I/O operations

CO7: Manipulate utility Package classes

CO8: Build JavaFX applications to handle Events

Web Sources:

1. https://www.javatpoint.com
2. https://docs.oracle.com/javase/8/javafx/events-tutorial/events.html
3. https://www.w3schools.com
4. https://www.tutorialspoint.com



24PMIT12 RELATIONAL DATABASE MANAGEMENT SYSTEMS LAB

L	T	P	O	C
0	0	4	1	2

COURSE OBJECTIVES:

This course gives practical training in design and implementation of relational data bases for the selected set of problems.

APPLICATIONS

Write a program for

1. Table creation, renaming a table, copying another table, dropping a table.
2. DDL commands
3. DML commands
4. Joins and subqueries.
5. Select statements with all clauses /options
6. Index and view.
7. Application development: students mark sheet processing, pay roll processing.
8. Functions in MySQL.
9. MySQL control statements.
10. MySQL triggers.

Total: 30 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Creating a table using basic commands.

CO2: Apply DDL, DML statement

CO3: Apply various types of joins in tables.

CO4: Apply various types of joins in tables.

CO5: Evaluate the functionalities of trigger.

CO6: Analyse different types of built-in function.

CO7: Able to write queries using Mysql

Web References:

1. https://docs.oracle.com/en/database/index.html
2. https://docs.oracle.com/database/121/SQLRF/toc.html

Web sites:

1. www.w3schools.com
2. www.tutorialspoint.com
3. www.javapoint.com

SEMESTER II

24CMIT21 **SOFTWARE TESTING TECHNIQUES AND TOOLS**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To understand the basics of software testing. To learn how to do the testing and planning effectively. To build test cases and execute them. To focus on wide aspects of testing and understanding multiple facets of testing.

UNIT I - FOUNDATIONS OF SOFTWARE TESTING 11

Why do we test Software? Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V- model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing.

UNIT II - TEST PLANNING 12

The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

UNIT III - TEST DESIGN AND EXECUTION 13

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

UNIT IV - ADVANCED TESTING CONCEPTS 12

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.

UNIT V TEST AUTOMATION AND TOOLS 12

Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

Total: 60 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Understand the basic concepts of software testing and the need for software testing

CO2: Design Test planning and different activities involved in test planning.

CO3: Design effective test cases that can uncover critical defects in the application.

CO4: Carry out advanced types of testing.

CO5: Automate the software testing using Selenium

Text Books:

1. Yogesh Singh, (2012),Software Testing, Cambridge University Press,.

2. Unmesh Gundecha, Satya Avasarala,(2018), Selenium WebDriver 3 Practical Guide, Second Edition. Packt Publishing

Reference Books:

1. Glenford J. Myers, Corey Sandler, Tom Badgett,(2012), The Art of Software Testing, 3rd Edition, , John Wiley & Sons, Inc.

2. Paul C. Jorgensen,(, 2014), Software Testing: A Craftsman's Approach, Fourth Edition, Taylor & Francis Group

3. Carl Cocchiaro, (2018), Selenium Framework Design in Data-Driven Testing, Packt Publishing.

4. Elfriede Dustin, Thom Garrett, Bernie Gaurf, (2009), Implementing Automated Software Testing, Pearson Education, Inc.

Web Sites:

1. www.javapoint.com
2. www.geeksforgeeks.org
3. www.w3schools.com
4. www.tutorialspoint.com

Web Sources:

1. https://www.javatpoint.com/software-testing-tutorial
2. https://mrcet.com/downloads/digital_notes/ME/III%20year/Software%20Testing%20Techniques.pdf
3. https://mrcet.com/downloads/digital_notes/ME/III%20year/Software%20Testing%20Techniques.pdf
4. https://malenezi.github.io/malenezi/SE401/Books/Software-Testing-A-Craftsman-s-Approach-Fourth-Edition-Paul- C-Jorgensen.pdf

24CMIT22 PROGRAMMING IN PYTHON USING DJANGO

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To describe the core syntax of python programming language. To discover the need for working with the strings and functions. To illustrate the process of structuring the data using lists, dictionaries, tuples and sets. To understand the basic theory underlying web technologies. To install Django in a development and production environment. To acquire knowledge about the architecture of a Django-based web site in real time.To understand the utilization of Django models to build an interface with powerful Sqlite database.

UNIT I - CONTROL STRUCTURES AND OOPS CONCEPTS 12

Python Program Execution Procedure – Statements – Expressions – Flow of Controls – Functions – Numeric Data Types – Sequences – Strings – Tuples – Lists – Dictionaries. Class – Constructors – Object Creation – Inheritance – Overloading. Python arrays, Access the Elements of an array, array methods, Numpy- Modules Overview - Modules Search Path - Import Statement -dir() Function - Executing A Module - Renaming A Module - Python Packages - Packages initialization - Importing modules from a package- Sub Packages.

UNIT II - ERRORS AND EXCEPTION HANDLING, FILES 12

Errors- Exception Handling: try block, except block and finally block- Files: Opening a File - Closing a File- Reading and Writing a File - File Methods – Renaming and Deleting a File - Built-in file directories in Python.

UNIT III - INTRODUCTION TO DJANGO AND TEMPLATES 12

Installing Django-The MVC framework-Starting a project with Django-Creating an application-Configuring the application- Creating a Django Project-Hello World with Django-Creating our first URL- Creating our first view-Testing our application. Injecting the data from view to the template-Built-in Tags & filters. Working with Templates Working with Templates Integrating variables in templates-Extending the templates using static files in templates

UNIT IV - DATABASE MODEL USING SQLITE 12

Define models - Creating a simple model - Save a model into a Database - Inserting & Editing Data - Getting a Model data with Query set - Deleting Objects Implementing Foreign key - Extending a model. Define models.

UNIT V - DJANGO ADMIN INTERFACE AND SECURITY 12

Activating the Admin Interface- Using the Admin Interface - Users, Groups and Permissions- Customizing the Admin Interface's Look and Feel- Customizing the Admin Index Page- When and Why to Use the Admin Interface- Form Processing- Form Validation- Save Form Response. Security in Django: Cross Site Request Forgery (CSRF) protection - SQL injection protection. Real time projects in Django– Evaluation of projects – Doubts and discussions – Assessment.

Total: 60 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Interpret the fundamental python syntax and be fluent in the use of python control flow statements and OOPS concepts.

CO2: Apply the concept of sets, dictionaries & tuples in python.

CO3: Understand the concepts of errors, exception handling.

CO4: Explain the concepts of file handling.

CO5: Illustrate and Configure Django in a development and production environment.

CO6: Make use of Django Models to build an interface with powerful relational databases in realtime. **CO7:** Design a form to automate the validation and verification of data in those forms and implement user authentication and access control using Django sessions.

CO8: Apply the Concept to a real-world problem to implement, maintain, and manage complete e- commerce, publishing, and other content-management systems using Django.

Text Books:

1. Gowrishanker and Veena, (2019), Introduction to Python Programming, CRC Press,.

2. Kameron Hussain,Frahaan Hussain(2023) ,Django Unleashed : Building Web Applications with Python's Framework, 1st Edition,Sonar Publishing.

3. Aidas Bendoraitis and Jake Kronika(2020),Django 3 Web Development Cookbook: Actionable solutions to common problems in Python web development, 4th Edition, Packt Publishing.

Reference Books:

1. Leo Chin and Tanmay Dutta, (2016), NumPy Essentials,1st Edition, Packt Publishing..

2. Leonardo Luis Lazzaro(2024), Ultimate Django for Web App Development Using Python: Build Modern, Reliable and Scalable Production-Grade Web Applications with Django and Python, First Edition, Orange Education Pvt Ltd.

Allen B. Downey(2016), Think Python: How to Think Like a Computer Scientist, Second Edition, Green Tea Press.

Dr. Charles Russell Severance (2016),Python for Everybody: Exploring Data in Python 3, Space Publishing.

Web Sources:

1. https://www.javatpoint.com/python- programs.
2. https://www.datacamp.com/community/tutorials/mysql-python
3. https://django-book-new.readthedocs.io/en/latest4.

24CMIT23 CRYPTOGRAPHY & NETWORK SECURITY

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To provide deeper understanding into cryptography, its application to network security, threats/vulnerabilities to networks and countermeasures. To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes. To familiarize Digital Signature Standard and provide solutions for their issues. To familiarize with cryptographic techniques for secure (confidential) communication of two parties over an insecure (public) channel; verification of the authenticity of the source of a message.

UNIT I – INTRODUCTION 12

Security trends, The OSI Security Architecture, Security Attacks, Security Services and Security Mechanisms, A model for Network security. Classical Encryption Techniques: Symmetric Cipher Modes, Substitute Techniques, Transposition Techniques, Rotor Machines, Stenography.

UNIT II - BLOCK CIPHER AND DATA ENCRYPTION STANDARDS 12

Block Cipher Principles, Data Encryption Standards, the Strength of DES, Differential and Linear Crypt Analysis, Block Cipher Design Principles. Advanced Encryption Standards: Evaluation Criteria for AES, the AES Cipher. More On Symmetric Ciphers: Multiple Encryption, Triple DES, Block Cipher Modes of Operation, Stream Cipher and RC4. Introduction To Number Theory: Prime Numbers, Fermat's and Euler's Theorem, Testing for Primarily, The Chinese Remainder Theorem, Discrete logarithms.

UNIT III PUBLIC KEY CRYPTOGRAPHY AND RSA 12

Principles Public key crypto Systems, Diffie Hellman Key Exchange, the RSA algorithm, Key Management, Elliptic Curve Arithmetic, Elliptic Curve Cryptography. Message Authentication and Hash Functions: Authentication Requirement, Authentication Function, Message Authentication Code, Hash Function, Security of Hash Function and MACs. Hash and Mac Algorithm: Secure Hash Algorithm, Whirlpool, HMAC, CMAC. Digital Signature: Digital Signature, Authentication Protocol, Digital Signature Standard.

UNIT IV AUTHENTICATION APPLICATION 12

Kerberos, X.509 Authentication Service, Public Key Infrastructure. EMAIL ECURITY: Pretty Good Privacy (PGP) and S/MIME. IP SECURITY: Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

UNIT V NETWORK SECURITY 12

Firewalls - Firewall Design principles, Trusted Systems - IP Security – VPN - Intrusion Detection - Viruses and related threats - Web Security – SSL – TLS.

Total: 60 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Identify basic security attacks and services

CO2: Use symmetric and asymmetric key algorithms for cryptography

CO3: Design a security solution for a given application

CO4: Analyze Key Management techniques and importance of number Theory.

CO5: Understanding of Authentication functions the manner in which Message Authentication Codes and Hash Functions works.

CO6: To examine the issues and structure of Authentication Service and Electronic Mail Security

CO7: Understand network security concepts and study different Web security mechanisms. **CO8:** Understand authentication requirements and study various authentication mechanisms. ***Text Books:***

1. William Stallings (2006), Cryptography and Network Security: Principles and Practice, 4th Edition, Pearson Education, India.
2. William Stallings (2000), Network Security Essentials (Applications and Standards), Pearson Education, India.

Reference Books:

1. Charlie Kaufman (2002), Network Security: Private Communication in a Public World, 2nd Edition, Prentice Hall of India, New Delhi.
2. Atul Kahate (2008), Cryptography and Network Security, 2nd edition, Tata Mc Graw hill, India.
3. Robert Bragg, Mark Rhodes (2004), Network Security: The complete reference, Tata McGraw hill, India.

Web Sources:

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-857-network- and-computer- security- spring-2014/index.htm
2. https://nptel.ac.in/courses/106105031/
3. https://medium.com/analytics-vidhya/cryptography-in-data-security-cf610303fd46
4. https://www.jaroeducation.com/blog/difference-between-cryptography-and-network- security/



24CMIT24 **ADVANCED OPERATING SYSTEMS**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES:

To study the characteristics of OS for Multiprocessor and Multicomputer. To learn the issues related to designing OS. To learn the latest trends in building Mobile OS.

UNIT I – MULTIPROCESSOR OPERATING SYSTEMS 12

Multiprocessor Operating Systems: System Architectures- Structures of OS – OS design issues – Process synchronization – Process Scheduling and Allocation- memory management.

UNIT II - DISTRIBUTED OPERATING SYSTEMS 12

Distributed Operating Systems: System Architectures- Design issues – Communication models – clock synchronization – mutual exclusion – election algorithms- Distributed Deadlock detection.

UNIT III FILE SYSTEMS 12

Distributed scheduling - Distributed shared memory - Distributed File system – Multimedia file systems - File placement – Caching.

UNIT IV DATABASE OPERATING SYSTEMS 12

Database Operating Systems: Requirements of Database OS – Transaction process model – Synchronization primitives - Concurrency control algorithms.

UNIT V MOBILE OPERATING SYSTEMS 12

Mobile Operating Systems: ARM and Intel architectures - Power Management - Mobile OS Architectures - Underlying OS - Kernel structure and native level programming - Runtime issues- Approaches to power management.

Total: 60 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Know the advanced concepts in OS **CO2:** Design an OS for multiprocessor system **CO3:** Develop OS for distributed systems

CO4: Analyze the memory and file system in distributed environment. **CO5:** Address the issues related to Synchronization and Concurrency control **CO6:** Understand Mobile OS Architectures

CO7: Develop modules for mobile devices.

Text Books:

1. M Singhal and NG Shivaratri(2001), Advanced Concepts in Operating Systems, Tata McGraw Hill Inc.

2. A S Tanenbaum(2001), Distributed Operating Systems, Pearson Education Asia.

Web Resources

1. https://www.javatpoint.com/distributed-operating-system
2. https://nptel.ac.in/courses/106106147
3. https://www.javatpoint.com/mobile-operating-system

24PMIT21 SOFTWARE TESTING TECHNIQUES AND TOOLS LAB

L	T	P	O	C
0	0	4	1	2

COURSE OBJECTIVES:

To understand the basics of software testing. To learn how to do the testing and planning effectively. To build test cases and execute them

APPLICATIONS

Write a program for

1. Preparing SRS document for Online Ticket Booking System
2. Creating a Test Case using Boundary Value Analysis Method
3. Creating a Test Case and Test Matrix to check Cyclomatic Complexity using Path Coverage Method.
4. Creating a Test Case using Equivalence Class Partitioning.
5. Performing black box testing of given programs using Boundary Value Analysis (BVA)
6. Performing white box testing of given programs using Branch Coverage Method.
7. Performing white box testing of given programs using Path Coverage Method.
8. Performing white box testing of given programs using Condition Coverage Method
9. Testing a given program using Equivalence Class Partitioning.

Total: 30 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Prepare SRS document for testing.

CO2: Design Test planning and different activities involved in test planning.

CO3: Design effective test cases that can uncover critical defects in the application.

CO4: Perform Black Box testing using Boundary Value Analysis.

CO5: Perform White Box testing using Path Coverage Method.

CO6: Test a given program using Equivalence Class Partitioning.

Web Sources

1. https://www.guru99.com/testers-write-code.html
2. https://www.browserstack.com/guide/code-based-testing
3. https://www.javatpoint.com/software-testing-tutorial

21PMIT22 PROGRAMMING IN PYTHON USING DJANGO LAB

L	T	P	O	C
0	0	4	1	2

COURSE OBJECTIVES:

To introduce to write programs using basic concepts of python programming. To practice the student to write simple programs using function. To improve the logical thinking in python programming. To develop the web application using Django. To demonstrate the CRUD operation with SQLite database using Django.

APPLICATIONS

Write a program for

1. Editing and executing Programs involving Flow Controls.
2. Editing and executing Programs involving Functions.
3. Program in String Manipulations.
4. Creating and manipulating a Tuple.
5. Creating and manipulating a List.
6. Creating and manipulating a Dictionary.
7. Object Creation and Usage.
8. Program involving Inheritance.
9. Program involving Overloading.
10. Reading and Writing with Text Files and Binary Files.
11. Installing Django and create a first web application.
12. Create a simple web application using view and template in Django.
13. Develop a web application using admin interface.
14. Create a Django web application using back end as sqlite and perform CRUD operation in the data base.
15. Create an ecommerce web application using Django

Total: 30 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Develop the program using fundamental python syntax and be fluent in the use of control flow statements as well as OOPS concepts.

CO2: Apply the concept of sets, dictionaries & tuples in python and demonstrate the program.

CO3: Create the program using the concepts of errors, exception handling.

CO4: Develop the programs using file handling.

CO5: Configure the Django in a development production environment.

CO6: Make use of Django Models to build an interface with powerful relational databases in realtime. **CO7:** Design a form to automate the validation and verification of data in those forms and implement user authentication and access control using Django sessions.

CO8: Apply the Concept and build a real-world problem to implement, maintain, and manage complete e- commerce, publishing, and other content-management systems using Django.

SEMESTER III

24CMIT32 **DEEP LEARNING**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES

1. To understand the major technology trends driving Deep Learning and apply fully connected deep neural networks.
2. This course is used to analyse the key parameters and hyper parameters in a neural network and architecture.

UNIT I MACHINE LEARNING BASICS 10

Machine Learning Basics- Types of Machine Learning-Classification-Regression-Clustering-Association- Supervised Vs. Unsupervised Learning- Machine Learning Models-Applications of Machine Learning.

UNIT II FUNDAMENTALS CONCEPTS OF NEURAL NETWORKS 13

Basic concepts — Layers – Neurons –Neural Networks in deep learning- Feed forward Neural Network (FNN) - Convolutional Neural Network (CNN) - Recurrent Neural Network (RNN).

UNIT III INTRODUCTION TO DEEP LEARNING 14

Machine Learning Vs. Deep Learning, Representation Learning, Width vs. Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU.

UNIT IV TRANSFER LEARNING 13

Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders. Techniques- Transfer learning in deep learning.

UNIT V APPLICATIONS OF DEEP LEARNING 10

Image Segmentation — Object Detection — Automatic Image Captioning — Image generation with Generative Adversarial Networks — Video to Text with LSTM Models — Attention Models for Computer Vision.

Total: 60 hours

COURSE OUTCOMES:

At the End of this course, the Student will be able to:

CO1: Design a learning model appropriate to the application.

CO2: Design a Neural Network for an application of your choice.

CO3: Analyze the foundation of neural network.

CO4: Apply Efficient Convolution Algorithms to solve real world problems

CO5: to understand the principles of deep learning and its capabilities.

CO6: Understand Supervised and Unsupervised Learning

CO7: To get knowledge of the fundamentals of neural networks and modern deep learning.

CO8: Analyze various applications of Deep learning

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press,2016.

2. Josh Patterson and Adam Gibson, "Deep learning: A practitioner's approach", O'Reilly Media, First Edition, 2017.

REFERENCE BOOKS:

1. Nikhil Buduma, O'Reilly, Fundamentals of Deep Learning, Designing next- generation machine intelligence algorithms, Shroff Publishers, 2019.

2. Douwe Osinga, O'Reilly,Deep learning Cook Book, Practical recipes to get started Quickly, Shroff Publishers, 2019.

WEB SOURCES:

1. https://keras.io/datasets/
2. http://deeplearning.net/tutorial/deeplearning.pdf
3. https://arxiv.org/pdf/1404.7828v4.pdf

24CMIT33 **DEVSEC OPS TOOLS AND TECHNIQUES**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES

1. To learn what a DevSecOps culture is and how it differs from more traditional software product development and deployment methodologies.

2. To learn how/and why inserting security into the software development lifecycle stages early enables the development of more secure code.

3. To use DevSecOps processes and techniques to develop software products.

UNIT 1: APPLICATION SECURITY FUNDAMENTALS 12

What is Secure Application Development-Need for Application Security- Common Application Security Risks and Threats- OWASP Top 10- Application Security Techniques- Secure Design Principles- Threat Modelling- Secure Coding- Secure Code Review- SAST and DAST Testing- Secure Configurations- Educating Developers- Role of Risk Management in Secure Development- Project Management role in secure application development.

UNIT 2: INTRODUCTION TO DEVOPS AND DEVSECOPS 10

Introduction to DevOps - Introduction to DevOps- DevOps Principles-Pipelines- Project Management- Understanding DevSecOps- DevOps vs. DevSecOps- DevSecOps:Principles- Culture- Pipelines- Benefits and Challenges.

UNIT 3: INTRODUCTION TO DEVSECOPS MANAGEMENT TOOLS 12

Introduction to DevSecOps Management Tools- Project Management Tools- Integrated Development Environment (IDE) Tools- Source-code Management Tools- Build Tools- Continuous Testing Tools. DevSecOps Code and CI/CD Tools- Continuous Integration Tools- Infrastructure as Code Tools- Configuration Management Tools- Continuous Monitoring Tools.

UNIT 4: INTRODUCTION TO DEVSECOPS PIPELINES 13

Introduction to DevSecOps Pipelines- Role of DevSecOps in the CI/CD Pipeline- DevSecOps Tools- Embracing the DevSecOps Lifecycle- DevSecOps Ecosystem- Key Elements of the DevSecOps Pipeline- Integrating Security into the DevOps Pipeline. Introduction to DevSecOps CI/CD Testing and Assessments.Implementing Security into the CI/CD Pipeline and Security Controls- Continuous Security in DevSecOps with Security as Code- Continuous Application Testing for CI/CD Pipeline Security- Application Assessments and Penetration Testing.

UNIT 5: IMPLEMENTING DEVSECOPS TESTING & THREAT MODELING 13

Implementing DevSecOps Testing & Threat Modeling - Integrating Security Threat Modeling in Plan Stage- Integrating Secure Coding in Code Stage- Integrating SAST, DAST, and IAST in Build and Test Stage- Integrating RASP and VAPT in Release and Deploy Stage

Total: 60 hours

COURSE OUTCOMES:

At the end of this course, the Student will be able to:

CO1: Develop/implement a software product that meets specified requirements in a team setting using DevSecOps processes and tools.

CO2: Utilize open-source and commercially available tools to implement DevSecOps processes

CO3: create reusable CI/CD pipelines in the development and automated testing of a software product.

CO4: Generate and analyze results of continuous integration automated tests that are part of a CI/CD pipeline.

CO5: Use configuration management tools to implement software configuration management and

CO6: Control processes integral to a DevSecOps environment.

CO7: Describe and demonstrate the ethical and security responsibilities associated with developing and deploying a software product

CO8: Conduct and share the outcome of the semester project using DevSecOps.

TEXT BOOKS:

1. Continuous Delivery with Docker and Jenkins - Third Edition, Author: Rafal Leszko ,May 2022
2. DevSecOps: A leader's guide to producing secure software without compromising flow, feedback and continuous improvement, Author: Glen Wilson, December 2020

REFERENCE BOOKS:

1. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations Authors: Gene Kim, Jez Humble, Patrick Debois, and John Willis, October 2016.
2. Implementing DevSecOps with Docker and Kubernetes: An Experiential Guide to Operate in the DevOps Environment for Securing and Monitoring Container Applications, Author: Jose Manuel Ortega,Feb 2022

WEB SOURCES:

1. https://github.com/devsecops/awesome-devsecops
2. https://k21academy.com/devsecops/devsecops-overview-and-important-tools/
3. https://dev.to/pavanbelagatti/a-developers-guide-to-devsecops-33nl

24PMIT31 DEVSEC OPS TOOLS AND TECHNIQUES LAB

L	T	P	O	C
0	0	4	1	2

COURSE OBJECTIVES

1. DevSecOps (Development, Security, and Operations) integrates security practices into the DevOps pipeline, ensuring that security is considered at every stage of software development and deployment.

2. Practical, hands-on experiences with tools and techniques to ensure secure coding, continuous security testing, and monitoring.

DevOps Exercises:

Lab Exercise 1: Understand the basics of version control, branching, and collaboration using Git and a Git repository hosting platform (GitHub or GitLab).

Lab Exercise 2: Set up Jenkins for Continuous Integration (CI) to automate the building and testing of your application.

Lab Exercise 3: Use GitLab CI/CD Implement Static Application Security Testing (SAST) in the CI/CD pipeline to catch vulnerabilities early and pipelines to automate the testing and deployment of an application.

Lab Exercise 4: Learn how to containerize an application using Docker.

Lab Exercise 5: Deploy and manage a containerized application using Kubernetes.

Lab Exercise 6: Automate infrastructure provisioning using **Terraform**.

Lab Exercise 7: Set up monitoring for your application using **Prometheus** and **Grafana**.

Lab Exercise 8: Set up a secure development environment that includes version control, vulnerability scanning, and secure coding practices.

Lab Exercise 9: Integrate Software Composition Analysis (SCA) into the CI/CD pipeline to scan for vulnerabilities in third-party libraries and dependencies.

Lab Exercise 10: Integrate container security into your CI/CD pipeline to ensure Docker images are secure.

Lab Exercise 11: Implement runtime application self-protection (RASP) to defend applications from attacks in real time.

Lab Exercise 12: Set up continuous monitoring of application and infrastructure and practice incident response.

Lab Exercise 13: Implement security monitoring using cloud-native tools like AWS GuardDuty or Azure Security Center.

Total: 30 Hours

COURSE OUTCOMES:

At the End of this course, the Student will be able to:

CO1: Able to automate the development, testing, deployment, and monitoring of applications using DevOps tools.

CO2: Utilize open-source and commercially available tools to implement DevSecOps processes

CO3: create reusable CI/CD pipelines in the development and automated testing of a software product.

CO4: Generate and analyze results of continuous integration automated tests that are part of a CI/CD pipeline.

CO5: Use configuration management tools to implement software configuration management and

CO6: Control processes integral to a DevSecOps environment.

CO7: Describe and demonstrate the ethical and security responsibilities associated with developing and deploying a software product

CO8: Conduct and share the outcome of the semester project using DevSecOps.

WEB SOURCES:

1. https://github.com/devsecops/awesome-devsecops
2. https://k21academy.com/devsecops/devsecops-overview-and-important-tools/
3. https://dev.to/pavanbelagatti/a-developers-guide-to-devsecops-33nl

24RMIT31 **RESEARCH METHODOLOGY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE:

To familiarize the students to the principles of scientific methodology in business enquiry, to develop analytical skills of business research, and to develop the skills for scientific communications.

UNIT I: INTRODUCTION: 12

Meaning, objectives and motivations in research, Characteristics and limitations of research – Components of research work - Criteria of good research, Research process – Types of Research, Fundamental, Pure or Theoretical Research –Applied Research –Descriptive Research – Evaluation Research –Experimental Research – Survey Research – Qualitative Research – Quantitative Research – Historical Research.

UNIT II: RESEARCH DESIGN & LITERATURE REVIEW: 12

Research Design – definition – essentials and types of research design – errors and types of errors in research design. Research problem: Selecting and analyzing the research problem – problem statement formulation – formulation of hypothesis. Literature review: purpose, sources, and importance - literature review procedure. Objectives: Learning Objectives; Definitions; Formulation of the research objectives.

UNIT III: MEASUREMENT. SCALING AND SAMPLING: 12

Variables in Research – Measurement and scaling – Different scales – Construction of instrument Validity and Reliability of Instrument. Data Collection Methods – Primary and Secondary Data - Construction of questionnaire and instrument – validation of instruments. Sample Size Determination - Sample Design and Sampling Techniques.

UNIT IV: DATA ANALYSIS AND TOOLS: 12

Processing of Data: Editing of Data – Coding of Data – Classification of Data – Statistical Series. Qualitative vs Quantitative data analyses – Univariate, Bivariate and Multivariate statistical techniques Measures of Central Tendency, Dispersion, correlation and Regression, Chi-square test: Applications, Steps, characteristics, limitations, Analysis of Variance and Covariance, Factor analysis – Discriminant analysis – cluster analysis – multiple regression and correlation – multidimensional scaling – Conjoint Analysis - Application of statistical software for data analysis.

UNIT V: RESEARCH REPORT WRITING: 12

Research report – Different types – Contents of report –executive summary – chapterization – contents of chapter – report writing – the role of audience – readability – comprehension – tone – final proof – report format – title of the report – Ethical issues in research: Code of Ethics in Research – Ethics and Research -Process – Importance of Ethics in Research

Total: 60 hours.

COURSE OUTCOMES:

On Completion of this course, the students can able to

1. Demonstrate knowledge of research processes (reading, evaluating and developing)
2. Perform literature reviews using print and online databases
3. Employ American Psychological Association (APA) formats for citations of print and electronic materials
4. Identify, explain, compare, and prepare the key elements of a research proposal/report
5. Define and develop a possible HIED research interest area using specific research designs
6. Compare and contrast quantitative and qualitative research paradigms, and explain the use of each in HIED research
7. Describe sampling methods, measurement scales and instruments, and appropriate uses of each
8. Analyze various research writing Techniques

TEXT BOOKS:

1. Kothari, C.R., 2004. Research methodology: Methods and techniques. New Age International.

2. Cooper, D.R., Schindler, P.S. and Sun, J., 2006. Business research methods (Vol. 9). New York: McGraw-Hill Irwin.

3. Creswell, J.W. and Creswell, J.D., 2017. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

REFERENCE BOOKS:

1. Business Research Methods- Donald Cooper & Pamela Schindler, TMGH, 9th editions.

2. Business Research Methods- Alan Bryman & Emma Bell, Oxford University Press.

WEBSITE:

1. https://www.geeksforgeeks.org/introduction-to-research-methodology/

24IMIT31 **INTERNSHIP**

L	T	P	O	C
0	0	0	4	2

COURSE OBJECTIVES

The objective of the mini project is to help the student develop the ability to apply theoretical and practical tools / techniques to solve real life problems related to industry academic institutions.

Students are to take up sample project development activities with the guidelines given below:

1. Preparing a project - brief proposal including:
   - Problem Identification
   - Developing a model for solving the problem
   - A statement of system / process specifications proposed to be developed (Data Flow Diagram)
   - List of possible solutions including alternatives and constraints
   - Cost benefit analysis
   - Time line activities
2. A report highlighting the design finalization [based on functional requirements & standards(if any)]
3. A presentation including the following:
   - Implementation phase (Hardware / Software / both)
   - Testing & Validation of the developed system
   - Learning in the Project Consolidated report preparation.

Total: 30 Hours

COURSE OUTCOME

At the End of this Course, the Student will be able to:

CO-1: Create new project with Report

CO-2: Evaluate project scope and Objectives.

CO-3: Analyze Software, Hardware and tools needed for the Project.

CO-4: Apply technical knowledge to solve project problem.

CO-5: Understand the implementation of Project

SEMESTER IV

L	T	P	O	C
4	0	0	2	4

24CMIT41 **INDUSTRIAL INTERNET OF THINGS**

COURSE OBJECTIVES:

1. To introduce the tools and techniques that enable IIoT solutions and Security.
2. Evaluate the security considerations and challenges associated with IoT-based systems.

UNIT I INTRODUCTION TO IOT 10

Definition of IoT – Advantages of IOT- IoT Reference Architecture-Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. Challenges in IoT-Realtime applications.

UNIT II INTRODUCTION AND ARCHITECTURE OF IIOT 12

Definition and Evolution of IIoT – Need of IIOT-Differentiating IIoT from IoT – architecture of IIOT- Drivers of IIoT**,** Benefits of IIoT- Components of IIOT- Sensors & Actuators, Edge Computing, Cloud Computing, Data Analytics & Machine Learning-,Cyber Security, Human-Machine Interface (HMI), Gateways- Key Milestones in the Development of Industrial IoT.

UNIT III IIOT SECURITY 12

IIOT protocol -security considerations and challenges in adopting the IIoT - Requirements of Cyber security in IIOT- Industrial internet systems security-Threat modeling.

UNIT IV APPLICATIONS OF IIOT 12

Manufacturing (Smart factories, predictive maintenance)-Energy (Smart grids, asset monitoring)-Healthcare (Remote patient monitoring, medical device management)- Agriculture (Precision farming, livestock tracking- Transportation (Fleet management, logistics optimization).

UNIT V PLATFORM AND CASE STUDY 14

Top Industrial IoT platforms, Technology Behind Industrial IoT Platforms: Implementation systems for IIoT , IIoT Data Monitoring & Control, Industrial IoT- Applications: Healthcare, Power Plants, Inventory Management & Quality Control, Safety and Security Applications (Including AR and VR safety applications), Facility Management, Case studies.

Total: 60 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to CO1: Understand the architecture of IOT.

CO2: Understand the architecture of IIOT.

CO3: Understand the components IoT devices, sensors, and actuators

CO4: Evaluate the security considerations and challenges associated with IoT-based systems. CO5: Understand the applications of IIOT.

CO6: To provide the protocols of IOT. CO7: Platform understanding.

CO8: Challenges associated with IoT-based systems. CO9: To present the case studies.

TEXT BOOKS:

1.Industrial Internet of Things (IIoT) by R. Anandan, Suseendran Gopalakrishnan, Souvik Pal, Noor Zaman ,Released March 2022.

2.Industrial Internet of Things Technologies and Research Directions Edited By Anand Sharma, Sunil Kumar Jangir, Manish Kumar, Dilip Kumar Choubey, Tarun Shrivastava, S. Balamurugan, April 2022.

REFERENCE BOOKS:

1. Industry 4.0: The Industrial Internet of Things Alasdair Gilchrist Publications: Apress, 2017

2. The Concept Industry 4.0 An Empirical Analysis of Technologies and Applications in Production Logistics Authors: Bartodziej, Christoph Jan Springer: Publication in the field of economic science, 2016

WEB SOURCES:

1. https://www.ptc.com/en/technologies/iiot
2. https://www.iiotconnection.com
3. https://www.techtarget.com/iotagenda/definition/Industrial-Internet-of-Things-IIoT

24PMIT41 **DATA VISUALIZATION LAB**

L	T	P	O	C
0	0	2	2	1

COURSE OBJECTIVES

- To understand the need of different datasets visualization
- Can perform descriptive and inferential analysis on data sets
- Can create visualization using modern tool
- Can develop analytical products
- Identify opportunities for application of data visualization in various domains

PROGRAMS

1. Identification of different types of data on the dataset

2. Visualization of datasets in terms of Line Chat, Area Chart, Bar Chart, Pie Chart, histogram, scatterplot, violin plot etc.

3. Representation of datasets and performing various statistical operation

4. Interactive Development of dashboard

5. Creating Visualization with Tableau

6. Presenting the working of dataset with Pivot Tables and Pivot Chart

7. Making World Map interaction with D3.js and SVG

8. Analysis of Variance (ANOVA)

9. Analysis of Covariance(ANCOVA)

10. Design and development of Analytical products

Total: 15 Hours

COURSE OUTCOMES

At the end of the course, the student should be able to:

CO1:Design and create data visualizations.

CO2:Conduct exploratory data analysis using visualization.

CO3:Craft visual presentations of data for effective communication.

CO4: Use knowledge of perception and cognition to evaluate visualization design alternatives.

CO5:Use JavaScript with D3.js to develop interactive visualizations for the Web.

DISCIPLINE SPECIFIC ELECTIVES

DSE 1

L	T	P	O	C
3	0	0	2	3

24DMIT11 OBJECT ORIENTED SOFTWARE ENGINEERING

COURSE OBJECTIVES:

To understand software process and Agile process. To be familiar with software project development process. To develop software project using Devops.

UNIT I – SOFTWARE PROCESS AND AGILE DEVELOPMENT 9

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models – Introduction to Agility-Agile process-Extreme programming-XP Process-Case Study.

UNIT II - REQUIREMENTS ANALYSIS AND SPECIFICATION 9

Requirement analysis and specification – Requirements gathering and analysis – Software Requirement Specification – Formal system specification – Finite State Machines – Petrinets – Object modelling using UML – Use case Model – Class diagrams – Interaction diagrams – Activity diagrams – State chart diagrams – Functional modelling – Data Flow Diagram- CASE TOOLS.

UNIT III SOFTWARE DESIGN 9

Software design – Design process – Design concepts – Coupling – Cohesion – Functional independence – Design patterns – Model-view-controller – Publish-subscribe – Adapter – Command – Strategy – Observer – Proxy – Facade – Architectural styles – Layered – Client Server – Tiered Pipe and filter- User interface design-Case Study.

UNIT IV SOFTWARE TESTING AND MAINTENANCE 9

Testing – Unit testing – Black box testing– White box testing – Integration and System testing– Regression testing – Debugging – Program analysis – Symbolic execution – Model Checking-Case Study.

UNIT V PROJECT MANAGEMENT 9

Software Project Management- Software Configuration Management – Project Scheduling- DevOps: Motivation-Cloud as a platform-Operations- Deployment Pipeline: Overall Architecture Building and Testing-Deployment- Tools- Case Study.

Total: 45 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Compare various Software Development Lifecycle Models

CO2: Evaluate project management approaches as well as cost and schedule estimation strategies.

CO3: Perform formal analysis on specifications.

CO4: Use UML diagrams for analysis and design.

CO5: Architect and design using architectural styles and design patterns.

CO6: Test the system with different techniques and tools.

CO7: Understand Devops tools.

CO8: Design cloud architecture and deployment.

Text Books:

1. Bernd Bruegge and Allen H. Dutoit(2009), Object-Oriented Software Engineering: Using UML, Patterns and Java, Third Edition, Pearson Education.

2. Roger S.Pressman(2014),Object-Oriented Software Engineering: An Agile Unified Methodology, First Edition, Mc Graw-Hill International Edition.

Reference Books:

1.Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli(2010), Fundamentals of Software Engineering, 2nd edition, PHI Learning Pvt. Ltd.

2. Craig Larman(2005), Applying UML and Patterns, 3rd ed, Pearson Education.

3. Len Bass, Ingo Weber and Liming Zhu(2016), DevOps: A Software Architect‘s Perspective, Pearson Education,.

4. Rajib Mall(2009), Fundamentals of Software Engineering, 3rd edition, PHI Learning Pvt. Ltd.

5. Stephen Schach(2010), Object-Oriented and Classical Software Engineering, 8th ed, McGraw- Hill,

Web Sources:

1. https://www.javatpoint.com/software-engineering-object-oriented-design
2. https://www.javatpoint.com/software-engineering-object-oriented-design
3. https://onlinecourses.nptel.ac.in/noc20_cs84/preview
4. https://developer.ibm.com/articles/an-introduction-to-uml/

DSE 1

24DMIT14 SCRIPTING LANGUAGES

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

Students will understand Scripting languages and its purposes. The course will cover theoretical aspects of the subject with suitable programs through scheduled lectures. The course will cover the Client Side and Server-Side Scripting Languages.

UNIT-I HTML 12

Internet Basics- Introduction to Scripting Languages- Client Side and Server Side Scripting Languages. Introduction to HTML - List - Creating Table - Linking document - Frames - Graphics to HTML Doc - Style sheet - Style sheet basic - Add style to document – Creating Style sheet rules - Style sheet properties
- Font - Text - List - Color and background color - Box - Display properties.

UNIT-II VB SCRIPT 12

Introduction to VBScript - Adding VBScript Code to an HTML Page - VB Script Basics - VBScript Data Types - VBScript Variables - VBScript Constants -VBScript Operators – mathematical- comparison- logical - Using Conditional Statements - Looping Through Code - VBScript Procedures – type casting variables - math functions – date functions – string functions– other functions - VBScript Coding Conventions - Dictionary Object in VBScript - Err Object

UNIT-III JAVA SCRIPT 12

Introduction to Javascript – Advantages of Javascript – Javascript syntax - Data type – Variable - Array – Operator & Expression – Looping – control structures – Constructor Function – user defined function Dialog Box.

UNIT-IV PERL 12

Introduction to PERL and Scripting Scripts and Programs, Origin of Scripting, Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages. PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.

UNIT-V CGI **12**

CGI and Scripting languages: Introduction to CGI, Alternative Technologies, The Hypertext Transport Protocol, URLs, HTTP, Browser Requests, Server Responses, Proxies, Content Negotiation, the Common Gateway Interface, The CGI Environment, Environment Variables, CGI Output, Forms and CGI, Sending Data to the Server.

Total: 60 Hours

COURSE OUTCOMES:

At the end of this course, the Student will be able to:

CO-1: Create applications by using concepts like Java Script, HTML, PERL.

CO-2: Create web scraping scripts to programmatically obtain data and content from web pages

CO-3: Evaluate techniques used to create scripts for automating system administrative tasks.

CO-4: Analyze many of the modern and way cool language features that show up frequently in scripting languages

CO-5: Have understanding of server side scripting with PERL & CGI language.

Text Books:

1. Ivan Bayross (2006), "Web Enable Commercial Application Development Using HTML, DHTML, Java script, PERL and CGI", BPB Publications

2. Kathleen Kalata (2001), "Internet Programming with VBScript and JavaScript", Thomson learning

3. J.Jaworski (1999), "Mastering Java script", BPB Publications

Reference Books:

1. Powell, Thomas; Schneider, Fritz (2004), "JavaScript: The Complete Reference", TMH, 2nd edition.

2. T. A. Powell (2002), "Complete Reference HTML", Third Edition, TMH,

Web Sources:

1. www.geeksforseeks.com

2. www.nptel.ac.in

DSE 1

24DMIT13 **COMPILER DESIGN**

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE

This course gives an insight into introduction, parsing techniques of compiler, working with syntax, grammar and semantics of programming languages proving students with an analogy to help them understand how grammar works for programming languages.

UNIT-I INTRODUCTION 12

Introduction – Structure of a optimizing Compiler – Compiler writing tools – Basic constructs of High level programming languages – Data structures – Parameter transmission. Lexical Analysis – Role of Lexical analyzer – Finite Automata – Regular Expressions to Finite Automata – Minimizing number of states of Deterministic Finite Automaton –Implementation of Lexical analyzer in C.

UNIT-II PARSING TECHNIQUES 12

Parsing Techniques – Context free Grammars – Derivations and Parse trees –Ambiguity – Writing a Grammar- Eliminating Ambiguity, Left recursion, Left Factoring - Top down – Recursive Descent Parsing – Non Recursive Predictive parsing - Bottom up Parsing – Handles Pruning – Shift Reduce parsing – Operator precedence parsing.

UNIT-III AUTOMATIC PARSING TECHNIQUES 12

Automatic Parsing Techniques – LR parser – Canonical Collection of LR(0) items – Construction of SLR parsing tables – LR(1) sets of items construction-LALR(1) – Construction of canonical LR parsing tables- Use of Bison or YACC.

UNIT-IV INTERMEDIATE CODE 12

Syntax Directed Translation – Semantic action – Implementation of syntax directed translators– Intermediate code: Prefix notation, Quadruples, Triples, and Indirect triples –Methods of translation of assignment statements, Boolean expressions and Control statements - Backpatching.

UNIT-V CODE GENERATION 12

Symbol Tables and Code Generation: Representing information in a symbol table –Data structures for symbol table – Introduction to code optimization – Basic blocks –DAG representation – Error Detection and Recovery – Semantic Processing- Code generation and local code optimization.

Total: 60 Hours

COURSE OUTCOME

At the End of this course, the Student will be able to:

CO-1: To understand the introduction of compiler and phases of compiler. CO-1: Evaluate concepts of lexical analyzer and Finite Automation.

CO-2: Analyze key concepts of context-free grammar.

CO-3: Apply different parsing techniques and construction of syntax tree.

CO-4: Understand advanced features of automatic parsing techniques specifically LR parser, SLR parser.

CO-5: Understand the concepts of construction of LR, SLR parsing table. to construct code generator.

Text Books:

1. Chattopadhyay , Santanu, (2022), " Compiler Design", Second Edition, PHI Learning Private Ltd.

2. Alfred V. Aho, Monica S. Lam, Ravi Sethi, and Jeffrey D. Ullman (2015), Compilers: Principles, Techniques, and Tools, Second Edition, Addison-Wesley.

Reference Books:

1. Keith D. Cooper, Linda Torczon (2022), Engineering a Compiler, 2nd Edition, Morgan Kaufmann.

2. teven S. Muchnick (2005), Advanced Compiler Design and Implementation, Edition not specified, Morgan Kaufmann Publishers

Web Sources:

1. www.nescoacademy.com
2. www.nptel.ac.in

DSE 2

24DMIT12 DATA MINING & DATA WAREHOUSING

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVE:

To understand the principles of Data warehousing and Data Mining. To be familiar with the Data warehouse architecture and its Implementation. To know the Architecture of a Data Mining system. To understand the various Data preprocessing Methods. To perform classification and prediction of data.

UNIT I – INTRODUCTION 9

Data mining – Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT II – CLASSIFICATION 9

Introduction to Classification- Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods.

UNIT III – PREDICTION 9

Introduction to Prediction- Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Regression Analysis - Model Section.

UNIT IV MINING OBJECT, SPATIAL, MULTIMEDIA, TEXT AND WEB DATA 9

Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

UNIT V DATA WAREHOUSING 9

Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

Total: 45 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: Analyze different classification & clustering techniques.

CO2: Understand steps involved in data mining.

CO3: Understand the basic functionalities & issues of data mining. **CO4:** Understand the basic components & benefits of Data Warehousing. **CO5:** Understand the concept of OLAP tools.

CO6: Understand the functionality of the various data mining and data warehousing component.

CO7: Compare different approaches of data ware housing and data mining with various technologies.

CO8: Describe different methodologies used in data mining and data ware housing.

Text Books:

1. Jiawei Han and MichelineKamber(2012), Data Mining Concepts and Techniques, Third Edition, Elsevie.

2. Alex Berson and Stephen J.Smith(2016), Data Warehousing, Data Mining & OLAP, 35th Reprint Tata McGraw – Hill Edition.

Reference Books:

1. Alex Berson and Stephen J. Smith(2007),Data Warehousing, Data Mining & OLAP, Tata McGraw – Hill Edition, Tenth Reprint.

2. K.P. Soman, Shyam Diwakar and V. Ajay(2006),Insight into Data mining Theory and Practice, Easter Economy Edition, Prentice Hall of India.

3. G. K. Gupta(2006),Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall of India,.

4. Pang-Ning Tan, Michael Steinbach and Vipin Kumar(2007), Introduction to Data Mining, Pearson Education.

WebSites:

1. www.w3schools.com
2. www.tutorialspoint.com
3. www.geeksforgeeks.org

Web Sources:

1. https://lecturenotes.in/subject/32/data-mining-and-data-warehousing-dmdw/note
2. https://www.smartzworld.com/notes/data-warehousing-and-data-mining-pdf-notes-dwdm

DSE 2

24DMIT15 MOBILE COMPUTING

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES:

This course introduces the basic concepts of mobile computing, communication systems, mobile and wireless devices, GSM – Architecture – Routing Strategies –TCP.

UNIT-I INTRODUCTION 12

Mobile and Wireless Devices – Simplified Reference Model – Need for Mobile Computing – Wireless Transmissions –Multiplexing – Spread Spectrum and Cellular Systems- Medium Access Control –Comparisons.

UNIT-II TELECOMMUNICATION SYSTEMS 12

GSM – Architecture – Sessions –Protocols – Hand Over and Security – UMTS and IMT – 2000– Satellite Systems - Types of Satellite System - Routing- Localization.

UNIT-III WIRELESS LAN 12

IEEE S02.11: System Architecture-Protocol Architecture, Physical Layer, 802.11b and 802.11a– Hiper LAN: WATM, BRAN, HYPERLAN2 – Bluetooth: User Scenarios, Architecture, Radio Layer, Baseband Layer, Link Manager Protocol, L2CAP, Security, SDP– Security and Link Management.

UNIT-IV MOBILE NETWORK LAYER 12

Mobile IP – Goals – Packet Delivery – Strategies – Registration – Tunneling and Reverse Tunneling – Adhoc Networks – Routing Strategies.

UNIT-V MOBILE TRANSPORT LAYER 12

Congestion Control – Implication of TCP Improvement – Mobility – Indirect – Snooping – Mobile – Transaction oriented TCP - TCP over wireless – Performance - Case study analysis: Smart Phone Enhanced Shopping, Advances on Sensors for Health Systems.

Total: 60 Hours

COURSE OUTCOMES:

At the End of this course, the students will be able to:

CO-1: Evaluate about various wireless LAN techniques.

CO-2: Analyze radio signal propagation issues and their impact on communication system performance.

CO-3: Understand about various wireless systems and standards and their basic operation cases.

CO-4: Understand the techniques of radio spectrum allocation in multi-user systems and they impact on networks capacity.

CO-5: Understand how the various signal processing and coding techniques of GSM and its Architecture.

Text Books:

1. J. Schiller (2013), "Mobile Communications", Pearson Education, Delhi, 2ndedition.

2. Hansmann, Merk, Nicklous, Stober (2004), Principles of Mobile Computing, 2nd Edition, Springer India.

Reference Books:

1. Pahalavan, Krishnamurthy (2003),Principle of wireless Networks: A unified Approach, Pearson Education, Delhi.

2. Martyn Mallick (2004) Mobile and Wireless Design Essentials, Wiley Dreamtech India Pvt. Ltd., New Delhi.

3. W.Stallings (2004), Wireless Communications and Networks, 2nd Edition, Pearson Education, Delhi.

Web Sources:

1. www.nptel.ac.in

2. www.nescoacademy.com

DSE 2

24DMIT16 SOFT COMPUTING

L	T	P	O	C
3	0	0	2	3

COURSE OBJECTIVES

1. To learn the basic concepts of Soft Computing
2. To study various Artificial Neural network architectures
3. To learn fuzzy sets, fuzzy logic and fuzzy inference system
4. To understand genetic algorithm for global optimization
5. To learn hybrids of neuro, fuzzy and genetic algorithm, and their applications.

UNIT I INTRODUCTION TO SOFT COMPUTING 12

Introduction: Neural networks – Fuzzy logic – Genetic algorithm – Hybrid systems; Artificial Neural Network: Fundamental concepts – Evolution of neural networks – Basic models of ANN – McCulloch and Pitts neuron – Linear separability – Hebb network.

UNIT II SUPERVISED, UNSUPERVISED & ASSOCIATIVE LEARNING NETWORKS 12

Supervised Learning Network: Perceptron networks – Adaptive linear neuron – Multiple adaptive linear neurons – Back propagation networks – Radial bias function network; Associative Memory Networks: Auto associative memory network – Bidirectional associative memory – Hopfield networks; Unsupervised Learning Networks: Hamming network – Kohonen neural network – Learning vector quantization – Adaptive resonance theory networks.

UNIT III FUZZY SYSTEMS 12

Introduction to fuzzy logic – Classical sets – Fuzzy sets – Fuzzy relations – Membership functions – Defuzzification methods – Fuzzy arithmetic – Fuzzy measures – Fuzzy rule base and approximate reasoning – Fuzzy decision making.

UNIT IV GENETIC ALGORITHMS 12

Genetic Algorithm and search space – General genetic algorithm – Operators – Stopping condition – Constraints – Classification – Genetic programming; Applications of genetic algorithm.

UNIT V HYBRID SOFT COMPUTING TECHNIQUES & APPLICATIONS 12

Neuro-Fuzzy hybrid systems – Genetic neuro hybrid systems – Genetic fuzzy hybrid and fuzzy genetic Hybrid systems; Applications of Soft Computing: A fusion approach of multispectral images with SAR – Optimization of Traveling Salesman Problem using genetic algorithm – Soft computing based hybrid fuzzy controllers.

Total Hours: 60

COURSE OUTCOMES

CO1: Understand various soft computing techniques

CO2: Design and develop different neural network algorithms

CO3: Analyse and apply fuzzy logic and fuzzy inference system

CO4: Solve problems using Genetic Algorithms

CO5: Apply various soft computing techniques for complex problems

TEXT BOOKS

1. S N Sivanandam, S N Deepa, “Principles of Soft Computing”, Wiley India, 2nd Edition, 2011.

2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, “Neuro-Fuzzy and SoftComputing”, Prentice-Hall of India, 2002.

REFERENCES

1. Kwang H Lee, “First course on Fuzzy Theory and Applications”, Springer, 2005.

2. George J Klir, Bo Yuan, “Fuzzy Sets and Fuzzy Logic-Theory and Applications”, Prentice Hall, 1996.

3. James A Freeman, David M Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Addison Wesley, 2003.

4. S Rajasekaran, G A VijayalakshmiPai, “Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications”, PHI Learning, 2017.

5. N P Padhy, S P Simon, “Soft Computing with MATLAB Programming”, Oxford University Press, 2015.

Weblinks:

1. https://archive.nptel.ac.in/courses/106/105/106105173/

DSE 3

24DMIT21 NATURAL LANGUAGE PROCESSING

L	T	P	O	C
3	1	0	2	4

COURSE OBJECTIVES:

To learn the fundamentals of natural language processing. To understand the use of CFG and PCFG in NLP. To understand the role of semantics of sentences and pragmatics. To apply the NLP techniques to IR application.

UNIT I – INTRODUCTION 9

Origins and challenges of NLP – Language Modelling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules-Tokenization, -Detecting and Correcting Spelling Errors-Minimum Edit Distance.

UNIT II – WORD LEVEL ANALYSIS 9

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of Speech Tagging-Rule-based-Stochastic and Transformation-based tagging- Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III – SYNTACTIC ANALYSIS 9

Concept of Grammars, Chomsky hierarchy of grammars,-concept of parsing, top-down parsing, bottom up parsing, bidirectional parsing-generating parse tree-data structures and algorithms used for parsing- tokenizer-Case study of parsers of NLP systems like ELIZA, LUNAR.

UNIT IV SEMANTIC ANALYSIS 9

Understanding meaning-CASE grammars-transformational grammars used for performing semantic analysis. Resolving ambiguities to generate correct meaning-Word Sense Disambiguation -Case study of Toolkit of word sense disambiguation used in WORDNET.

UNIT V SOFTWARE TOOLS FOR PERFORMING NLP 9

English WORDNET-components of WorldNet-understanding NLTK tool for using wordnet- HINDI wordnet-Indian Govt initiative for language analysis and machine translation.

Total: 45 Hours

COURSE OUTCOMES:

On Completion of this course, the students will be able to

CO1: To tag a given text with basic Language features

CO2: To understand and Compare different parsing methods.

CO3: To design an innovative application using NLP components.

CO4: To implement a rule based system to tackle morphology/syntax of a language.

CO5: To design a tag set to be used for statistical processing.

CO6: Use grammars for Semantic Analysis

CO7: To compare and contrast the use of different statistical approaches or different types of NLP applications.

Text Books:

1. Allen,James(1995), Natural Language Understanding, Second Edition, Benjamin/ Cumming.

2. Jurafsky, Danand Martin, James(2008),Speech and Language Processing, Second Edition, Prentice Hall.

3. Ela Kumar(2014), " Natural Language Processing", second edition ,IK international Publication,

Reference Books:

1.Bharati Akshar, Chaitanya Vineet, Sangal, Rajeev(1995), Natural Language Processing: A Paninian Perspective, EASTERN ECONOMY ed. edition Prentice Hall India Learning Private Limited;, 1995

2. Philipp Koehn(2009), Statistical Machine Translation, Cambridge University Press; 1st edition,

3. U.S. Tiwari and Tanveer Siddiqui(2008), Natural Language Processing and Information Retrieval, Oxford UniversityPress.

WebSites:

1. https://www.cl.cam.ac.uk/teaching/2002/NatLangProc/nlp1-4.pdf
2. https://www.techtarget.com/searchenterpriseai/definition/natural-language-processing-
3. https://www.cs.jhu.edu/~phi/ai/slides/lecture-natural-language-processing.pdf

DSE 3

24DMIT22 **CLOUD COMPUTING**

L	T	P	O	C
3	1	0	2	4

COURSE OBJECTIVES:

1. To introduce the broad perceptive of cloud architecture and model
2. To understand the concept of Virtualization and design of cloud Services
3. To be familiar with the lead players in cloud.
4. To understand the features of cloud simulator
5. To apply different cloud programming model as per need.
6. To learn to design the trusted cloud Computing system

UNIT I CLOUD ARCHITECTURE AND MODEL 9

Technologies for Network-Based System – System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture. Cloud Models:- Characteristics – Cloud Services – Cloud models (IaaS, PaaS, SaaS) – Public vs Private Cloud –Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

UNIT II VIRTUALIZATION 9

Basics of Virtualization - Types of Virtualization - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data-center Automation.

UNIT III CLOUD INFRASTRUCTURE AND IoT 9

Architectural Design of Compute and Storage Clouds – Layered Cloud Architecture Development – Design Challenges - Inter Cloud Resource Management – Resource Provisioning and Platform Deployment – Global Exchange of Cloud Resources-Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.

UNIT IV PROGRAMMING MODEL 9

Parallel and Distributed Programming Paradigms – Map Reduce, Twister and Iterative Map Reduce – Hadoop Library from Apache – Mapping Applications - Programming Support - Google App Engine, Amazon AWS - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Aneka, CloudSim.

UNIT V SECURITY IN THE CLOUD 9

Security Overview – Cloud Security Challenges and Risks – Software-as-a-Service Security – Security Governance – Risk Management – Security Monitoring – Security Architecture Design – Data Security – Application Security – Virtual Machine Security - Identity Management and Access Control – Autonomic Security.

TOTAL: 45 HOURS

COURSE OUTCOMES:

CO1: Compare the strengths and limitations of cloud computing

CO2: Identify the architecture, infrastructure and delivery models of cloud computing

CO3: Apply suitable virtualization concept.

CO4: Choose the appropriate cloud player, Programming Models and approach.

CO5: Address the core issues of cloud computing such as security, privacy and interoperability.

CO6: Design Cloud Services and Set a private cloud.

CO7: Implement security in cloud

CO8: Identify the risk in the cloud.

TEXT BOOKS:

1. George Reese, “Cloud Application Architectures: Building Applications and Infrastructure in the Cloud” O'Reilly,3rd edition,2022.

2. John W.Rittinghouse and James F.Ransome, “Cloud Computing: Implementation, Management, and Security”, CRC Press, 2018.

REFERENCE BOOKS:

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing,2022.
2. From ParallelProcessing to the Internet of Things", Morgan Kaufmann Publishers, 2022
3. Kumar Saurabh, "Cloud Computing – insights into New-Era Infrastructure", Wiley India,2021.

WEB SOURCES

1. https://www.geeksforgeeks.org/cloud-computing/
2. https://www.ibm.com/topics/cloud-computing
3. https://www.javatpoint.com/cloud-computing

DSE 3

24DMIT23 **NEURAL NETWORKS**

L	T	P	O	C
3	1	0	2	4

COURSE OBJECTIVES:

1. Biological motivation to design intelligent systems and control
2. Study the learning strategies of artificial neural networks and their training algorithms.
3. Discuss neural networks, architectures, algorithms and applications, including Back-propagation, adaptive networks, BAM, Hopfield network
4. To acquire knowledge about associate memory and training algorithms of various associate memory networks.
5. Introducing the concepts of classical and fuzzy set theory in crisp and fuzzy logic principle, fuzziness involved in various systems.
6. Study the fuzzy rule base system, decision making system and different methods of defuzzification and applications of fuzzy logic.

UNIT I ARTIFICIAL NEURAL NETWORKS 9

Introduction, Biological Neuron, Artificial Neuron, Basic concepts of Neural Networks, Basic Models of ANN Connections, McCulloch-Pitts Model, Characteristics of ANN, Applications of ANN.

UNIT II ESSENTIALS OF ANN 9

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategies (Supervised, Unsupervised, Reinforcement), Learning Rules, Numerical problems, Types of Applications.

UNIT III SUPERVISED LEARNING NETWORKS 9

Perceptron Network, Perceptron Learning Rule, Architecture, Perceptron Training Algorithm, ADALINE, MADALINE, Back Propagation Network, BP Learning Rule, Input Layer Computation, Hidden Layer Computation, Output Layer Computation, Radial Basis Function Demonstration through MATLAB.

UNIT IV ASSOCIATIVE MEMORY NETWORK 9

Training Algorithms for Pattern Association, Auto Associative Memory Network, Hetero Associative Memory Network, BAM, Hopfield Networks and Applications.

UNIT V CLASSICAL & FUZZY SETS 9

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, Membership functions.

TOTAL: 45 HOURS

COURSE OUTCOMES:

CO1: To differentiate Biological system, intelligent systems and the concepts of crisp and fuzzy set theory

CO2: To analyze the learning strategies of Artificial Neural networks and learning rules. **CO3:** To understand training algorithms and are able to provide adequate knowledge about feed forward and feedback neural networks.

CO4: To design training algorithms for associative memory network for pattern recognition problems

CO5: To able to work in the MATLAB tool.

CO6: To understand the associate memory and training algorithms of various associate memory networks.

CO7: To demonstrate knowledge and understanding of fuzzy system as they apply in real time systems.

CO8: To apply different methodologies to solve the problems related to defuzzification.

TEXT BOOKS:

1. Neural Networks and Deep Learning: A Textbook Charu C. Aggarwal, 2018.

2. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publications, 2013.

3. Fundamental of Artificial Neural Network and Fuzzy Logic-by Rajesh Kumar, Lakshmi publications,2009.

REFERENCE BOOKS:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education. 2006.

2. Neural Networks – Simon Hakins , Pearson Education,1997.

WEB SOURCES:

1. https://www.sciencedirect.com/journal/neural-networks
2. https://cs.stanford.edu/people/eroberts/courses/soco/projects/neural- networks/Sources/index.html
3. https://www.ibm.com/topics/neural-networks

DSE - 4

24DMIT31 BLOCK CHAIN TECHNOLOGY

L	T	P	O	C
3	1	0	2	4

COURSE OBJECTIVES

This course covers the technical aspects of public distributed ledgers, block chain systems, crypto currencies, and smart contracts. Students will learn how these systems are built, how to interact with them, how to design and build secure distributed applications.

UNIT-I BLOCKCHAIN BASICS 12

Distributed Database, Two General Problem, Byzantine General Problem and Fault Tolerance, Hadoop Distributed File System, Distributed Hash Table, ASIC resistance, Turing Complete. Cryptography: Hash function, Digital Signature - ECDSA, Memory Hard Algorithm, Zero Knowledge Proof positions.

UNIT-II INTRODUCTION TO BLOCK CHAINS 12

Introduction, Advantage over conventional distributed database, Block chain Network, Mining Mechanism, Distributed Consensus, Merkle Patricia Tree, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Block chain application, Soft & Hard Fork, Private and Public block chain.

UNIT-III DISTRIBUTED CONSENSUS AND CRYPTO CURRENCY 12

Nakamoto consensus, Proof of Work, Proof of Stake, Proof of Burn, Difficulty Level, SybilAttack, Energy utilization and alternate. History, Distributed Ledger, Bit coin protocols - Mining strategy and rewards, Ethereum - Construction, DAO, Smart Contract, GHOST, Vulnerability, Attacks, Side chain, Name coin.

UNIT-IV CRYPTO CURRENCY REGULATION 12

Stakeholders, Roots of Bit coin, Legal Aspects-Crypto currency Exchange, Black Market and Global Economy. Applications: Internet of Things, Medical Record Management System, Domain Name Service and future of Block chain.

UNIT-V BLOCK CHAIN CONSTRUCTION 12

Case study on Naive Block chain construction, Memory Hard algorithm – Hash cash implementation, Direct Acyclic Graph, Play with Go-ethereal, Smart Contract Construction, Toy application using Block chain, mining puzzles.

Total: 60 Hours

COURSE OUTCOMES

At the End of this course, the Student will be able to:

CO-1: Evaluate a method for solving a problem case study with different perspective.

CO-2: Analyze limitations and proofs are another essential part of block chain technologies, which are learned for betterment of creating block chain.

CO-3: Apply latest crypto currency aspects leads students to understand some of basic concepts of Black Market and Global Economy.

CO-4: Understand block chain technologies basics.

CO-5: Describing the history behind the block chain and learning about Vulnerability, Attacks and Side chain gives an additional support for creating a secured blockchain.

Text Books:

1. Imran Bashir (2018), Mastering Blockchain: Unlocking the Power of Cryptocurrencies, Smart Contracts, and Decentralized Applications, 1st Edition, 1 Packt Publishing.

2. Daniel Drescher (2020), Blockchain Basics: A Non-Technical Introduction in 250 Pages, 1st Edition, Wiley.

3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder (2016), Blockchain Technology: A Comprehensive Introduction, 1st Edition, Cambridge University Press.

Reference Books:

1. Don Tapscott, Alex Tapscott (2016), Blockchain Revolution: A New Economic and Social Paradigm, 1st Edition, Penguin Random House.

2. Atulya K. Dutta (2018), Blockchain and Cryptocurrency Technologies: Principles and Applications, 1st Edition, CRC Press.

Web Sources:

1. https://www.google.com/url?sa=E&source=gmail&q=https://www.blockchain.com/

2. https://www.google.com/url?sa=E&source=gmail&q=https://cryptozombies.io/

3. https://www.google.com/url?sa=E&source=gmail&q=https://www.coursera.org/

DSE - 4

24DMIT32 EMBEDDED SYSTEMS

L	T	P	O	C
3	1	0	2	4

COURSE OBJECTIVES

To learn parallel and distributed algorithm's development techniques for shared memory and message passing models. To study the main classes of parallel algorithms. To study the complexity and correctness models for parallel algorithms.

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 12

Definition of Embedded System - Embedded Systems Vs General Computing Systems - History of Embedded Systems - Classification, Major Application Areas - Purpose of Embedded Systems - Characteristics and Quality Attributes of Embedded Systems.

UNIT II TYPICAL EMBEDDED SYSTEM 12

Core of the Embedded System - General Purpose and Domain Specific Processors - ASICs, PLDs, Commercial Off- The Shelf Components (COTS) - Memory - ROM, RAM- Memory according to the type of Interface - Memory Shadowing - Memory selection for Embedded Systems - Sensors and Actuators - Communication Interface: Onboard and External Communication Interfaces.

UNIT III EMBEDDED FIRMWARE 12

Reset Circuit - Brown-out Protection Circuit - Oscillator Unit - Real Time Clock - Watchdog Timer - Embedded Firmware Design Approaches and Development Languages.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 12

Operating System Basics - Types of Operating Systems – Tasks - Process and Threads - Multiprocessing and Multitasking - Task Scheduling.

UNIT V TASK COMMUNICATION 12

Shared Memory - Message Passing - Remote Procedure Call and Sockets - Task Synchronization: Task Communication/Synchronization Issues - Task Synchronization Techniques - and Device Drivers - Case-Study: How to Choose an RTOS.

Total: 60 Hours

COURSE OUTCOMES

At the End of this course, the Student will be able to:

CO-1: Apply concept of Embedded System and General Computing systems. CO-2: Understand the History and Classification of Embedded systems.

CO-3: Understand the Major Application Areas, Purpose of Embedded Systems. CO-4: Understand about the Core of the Embedded System.

CO-5: Understand of General Purpose and Domain Specific Processors.

Text Books:

1.Shibu K.V, "Introduction to Embedded Systems", McGraw Hill 2009

2. Raj Kamal, "Embedded Systems", TMH, 2nd edition 2008.

3. Frank Vahid, Tony Givargis, "Embedded System Design", John Wiley 2002.

Reference Books:

1. Lyla, "Embedded Systems", Pearson 2013.

2. David E. Simon, "An Embedded Software Primer", Pearson Education, Ist Edition 2002.

Web Sources:

1 . www.tutorialandexample.com/embedded-systems-tutorial/

2 . www.studyelectronics.in/embedded-programming-tutorial

DSE - 4

L	T	P	O	C
3	1	0	2	4

24DMIT33 **GREEN COMPUTING**

COURSE OBJECTIVES:

- To learn the fundamentals of Green Computing.
- To analyze the Green computing Grid Framework.
- To understand the issues related with Green compliance.
- To study and develop various case studies.

UNIT I FUNDAMENTALS 12

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II GREEN ASSETS AND MODELING 12

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT III GRID FRAMEWORK 12

Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT IV GREEN COMPLIANCE 12

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V CASE STUDIES 12

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

COURSE OUTCOMES:

At the End of this course, the Student will be able to:

- Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
- Enhance the skill in energy saving practices in their use of hardware.
- Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders.
- Understand the ways to minimize equipment disposal requirements.

TEXT BOOKS:

1. Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, ―Green Home computing for dummies‖, August 2012.

REFERENCES

1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: steps for the Journey‖, Shroff/IBM rebook, 2011.
2. John Lamb, ―The Greening of IT‖, Pearson Education, 2009.
3. Jason Harris, ―Green Computing and Green IT- Best Practices on regulations & industry‖, Lulu.com, 2008
4. Carl speshocky, ―Empowering Green Initiatives with IT‖, John Wiley & Sons, 2010.
5. Wu Chun Feng (editor), ―Green computing: Large Scale energy efficiency‖, CRC Press

Web Sources:

1. **www.nptel.ac.in**
2. **www.javapoint.in**

DSE - 5

L	T	P	O	C
3	1	0	2	4

24DMIT34 BIG DATA ANALYTICS

COURSE OBJECTIVES:

To explore, design, and implement basic concepts of big data & analytics methodologies for analyzing structured and unstructured data with emphasis on the relationship between the Data Scientist and its application to the business needs.

UNIT-I INTRODUCTION TO BIG DATA 12

Introduction to Big Data Platform – Challenges of Conventional Systems - Nature of Data- Evolution of Analytic Scalability - Intelligent data analysis- Analytic Processes and Tools - Analysis vs Reporting - Modern Data Analytic Tools.

UNIT-II MINING DATA STREAMS 12

Introduction to Streams Concepts – Stream Data Model and Architecture – Stream Computing -Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Real Time Analytics Platform (RTAP) Applications.

UNIT-III ADVANCED ANALYTICS 12

Analyzing, Visualization and Exploring the Data, Statistics for Model Building and Evaluation, Advanced Analytics - K-means clustering, Association rules-Speedup, Linear Regression, Logistic Regression, Naïve Bayes, Decision Trees, Time Series Analysis, Text Analysis.

UNIT-IV HADOOP 12

History of Hadoop- The Hadoop Distributed File System – Components of Hadoop - Analyzing the Data with Hadoop- Scaling Out- Hadoop Streaming.

UNIT-V FRAMEWORKS 12

Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications Case Studies - Real Time Sentiment Analysis, Stock Market Predictions.

Total: 60 Hours

COURSE OUTCOMES:

At the End of this course, the students will be able to:

CO-1: Evaluate Big Data real time analytics platform applications.

CO-2: Analyze big data platform and learn intelligent data analysis and compare old and modern data analytic tool.

CO-3: Apply advanced analytics techniques to gain knowledge of latest techniques. CO-4: Understand the data streams concepts and stream computing.

CO-5: Understand the fundamental concepts of big data platforms and know about the basic concepts of nature and evolution of big data.

Text Books:

1. Prajapati (2014), Big Data Analytics with R and Hadoop.

Reference Books:

1. Stephan Kudyba (2014), Big Data, Mining, and Analytics: Components of Strategic Decision Making,Auerbach Publications.
2. Michael Minelli, Michele Chambers, Ambiga Dhiraj (2013), Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses, Wiley Publications.

Web Sources:

1. www.intellipaat.com/blog/big-data-tutorial-for-beginners/

2. www.simplilearn.com/tutorials/data-analytics-tutorial24DMCS13

DSE - 5

L	T	P	O	C
3	1	0	2	4

24DMIT35 QUANTUM COMPUTING

COURSE OBJECTIVES

1. Outline the importance of quantum computation
2. Understand the aspects of quantum computational model
3. Comprehend the concepts of quantum mechanics involved in quantum computing
4. Familiarize with quantum circuits
5. Realize the various aspects of quantum algorithm and quantum computer hardware

UNIT-1 INTRODUCTION TO QUANTUM COMPUTING 12

What is information? Is information physical? - Quantitative measure of information - Shannon's first coding theorem - More about the bit - Why do we need to know how to manage information? - Which technology? - The qubits - A brief history of quantum computation and quantum communication.

UNIT-2 QUANTUM COMPUTATIONAL MODELS 12

Quantum computational models: Elementary idea of complexity of an algorithm - Turing machine, Deterministic Turing machine - Probabilistic Turing machine - Reversible Turing machine – Quantum Turing machine – Circuit model of computation - Computational complexity and related issues.

UNIT-3 PRINCIPLES OF QUANTUM MECHANICS IN QUANTUM COMPUTING 12

Basic ideas of quantum mechanics - A little more of quantum mechanics - Density operator and density matrix - Density operator of pure states - Density operator of mixed states - The meaning of entanglement - Bell's inequality and nonlocality – A little more algebra for quantum computing – Bell measurement and entanglement - Partial trace - 1 Quantum bit commitment and quantum coin - Schmidt decomposition – Partial transpose and test of entanglement - Entanglement witness - State discrimination - Trace distance and fidelity – No cloning theorem - Conclusions from no cloning theorem - Other no-go theorems.

UNIT-4 QUANTUM GATES AND QUANTUM CIRCUITS 12

Quantum gates and quantum circuits - Single qubit gates - Two qubit gates - Three qubit gates - A little more on quantum gates – Quantum circuits – Quantitative measures of quality of a circuit - Gate count or circuit cost - Garbage bit – Quantum cost - Depth and width of a circuit - Total cost - Circuit optimization rules - Moving rule – Template matching - Visualizing the quantum gate.

UNIT-5 QUANTUM ALGORITHMS FOR REAL TIME APPLICATIONS 12

Quantum logic gates - The Deutsch algorithm - Generalization to n+m qubits - The Grover search algorithm - The quantum Fourier transform - The period of a function - Classical algorithms and quantum algorithms. Physical realizations: Trapped ions - Superconducting qubits - Quantum dot.

COURSE OUTCOMES:

At the End of this course, the students will be able to:

CO-1: Understand the evolution of quantum computing

CO-2: Apply the principles of quantum mechanics in quantum computing CO-3: Employ the quantum gates for designing quantum circuits

CO-4: Utilize the quantum algorithm for real time applications

Text Books:

1. Anirban Pathak, Elements Of Quantum Computation, CRC Press, First Edition, 2013

2. Michel LeBellac, , A Short Introduction To Quantum Information And Quantum Computation, Cambridge university press, 2006

Reference Books:

1. Michael A Nielsen; Isaac L Chuang, Quantum computation and quantum information, Cambridge university press, 2010.

2.Tim Spiller, Hoi-Kwong Lo, Introduction to quantum computation and quantum information, World Scientific Publishing Company, 2001.

Web Sources:

1. https://medium.com/@johncoogan/the-best-resources-for-learning-about-quantum-computing-4fcc9f3cbe56

2. https://www.nqcc.ac.uk/a-guide-to-online-resources-for-learning-quantum-computing/

DSE - 5

24DMIT36 THEORY OF COMPUTATION

L	T	P	O	C
3	1	0	2	4

COURSE OBJECTIVES:

To introduce concepts in automata theory and theory of computation. To identify different formal language classes and their relationships. To design grammars and recognizers for different formal languages.

UNIT – I INTRODUCTION 12

Alphabets, Strings and Languages; Automata and Grammars, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence of NFA and DFA, Minimization of Finite Automata, Distinguishing one string from other, Myhill-Nerode Theorem.

UNIT – II REGULAR EXPRESSION (RE) 12

Regular expression (RE) Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to FA, DFA to Regular expression, Arden Theorem, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages, Decision properties of Regular Languages, FA with output: Moore and Mealy machine, Equivalence of Moore and Mealy Machine, Applications and Limitation of FA.

UNIT – III CONTEXT FREE GRAMMAR & CONTEXT FREE LANGUAGES 12

Definition, Examples, Derivation, Derivation trees, Ambiguity in Grammar, Inherent ambiguity, Ambiguous to Unambiguous CFG, Useless symbols, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure proper ties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs.

UNIT – IV PUSH DOWN AUTOMATA (PDA) 12

Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG.

UNIT – V TURING MACHINES (TM) 12

Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, Variants of Turing Machine, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs. Post correspondence problem (PCP), Modified PCP, Introduction to recursive function theory.

Total: 60 Hours

COURSE OUTCOMES:

CO1: Ability to relate practical problems to languages, automata, and computability CO 2: Ability to demonstrate an increased level of mathematical sophistication

CO 3: Ability to apply mathematical and formal techniques for solving problems

CO 4: Ability to demonstrate an increased level of Automata and push down Automata CO 5: Ability to understand and demonstrate turning machines

Text books:

1. Hopcroft and Ullman (2006) "Introduction to Automata Theory, Languages and Computation", Pearson Education, 3rd edition,

Reference Books:

1. Martin J. C (2010), “Introduction to Languages and Theory of Computations”, TMH, 4th edition,
2. Peter Linz (2011) "An Introduction to Formal Language and Automata", Narosa Pub. House,
3. Papadimitriou, C. and Lewis, C. L. (1997), “Elements of the Theory of Computation”, PHI.

Web Sources:

1. **https://ocw.mit.edu/courses/18-404j-theory-of-computation-fall-2020/pages/syllabus/’**

DSE 6

L	T	P	O	C
4	0	0	2	4

24DMIT41 PARALLEL AND DISTRIBUTED COMPUTING SYSTEM

COURSE OBJECTIVES

1. To learn parallel and distributed algorithm development techniques for shared memory and message passing models
2. To study the main classes of parallel algorithms
3. To study the complexity and correctness models for parallel algorithms.

UNIT-I INTRODUCTION 12

Basic Techniques - Parallel Computers for Increase Computation Speed - Parallel &Cluster Computing.

UNIT-II PARALLEL PROGRAMS 12

Message Passing Technique - Evaluating Parallel Programs and Debugging - Portioning and Divide and Conquer Strategies Examples.

UNIT-III PIPELININGTECHNIQUES 12

Pipelining - Techniques Computing Platform - Pipeline Programs Examples.

UNIT-IV SHARED MEMORY 12

Synchronous Computations - Load Balancing - Distributed Termination Examples - Programming with Shared Memory - Shared Memory Multiprocessor Constructs For Specifying Parallel List - Sharing Data Parallel Programming Languages and Constructs - OpenMP.

UNIT-V DISTRIBUTED SHARED MEMORYSYSTEMS 12

Distributed Shared Memory Systems and Programming Achieving Constant Memory Distributed Shared Memory Programming Primitive - Algorithms – Sorting and Numerical Algorithms.

Total: 60 Hours

COURSE OUTCOMES

At the End of this course, the Student will be able to:

CO1: Evaluate concepts of Parallel computing systems. CO2: Analyze about Cluster Computing systems.

CO3: Apply Message Passing Technique. CO4: Apply Parallel programs and debugging.

CO5: Understand Pipelining Techniques and examples.

Text Books:

1. Blaise Barney (2010), Introduction to Parallel Computing, 1st Edition, CRC Press.

2. Anshul Kumar, Anant Grama, Vipin Kumar, and George Karypis (2003), Parallel Computing: Architectures and Algorithms, 1st Edition, Addison-Wesley Professional.(NA).

3. Andrew S. Tanenbaum, Maarten van Steen (2023), Distributed Systems: Principles and Paradigms, 2nd Edition, Pearson Education.

Reference Books:

1. Michael J. Quinn (2005), Parallel Programming and Applications, 1st Edition, McGraw-Hill Education(NA).

2. Martin Kleppmann (2017), Designing Data-Intensive Applications, 1st Edition, O'Reilly Media.

Web Sources:

1. https://www.google.com/url?sa=E&source=gmail&q=https://en.wikipedia.org/wiki/Parallel_computing

2. https://www.google.com/url?sa=E&source=gmail&q=https://en.wikipedia.org/wiki/Distribut ed_system

DSE 6

24DMIT42 **CYBER SECURITY**

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVE

- To introduce students to the fundamental concepts and evolving landscape of cyber security, including cyber threats, cyber warfare, and critical infrastructure protection.
- To provide in-depth knowledge about various types of cyber crimes, cyber law frameworks, and enforcement mechanisms both in India and globally.
- To equip students with an understanding of data privacy, data protection regulations, and effective cyber security management strategies including compliance and governance.

UNIT I OVERVIEW OF CYBER SECURITY 9

Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies

UNIT II CYBER CRIMES 9

Cyber crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cybersquatting, Pharming, Cyber espionage, Cryptojacking, Darknet- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, fake newscyber crime against persons - cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.

UNIT III CYBER LAW 9

Cyber crime and legal landscape around the world, IT Act,2000 and its amendments. Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.

UNIT IV DATA PRIVACY AND DATA SECURITY 9

Defining data, meta-data, big data, nonpersonal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations(GDPR),2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues.

UNIT V CYBER SECURITY MANAGEMENT, COMPLIANCE AND GOVERNANCE 9

Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.

COURSE OUTCOME

CO1: To explain the key terminologies, threat vectors, and actors in the cyber security landscape.

CO**2:** To analyze various forms of cybercrimes and demonstrate awareness of online frauds, scams, and social engineering techniques.

CO3: To apply the relevant cyber laws and legal provisions applicable to different types of cyber offenses including

AI, IoT, Blockchain and social media.

CO4: To assess data privacy concerns and apply global data protection regulations such as GDPR and PIPEDA in real-world scenarios.

CO5: To design basic cybersecurity frameworks for organizations including security policies, risk assessments, and cyber crisis management plans.

TEXTBOOK/REFERENCES

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and LegalPerspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd.

2. Information Warfare and Security by Dorothy F. Denning, Addison Wesley.

3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities byHenry A. Oliver, Create Space Independent Publishing Platform.

4. Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram,CRC Press.

5. Information Security Governance, Guidance for Information Security Managers byW. KragBrothy, 1st Edition, Wiley Publication.
6. Auditing IT Infrastructures for Compliance By Martin Weiss, Michael G. Solomon,2nd Edition, Jones Bartlett Learning.

DSE - 6

24DMIT43 SECURITY ISSUES IN MACHINE LEARNING

L	T	P	O	C
4	0	0	2	4

COURSE OBJECTIVES

1. Understand the fundamentals of machine learning.
2. Identify security vulnerabilities in machine learning systems.
3. Analyse the impact of adversarial attacks.
4. Implement defence mechanisms against attacks.
5. Stay updated on emerging threats and countermeasures

UNIT-I INTRODUCTION TO MACHINE LEARNING 12

Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine Learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression-model assumptions, regularization (lasso, ridge, elastic net).

UNIT-II CLASSIFICATION AND REGRESSION ALGORITHMS 12

Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, Logistic Regression, Support Vector Machines (SVM), Decision Trees, and Random Forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks Learning and Generalization, Overview of Deep Learning.

UNIT-III SECURITY IN MACHINE LEARNING 12

Security Vulnerabilities in Machine Learning Algorithms, Evasion Attacks (Adversarial Inputs), Data Poisoning Attacks, Model Stealing Techniques, Possible Solutions to Ensure Machine Learning Security.

UNIT-IV ADVANCED LEARNING 12

Sampling-Basic Sampling methods, Monte Carlo, Gibbs Sampling – Computational Learning Theory – Mistake Bound Analysis – Reinforcement learning – Markov Decision processes, Deterministic and Non- deterministic Rewards and Actions, Temporal Difference Learning Exploration.

UNIT-V INTRUSION DETECTION **12**

Possible case studies: Machine learning for intrusion detection, Machine learning for side channel analysis, Privacy preserving machine learning, Adversarial machine learning.

Total: 60 Hours

COURSE OUTCOMES

At the End of this course, the Student will be able to:

CO1: Evaluate concepts of machine learning.

CO2: Analyze appreciate supervised and unsupervised learning and their applications CO3: Analyze security issues in machine learning.

CO4: Understand the analysis of time series and overview of deep learning. CO5: Understand the security issues in machine learning.

Text Books:

1. Clarence Chio, David Freeman (2018), Machine Learning and Security: Protecting Systems with Data and Algorithms, 1st Edition, O'Reilly Media, 9781491979909.

2. Soma Halder, Sinan Ozdemir (2020), Hands-On Machine Learning for Cybersecurity, 1st Edition, Packt Publishing, 9781788992288.

Reference Books:

1. Nicholas Carlini, David Wagner (2017), Adversarial Machine Learning in the Physical World, IEEE Security & Privacy.

2. Battista Biggio, Igino Corona (2017), Machine Learning Security: Threats and Defenses, Journal of Artificial Intelligence Research.

Web Sources:

1. https://owasp.org/www-project-machine-learning-security-top-10/

2. https://www.google.com/url?sa=E&source=gmail&q=https://cybersecurityventures.com/