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124CAT01 MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

COURSE OBJECTIVES :

- To introduce set theory and functions.
- To expose the concept of logic and hence to construct valid mathematical arguments.
- To master combinatorics which deals with the counting principles.
- To introduce formal languages and finite state automata.
- To learn network scheduling

UNIT – I FUNDAMENTAL STRUCTURES 9+3

Set theory- Relationships between sets – Operations on sets – Set identities – Principle of inclusion and exclusion – Minsets- Relations- Binary relations – Partial orderings – Equivalence relations-Functions- Properties of functions – Composition of functions – Inverse functions.

UNIT – II LOGIC 9+3

Propositional logic – Logical connectives – Truth tables – Normal forms (conjunctive and disjunctive) – Predicate logic – Universal and existential quantifiers – Proof techniques(direct and indirect).

UNIT – III COMBINATORICS 9+3

Mathematical Induction – Strong induction and well-ordering- Basics of counting – Counting arguments – Pigeonhole principle – Permutations and Combinations – Recurrence relations- Solving linear recurrence relations – Generating functions.

UNIT – IV FORMAL LANGUAGES& FINITE AUTOMATA 9+3

Formal Languages – Classes of Grammars – Phrase structure – Context sensitive – Context Free – Regular Grammars – Finite State Automata –Non- Deterministic Finite State Automata – Deterministic Finite State Automata.

UNIT – V NETWORK SCHEDULING BY PERT AND CPM 9+3

Network construction- Critical path method(CPM)-time charts and resource leveling- Project evaluation and review technique(PERT)- resource analysis in network scheduling-Minimal spanning tree-Shortest route.

Total No. of Periods : 45 + 15

***Note** : Use of approved statistical table is permitted in the examination.*

COURSE OUTCOMES:

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

- **CO1 :** Use the set theory concepts to understand the structures of functions.
- **CO2 :** Expertise the knowledge of logics helps to verify the correctness of computer programs and to draw conclusions from scientific experiments.
- **CO3 :** Demonstrate the applications of basic concepts of an algorithm and counting principles in combinatorial mathematics.
- **CO4 :** Construct finite automata machines using automata theory and formal languages.
- **CO5 :** Apply optimum network scheduling using PERT and CPM.

REFERENCES :

1. Judith L.Gersting, "Mathematical Structures for Computer Science", W.H.Freeman and Company, NY, 2012.
2. Kenneth H. Rosen, "Discrete Mathematics and its Applications",seventhth edition,TMH, 2013.
3. M.K. Venkataraman, N. Sridharan and N.Chandrasekaran," Discrete Maths.",The National Publishing Company, 2012.
4. Hopcraft.J.E., Motwani.R., Ullman.J.D., Introduction to Automata Theory, Languages and Computations", 3rd Edition, Pearson Education, 2008.
5. John.C.Martin, "Introduction to Languages and Theory of Computation", 4th edition, Tata McGraw Hill, 2011.
6. Hamdy A Taha, "Operations Research – An Introduction", Pearson, 10th Edition, 2016.

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124CAT02 DATABASE MANAGEMENT SYSTEMS

BASIC PREREQUISITES:

- Basic database concept.

COURSE OBJECTIVES:

- Knowledge of DBMS, both in terms of use and implementation/design
- Understand the areas of database design, SQL and programming
- To study the working principles of distributed databases.
- To manage database transactions effectively by understanding transaction properties.
- To design and implement efficient file structures and indexing methods, and to understand and apply concepts of special purpose databases.

UNIT – I INTRODUCTION 9

File systems versus Database systems – Data Models – DBMS Architecture – Data Independence Data Modeling using Entity – Relationship Model – Enhanced E-R Modeling.

UNIT – II RELATIONAL MODEL AND QUERY EVALUATION 9

Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries Joins -Views – Constraints – Partitions - Dynamic SQL, Other SQL Functions, overview of commercial RDBMSs – Database Design – Functional Dependencies – Normal Forms –1NF – 2NF-3NF-BCNF – 4NF-5NF - Algorithms for Executing Query Operations– Query Processing– Overview– Measures of Query Cost.

UNIT – III TRANSACTION PROCESSING 9

Transaction Processing – Properties of Transactions –Serializability– Transaction support in SQL Time Stamp ordering – Recovery concepts – Shadow paging, Buffer Management – Log Based Recovery – Database Security Issues – Access control.

UNIT - IV FILES, INDEXING & SPECIAL PURPOSE DATABASES 9

File Structures – Disks – RAID-File operations – Hashing Techniques – Indexing – Single level and Multi-Level Indexes – B+ tree – Static Hashing - Indexes on Multiple Keys. Basic Concepts: Distributed Databases DBMS Architecture, Architecture of Parallel Databases, Database design for ORDBMS - The ODMG Data Model and ODL.

UNIT - V NOSQL DATABASES 9

Introduction to distributed databases - NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding, Deployment – Advanced MongoDB Features –Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types - Using MongoDB with PHP / JAVA

Total No. of Periods : 45

COURSE OUTCOMES:

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

- **CO1 :** Understand the basic fundamentals of DBMS
- **CO2 :** Analyze the principles of the relational model, develop and optimize SQL queries, and assess query execution.
- **CO3 :** Apply and manage transaction processing, including transaction properties, serializability, recovery methods, and apply database security.
- **CO4 :** Implement file structures, utilize disk storage and RAID, perform file operations. Design databases for object-relational systems using the ODMG data model and ODL
- **CO5 :** Build and Deploy a simple application with NoSQL database systems.

REFERENCES

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan , "Database System Concepts", McGraw-Hill Education, 2019 ·
2. Ramez Elamassri and Shankant B-Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education Delhi, 2010.
3. Brad Dayley, "Teach Yourself NoSQL with MongoDB in 24 Hours", Sams Publishing, First Edition, 2014.
4. Raghu Ramakrishnan, Johannes Gehrke ,' Database management systems", McGraw, Hill, 6rd Edition, 2014.
5. Frank. P. Coyle, "XML Web Services and the Data Revolution", Pearson Education, 2012.
6. Lee Chao, "Database Development and Management", Auerbach Publications, 2016.

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124CAT03 ADVANCED DATA STRUCTURES AND ALGORITHMS

BASIC PREREQUISITES:

- Knowledge in C Structure
- Understanding of Pointers
- Concept in Array and Linked List.

COURSE OBJECTIVES :

- To explore the principles of algorithm efficiency and complexity in computing.
- Understand and Hierarchical data structures and their applications.
- To Master fundamental graph algorithms and their applications
- Introduce dynamic programming and greedy strategies to solve optimization problems.
- Understand NP-completeness and its implications for computational complexity.

UNIT – I ROLE OF ALGORITHMS IN COMPUTING AND COMPLEX ANALYSIS 9

Algorithm – Algorithms as a Technology – Time and Space Complexity of Algorithms – Asymptotic Analysis – Average and Worst Case Analysis – Asymptotic Notation – Importance of Efficient Algorithms – Program Performance Measurement – Recurrences Substitution Method – The Recursion – Tree Method.

UNIT – II HIERARCHIAL DATA STRUCTURES 9

Binary Search Trees: Basics – Querying a Binary Search Tree – Insertion and Deletion – Huffman Coding – Red Black Tree: Properties – Insertion – Deletion- Rotation – B-tree: Definition- Basic Operation – Heap – Heap Implementation - Disjoint Sets – Fibonacci Heaps: Structure – Merge able – Heap Operations – Decreasing a Key and Deleting a node - Bounding the maximum degree.

UNIT – III GRAPHS 9

Elementary Graph Algorithms: Representation of Graphs – Breadth First and Depth First SearchTopological Sort – Minimum Spanning Tree: Prims – Kruskal- Single Source Shortest Path: Bellman – Ford Algorithm – Single Source Shortest path in Directed Acyclic Graph: Dijsktra's Algorithm- Dynamic Programming: The Floyd – Warshall Algorithms.

UNIT – IV ALGORITHM DESIGN TECHNIQUES 9

Dynamic Programming: Matrix – Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence – Greedy Strategy – An Activity – Selection Problem.

UNIT – V NP COMPLETE AND NP HARD 9

NP – Completeness: Polynomial Time – Time Verification – NP Completeness and Reducibility NP Completeness Proofs – NP Complete Problem.

Total No. of Periods : 45

COURSE OUTCOMES:

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

- **CO1 :** Analyze e algorithm performance using various methods
- **CO2 :** Manipulate advanced data structures like trees and heaps
- **CO3 :** Implement and Analyze key graph algorithms to solve real-world problems
- **CO4 :** Apply dynamic programming and greedy methods to solve real-world problems efficiently.
- **CO5 :** Identify and prove NP-complete problems and analyze their complexity

REFERENCE BOOKS :

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein,Introduction to Algorithms, MIT Press, 2023 (4th edition).
2. Robert Sedgewick, Kevin Wayne, Algorithms, Addison-Wesley, 2022 (4th edition).
3. Steven S. Skiena, The Algorithm Design Manual, Springer, 2020 (3rd edition).
4. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, Pearson, 2019(5th edition).
5. Robert Lafore, Advanced Data Structures and Algorithms in Java, Sams Publishing,2021 (3rd edition).
6. Narasimha Karumanchi, Data Structures and Algorithms Made Easy, CareerMonkPublications, 2019 (5th edition).
7. Jeffrey D. Ullman, John E. Hopcroft, Introduction to Automata Theory, Languages,and Computation, MIT Press, 2020 (3rd edition).
8. S. Sridhar, “Design and Analysis of Algorithm”, Oxford University Press, 1 st Edition,2014.

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124CAT04 RESEARCH METHODOLOGY AND IPR

BASIC PREREQUISITES:

- Idea about Data Collections
- Meaning of Hypothesis
- Preparation of Report Writing

COURSE OBJECTIVES :

- Understanding the principles of experimental design and sampling methods
- Familiarize with various measurement scales, data collection techniques, and the development of measurement tools.
- Foundation in formulating and testing hypotheses using parametric and non- parametric statistical methods
- Understand the principles of intellectual property, its evolution, and its implications for innovation and research
- Analyze the objectives, types, and procedures involved in the patenting process, and create strategies for acquiring and managing patents effectively.

UNIT - I RESEARCH DESIGN 6

Meaning of Research Design – Need for Research Design – Features of Good Design – Different Research Design – Basic Principles of Experimental Design – Census and Sample Survey – Implications of a Sample Design – Steps in Sampling Design – Criteria of Selecting a sample procedure – Characteristics of Good Sample Design – Different types of Sample Design.

UNIT – II MEASUREMENT AND METHODS FOR DATA COLLECTIONS 6

Measurement in Research – Scales – Error Measurement – Types of Measurement – Techniques of Developing Measurement tools – Scaling – Meaning of Scaling –Scale Classification bases – Scaling Techniques – Collection of Primary Data – Observation –Interview Method – Collection of Data Through Questionnaires – Data Through Schedules – Difference between Questionnaires and Schedules.

UNIT – III HYPOTHESIS STANDARD 6

Hypothesis – Basic Concepts – Procedure – Flow Diagram – Tests of Hypotheses – Parametric Test – Hypothesis Testing: Means – Difference between means – Comparing two related samples – proportions – difference between proportions – Comparing a variance–Correlation Coefficients – Limitation of the Tests of Hypothesis.

UNIT – IV INTELLECTUAL PROPERTY RIGHTS 6

Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Biodiversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT V PATENTS **6**

Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents

Total No. of Periods : 30

COURSE OUTCOMES:

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

- **CO1 :** Design and evaluate research studies by applying appropriate research designs and sampling techniques to ensure robust and reliable results
- **CO2 :** Developing and implementing measurement tools and data collection methods, including surveys and interviews, to gather and analyse primary data effectively
- **CO3 :** Conducting and interpreting hypothesis tests using parametric and non-parametric methods to draw valid conclusions from research data.
- **CO4 :** Apply key concepts of intellectual property rights to protect and manage innovations
- **CO5 :** Navigating the patent application process, including understanding patent features, filing procedures, and managing patents and related licenses.

REFERENCE BOOKS :

1. Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods",Tata McGraw Hill Education, 11e (2012).
2. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, TradeSecrets", Entrepreneur Press, 2007.
3. David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007.
4. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", September 2013.

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124CAI01 PYTHON PROGRAMMING

BASIC PREREQUISITES:

- Basic Looping, branching statements and functions
- Fundamental of OOPs Concept
- Knowledge in Scripting Language

COURSE OBJECTIVES :

- To Develop python program using conditional and looping statement
- To implement python data structure – List, tuples, dictionary
- To process various file operations and exception handling.
- To define class and integrate database with python
- To execute modules, packages and framework.

UNIT – I INTRODUCTION 6

Introduction to Python Programming: Python Interpreter and Interactive Mode – Variables and Identifiers – Arithmetic Operators – Values and Types – Statement. Operators: – Boolean Values Operator Precedence – Expression. Conditionals: If- Else Constructs – Loop / Structures / Iterative Statement – While Loop – For Loop – Break Statement – Continue Statement –Function Call and return values – Parameter Passing – Local and Global Scope – Recursive Function.

UNIT – II COLLECTION AND MODULES 6

List and its Operation – Tuples – Dictionary – Sets – Advanced List Processing – List Comprehensive – Filtering – Modules: Module Loading Execution – Packages – Making your own Module – The Python Standard Libraries.

UNIT - III FILE HANDLING AND EXCEPTION HANDLING 6

Files – Introduction – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Error and Exceptions – Exception Handling and Multiple Exceptions

UNIT – IV OOC AND DB INTEGRATION IN PYTHON 6

Introduction to OOC – Class and Methods – Encapsulation – Inheritance – Polymorphism – Class Methods Vs Static Methods – Python Object Persistence – Built-in Functions – Python with Database Connection – Connect Database –CRUD Operations– Parameter Passing and Retrieving from the database.

UNIT – V PYTHON DECORATOR 6

Functions with Parameter – with Arguments – Return Values – Syntactic Decorator – Recusing Decorator – Class Decorator – Singleton Class Decorator – Nesting Decorator – State full Decorator

Total No. of Periods : 30

LIST OF EXPERIMENTS

1. Write a python program to implement conditional and branching statements.
2. Design a user defined function and recursive functions.
3. Write a simple program using List, Tuples and Dictionary.
4. Python program to develop functions using standard libraries
5. Write a program to manipulate the various file operations.
6. Python program to implement exception handling
7. Develop a python program using Inheritance.
8. Integrate Web Application in python using MySQL Database.

Total No. of Periods: 30

COURSE OUTCOMES:

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

CO1 : Develop a solution to simple computation problem
CO2 : Analyze Compound Data Structure using python list, tuples and dictionaries.
CO3 : Design and Develop an application based on the File operation.
CO4 : Develop an application with Database Integrations
CO5 : Implement of an application with Modules, Packages and Frameworks

REFERENCES :

1. James Payne, “Beginning Python”, Wrox Programming to Progammer, second editon 2018.
2. Fabrizio Romano,”Learn Python Programming”, Second Edition, Paktr Publication, 2018
3. Ashok Namdev Kamthane, Amit Ashok Kamthane,"Python programming", McGrawHill Publication,2018
4. Brian Draper, “Python Programming -A Complete Guide for Beginners to Master and Become an Expert in Python Programming Language”, Create Space Independent Publishing Platform,2016
5. John M. Stewart, “Python for Scientists”, Cambridge University Press, 2015.
6. Mitch Garnaat, "Python and AWS Cookbook", First Edition, O'Reilly Media, Inc., 2012.
7. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist ‘‘, 2nd edition, Updated for Python 3, Shroff/O ‘Reilly Publishers, 2016
8. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

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124CAP01 DATABASE MANAGEMENT SYSTEMS LAB

BASIC PREREQUISITES:

- Fundamental of Database Concept.

COURSE OBJECTIVES :

- To understand the concepts of DBMS.
- Populate and query a database using SQL DDL/DML Commands
- Declare and enforce integrity constraints on a database
- Writing Queries using advanced concepts of SQL
- Programming PL/SQL including procedures, functions, cursors and triggers

LIST OF EXPERIMENTS

1. Execute all DDL, DML and DCL commands on sample tables.
2. Implementation of different types of operators and built-in functions with suitable examples
3. Implementation of different types of joins with suitable examples
4. Create views, partitions, Sequence, Indexes and locks
5. Implement different types of constraints on relations.
6. Implementation of sub queries and nested queries.
7. Implement Queries on Group By & Having Clauses, ALIAS, Sequence By, Order By
8. a) Write a PL/SQL block for IF, IF and else condition
   b) Write a PL/SQL block for implementation of loops
   c) Write a PL/SQL block for greatest of three numbers using IF ANDELSEIF
9. Exception Handling-Implement the following with respect to exception handling.
   a) Raising Exceptions
   b) User Defined Exceptions
   c) Pre-Defined Exceptions
10. Write PL/SQL block for an application using exception handling Procedures
    a) Write a PL/SQL Procedure using Positional Parameters
    b) Write a PL/SQL Procedure using notational parameters
    c) Write a PL/SQL Procedure for GCD Numbers
    d) Write a PL/SQL Procedures for cursor implementation (explicit and implicit cursors)
11. Functions:
    a) Write a PL/SQL block to implement factorial using functions
    b) Write a PL/SQL function to search an address from the given database
12. Write a DBMS program to prepare Pl/SQL reports for an application using functions.
    a) Write a Trigger to pop-up the DML operations
    b) Write a Trigger to check the age valid or not Using Message Alert.
    c) Create a Trigger to Raise appropriate error code and error message.
    d) Create a Trigger on a table so that it will update another table while inserting values
13. Write PL/SQL block for an application using cursors and all types of triggers.
14. Write a PL/SQL block for transaction operations of a typical application using package
15. Implement CRUD operations using Mongo DB

Total No. of Periods : 60

COURSE OUTCOMES :

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

- **CO1 :** Execute DDL, DML, and DCL commands, use different operators and built-in functions, and implement various types of joins on sample tables
- **CO2 :** Implement a variety of constraints on relations for data integrity and proficiency in using subqueries and nested queries.
- **CO3 :** Develop robust PL/SQL blocks, incorporating conditional statements, loops, and exception handling mechanisms
- **CO4 :** Master PL/SQL programming, including procedures with positional and notational parameters, functions for complex computations and database queries
- **CO5 :** Implement PL/SQL blocks using advanced cursor techniques for precise data management and leverage diverse triggers to automate

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124CAE01 OBJECT ORIENTED SOFTWARE ENGINEERING

BASIC PREREQUISITES:

- Basic Definition of Software Engineering
- Functionalities of Software Engineering

COURSE OBJECTIVES :

- Understand software development processes and lifecycle models.
- Learn object-oriented analysis and design techniques for system modeling.
- Explore design principles and patterns in object-oriented development.
- Gain knowledge of testing techniques and maintenance strategies for object-oriented software.
- Understand software estimation, quality models, and metrics for object-oriented systems.

UNIT - I SOFTWARE DEVELOPMENT AND PROCESS MODELS 9

Introduction to Software Development – Challenges – An Engineering Perspective – Object Orientation – Software Development Process – Iterative Development Process – Process Models – Life Cycle Models – Unified Process – Iterative and Incremental – Agile Processes.

UNIT - II MODELING OO SYSTEMS 9

Object Oriented Analysis (OOA / Coad-Yourdon), Object Oriented Design (OOD/Booch), Hierarchical Object Oriented Design (HOOD), Object Modeling Technique (OMT) – Requirement Elicitation – Use Cases – SRS Document – OOA - Identification of Classes and Relationships, Identifying State and Behavior – OOD - Interaction Diagrams – Sequence Diagram – Collaboration Diagrams - Unified Modeling Language and Tools.

UNIT - III DESIGN PATTERNS 9

Design Principles – Design Patterns – GRASP – GoF – Dynamic Object Modeling – Static Object Modeling.

UNIT - IV SYSTEM TESTING 9

Software testing: Software Verification Techniques – Object Oriented Checklist :- Functional Testing – Structural Testing – Class Testing – Mutation Testing – Levels of Testing – Static and Dynamic Testing Tools - Software Maintenance – Categories – Challenges of Software Maintenance – Maintenance of Object Oriented Software – Regression Testing.

UNIT - V SOFTWARE QUALITY AND METRICS 9

Need of Object Oriented Software Estimation – Lorenz and Kidd Estimation – Use Case Points Method – Class Point Method – Object Oriented Function Point – Risk Management – Software Quality Models – Analyzing the Metric Data – Metrics for Measuring Size and Structure – Measuring Software Quality - Object Oriented Metrics.

Total No. of Periods : 45

COURSE OUTCOMES :

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

- **CO1 :** Explain different software development process models, including Agile and Unified processes.
- **CO2 :** Model systems using UML tools, identifying use cases, sequence diagrams, and class relationships.
- **CO3 :** Apply design patterns such as GRASP and GoF to solve design problems.
- **CO4 :** Implement testing techniques and address challenges in maintaining object-oriented software.
- **CO5 :** Use estimation methods and metrics to evaluate software quality and performance.

REFERENCES

1. Roger S. Pressman, "Software Engineering: A Practitioner's Approach, Tata McGraw-Hill Education, 8th Edition, 2015
2. Yogesh Singh, RuchikaMalhotra, " Object – Oriented Software Engineering", PHI Learning Private Limited ,First edition,2012
3. Ivar Jacobson. Magnus Christerson, PatrikJonsson, Gunnar Overgaard, "Object Oriented Software Engineering, A Use Case Driven Approach", Pearson Education, Seventh Impression, 2009
4. Craig Larman, "Applying UML and Patterns, an Introduction to Object-Oriented Analysis and Design and Iterative Development", Pearson Education, Third Edition, 2008
5. Watts S. Humphrey, "A Discipline for Software Engineering", Pearson Education, Edition 2007.
6. James F Peters and Witold Pedrycz," Software Engineering-An Engineering Approach: John Wiley and Sons, New Delhi, 2009.
7. Shari Lawrence Pfleeger, Joanne M. Atlee, "Software Engineering: Theory and Practice", Fourth Edition, Pearson Education, 2010.
8. Ian Sommerville, "Software Engineering", Ninth Edition, Pearson Education, 2011

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124CAE02 COMPUTER NETWORKS

BASIC PREREQUISITES:

- Knowledge of Types of Networks
- Functionalities of Various Topology
- Process of Packets

COURSE OBJECTIVES :

- To learn the fundamental concept of OSI Layer, Networks and Protocol standards.
- To understand about Wired and Wireless Network in Data Link Layer
- To Explore the concept of Network Protocol and Routing
- To Know the basic concept of Transport Layer
- To understand basic skill in Application Layer.

UNIT - I DATA COMMUNICATION 9

Data Communication – Networks - Protocols and Standards – Network Models – Layers in the OSI model – TCP/IP Protocol Suite – Addressing – Transmission Modes – Transmission Media Telephone Network – Dial-Up Modems – Digital Subscriber Line – Cable TV Networks – Cable TV for Data Transfer.

UNIT - II DATA LINK LAYER 9

Error Detection and Error Correction : Block Coding – Linear Block Codes – Cyclic Codes – Checksum – Data Link Control : Framing – Flow and error control – Protocols – Noiseless channels – Noisy channels – HDLC – Point to point protocols – Wired LANs: Ethernet – IEEE standard - Standard Ethernet – Changes in the standard – Fast Ethernet – Gigabit Ethernet – Wireless LANs: IEEE 802.11 – Bluetooth – SONETISDH – Architecture – SONET layers – SONET frames – STS Multiplexing – SONET networks – Virtual Tributaries.

UNIT - III NETWORK LAYER 9

Internetworking – Ipv4 Addresses – Ipv6 Addresses -Ipv4 – Ipv6 – Transition from IPv4 to IPv6– Address Mapping –ICMP – IGMP – ICMPv6 – Delivery- Forwarding – Routing – Unicast Routing protocols – Multicast Routing protocols

UNIT - IV TRANSPORT LAYER 9

Process-to-Process Delivery – User Datagram Protocol – TCP – SCTP – Data Traffic – Congestion and its Control – Quality of Service – Improve QoS – Integrated Services – QoS in Switched Networks.

UNIT - V APPLICATION LAYER 9

Domain Name System – Remote Logging – Electronic Mail – File Transfer – WWW and HTTP Simple Network Management Protocol – Cryptography – Symmetric-Key and Asymmetric- Key Cryptography – Security Service – Message Confidentiality, Integrity and Authentication –IPSec – SSL – PGP – Firewall.

Total Number of Periods: 45

COURSE OUTCOMES:

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

- **CO1 :** Understand principles of data communication, network protocols, and standards, including the OSI and TCP/IP models, various transmission modes, media, and modern telecommunication technologies
- **CO2 :** Implement data link layer mechanisms such as framing, flow control, and error control.
- **CO3 :** Analyze and evaluate different routing algorithms and their impact on network performance.
- **CO4 :** Applying knowledge of transport layer protocols in practical network applications and optimizing their performance.
- **CO5 :** Demonstrate proficiency in understanding, configuring, and securing network services.

REFERENCES :

1. Gerry Howser, "Computer Networks and the Internet: A Hands-On Approach", Springer Publication, 2019
2. Oliver C. Ibe, "Fundamentals of Data Communication Networks", Wiley Publication, 2017
3. Behrouz A. Forouzan, "Data Communication and Networking", 4th Edition, McGraw-Hill, 2007.
4. Behrouz A. Forouzan and Firouz Mosharraf, "Computer Networking: A Top-Down Approach", McGraw-Hill, 2013.
5. Andrew S. Tannenbaum and David J. Wetherall, "Computer Networks", Pearson, 2013.
6. William Stallings, "Data and Computer Communications", 8th Edition, Pearson, 2012.
7. Larry L. Peterson & Bruce S. Davie, "Computer Networks – A systems Approach", 5th Edition, 2012.

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124CAE03 - OPERATING SYSTEM CONCEPTS

COURSE OBJECTIVES

- To learn the fundamentals of Operating Systems.
- To learn the mechanisms of OS to handle processes and threads and their communication
- To learn the mechanisms involved in memory management in contemporary OS
- To gain knowledge on distributed operating system concepts that include architecture, Mutual exclusion algorithms, deadlock detection algorithms, and agreement protocols
- To know the components and management aspects of concurrency management

UNIT - I OPERATING SYSTEM AND PROCESS MANAGEMENT 9

Introduction - System Components - Operating System Services - System Calls – System Programs - Process Concept - Process Scheduling – Operations on Process - Cooperation Process - Inter-process Communication - CPU Scheduling and Criteria - Scheduling Algorithms - Multiple-Processor Scheduling - Real-Time Scheduling.

UNIT - II CRITICAL SECTION AND DEADLOCKS 9

The Critical-Section Problem - Synchronization Hardware – Semaphores - Classic problems of Synchronization - Critical regions – Monitors. System Model – Deadlock Characterization – Methods for Handling Deadlocks – Deadlocks Prevention and Avoidance – Deadlock Detection and Recovery.

UNIT - III STORAGE MANAGEMENT 9

Memory Management – Swapping – Contiguous Memory Allocation – Paging – Segmentation– Segmentation with Paging - Virtual Memory – Demand Paging – Process Creation – Page Replacement – Allocation of frames – Thrashing.

UNIT – IV FILE SYSTEMS INTERFACE AND IMPLEMENTATION 9

File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection. File System Structure – File System Implementation – Directory Implementation – Allocation Methods – Free-space Management. Kernel I/O Subsystems – Disk Structure – Disk Scheduling – Disk Management – Swap – Space Management.

UNIT - V WINDOWS ARCHITECTURE 9

Design Goals – System Architecture – System Management Mechanisms – Process and Thread Management – Memory Management – File Systems Management – Input / Output Management – Inter process Communication. Case Study: Linux – Mobile OS

Total No. of Periods: 45

COURSE OUTCOMES:

- **CO1 :** Understand the principles of operating system design and process management.
- **CO2 :** Analyze and design the applications to run in parallel either using process or thread models of different OS
- **CO3 :** Design, implement, and optimize memory management systems and virtual memory subsystems
- **CO4 :** Demonstrate proficiency in file and disk management concepts in operating systems.
- **CO5 :** Explore concepts such as virtual memory, demand paging, memory mapping, and memory compaction

REFERENCES :

1. Abraham Silberschatz, Greg Gagne, Peter B. Galvin, "Operating System Concepts", Eight Edition, Wiley Publication, 2019
2. Ekta. Walia, Ekta, "Operating System Concepts", Khanna Book Publishing Company (P) Limited,2015
3. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, “Operating System”, Third Edition, Pearson, 2013.
4. William Stalling, “Operating Systems Internals and Design Principles”, Fifth Edition, Prentice Hall of India, 2005.
5. Andrew S. Tanenbaum, “Modern Operating Systems”, Third Edition, PHI

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124CAE04 – CYBER SECURITY

BASIC PREREQUISITES:

- Understanding networking concepts like IP addresses, TCP/IP, DNS, and firewalls is essential for grasping how data is secured and transmitted.
- Experience with both Windows and Unix/Linux systems is important, as cybersecurity often involves securing and troubleshooting these platforms.
- Knowing fundamental programming concepts and languages (such as Python) can help in understanding vulnerabilities, scripting, and automating tasks.

OBJECTIVES

- To learn the principles of cyber security and to identify threats and risks.
- To learn how to secure physical assets and develop system security controls.
- To understand how to apply security for Business applications and Network Communications.
- To learn the technical means to achieve security.
- To learn to monitor and audit security measures

UNIT-I PLANNING FOR CYBER SECURITY **9**

Best Practices-Standards and a plan of Action-Security Governance Principles, components and Approach-Information Risk Management-Asset Identification-Threat Identification-Vulnerability Identification-Risk Assessment Approaches-Likelihood and Impact Assessment-Risk Tentative Determination, Evaluation and Treatment-Security Management Function-Security Policy Acceptable Use Policy-Security Management Best Practices - Security Models: Bell La Padula model, Biba Integrity Model -Chinese Wall model

UNIT-II SECURITY CONTROLS **9**

People Management-Human Resource Security-Security Awareness and Education-Information Management- Information Classification and Handling-Privacy-Documents and Record Management-Physical Asset Management-Office Equipment-Industrial Control Systems-Mobile Device Security-System Development-Incorporating Security into SDLC - Disaster management and Incident response planning.

UNIT-III CYBER SECURITY FOR BUSINESS APPLICATIONS **9**

Business Application Management-Corporate Business Application Security-End user Developed Applications-System Access- Authentication Mechanisms-Access Control-System Management Virtual Servers-Network Storage Systems-Network Management Concepts-Firewall-IP Security Electronic Communications - Case study on OWASP vulnerabilities using OWASP ZAP tool.

UNIT-IV TECHNICAL SECURITY **9**

Supply Chain Management-Cloud Security-Security Architecture-Malware Protection-Intrusion Detection-Digital Rights Management-Cryptographic Techniques-Threat and Incident Management-Vulnerability Management-Security Event Management-Forensic Investigations Local Environment Management-Business Continuity.

UNIT-V SECURITY ISSUES **9**

Security Monitoring and Improvement-Security Audit-Security Performance-Information Risk Reporting-Information Security Compliance Monitoring-Security Monitoring and Improvement Best Practices.

Total No. of Periods: 45

COURSE OUTCOMES

At the end of the Course, the Student will be able to

- **CO1 :** Understanding of the organization's cybersecurity frameworks, policies, and practices, ensuring foundational knowledge of security principles and practices.
- **CO2 :** Apply appropriate management, operational, and technical controls to actively safeguard against potential threats and vulnerabilities in the organization's systems.
- **CO3 :** Analyze audit results and performance data from cybersecurity controls to assess their effectiveness and identify any potential weaknesses or gaps.
- **CO4 :** Evaluate identified security gaps within the system, considering the impact and likelihood of each gap, and prioritize remediation efforts to enhance overall security.
- **CO5 :** Create detailed reports on vulnerabilities and proposed improvements, including actionable plans to address and mitigate identified security risks.

REFERENCES :

1. William Stallings, "Effective Cyber Security - A guide to using Best Practices and Standards", Addison-Wesley Professional, First Edition, 2019.
2. Adam Shostack, "Threat Modelling - Designing for Security", Wiley Publications, First Edition, 2014.
3. Gregory J. Touhill and C. Joseph Touhill, "Cyber Security for Executives – A Practical Guide", Wiley Publications, First Edition, 2014.
4. Raef Meeuwisse, "Cyber Security for Beginners", Second Edition, Cyber Simplicity Ltd, 2017.
5. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", 2nd Edition, Syngress, 2013.
6. Charles P. Pfleeger, Shari Lawrence Pfleeger, Jonathan Margulies, "Security in Computing", Fifth Edition, Prentice Hall, 2015.

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124CAE05 ARTIFICIAL INTELLIGENCE

BASIC PREREQUISITES:

- Definition of Artificial intelligence
- Types of Artificial Intelligence and its functionalities

COURSE OBJECTIVES :

- To provide a fundamental concept in Artificial Intelligence.
- To learn how to represent knowledge in solving AI problems
- To apply various techniques in application which involve reasoning.
- To analyze about Natural Language Processing,
- To Explore knowledge about AI applications and Model.

UNIT - I INTRODUCTION 9

Artificial Intelligence Definition-Goal of Artificial Intelligence-AI technique- Progress of AI - Uninformed Search -General State space search- Depth First Search-Depth Limited Search-Iterative Deepening Search-Breadth First Search-Uniform Cost Search-Informed Search-Heuristic Search Techniques-Generate and Test-Best First Search-Hill Climbing

UNIT - II KNOWLEDGE REPRESENTATION 9

Knowledge Representation-Representation and Mappings-Approaches to Knowledge Representation-Propositional Calculus- Predicate Calculus-Clausal Form-Inference Rules-Unification Algorithm-Resolution

UNIT – III SYMBOLIC REASONING UNDER UNCERTAINTY AND STATISTICAL REASONING 9

Non monotonic Reasoning-Bayes Theorem-Certainty Factors-Bayesian Networks-Dempster-Shaffer Theory-Fuzzy Logic—Semantic Nets-Frames-Conceptual Dependency-Scripts-CYC-Game Playing

UNIT - IV NATURAL LANGUAGE PROCESSING, PARALLEL AND DISTRIBUTED ARTIFICIAL INTELLIGENCE 9

Introduction-Syntactic Processing-Semantic Analysis-Discourse and Pragmatic Processing-Stochastic Tools for Language Analysis-Natural Language Applications-Psychological Modeling-Parallelism in Reasoning Systems-Distributed Reasoning Systems-PROLOG

UNIT - V APPLICATIONS 9

AI Applications – Language Models – Information Retrieval – Information Extraction – Natural Language Processing – Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

Total No. of Periods : 45

COURSE OUTCOMES :

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

- **CO1 :** Develop proficiency in both traditional and heuristic-based search algorithms.
- **CO2 :** Acquire in-depth knowledge of knowledge representation methods like Propositional and Predicate Calculus, and their application in logical reasoning
- **CO3 :** Master symbolic reasoning techniques in uncertain environments, including Bayesian Networks and Fuzzy Logic.
- **CO4 :** Develop Natural Language Processing (NLP) techniques, including syntactic and semantic analysis, discourse processing, and pragmatic interpretation.
- **CO5 :** Apply AI techniques across various multi-disciplinary domains.

REFERENCES

1. Elaine Rich and Kevin Knight S.B. Nair, "Artificial Intelligence" Tata McGraw-Hill Pub, Delhi, 2009.
2. M. Tim Jones, "Artificial Intelligence" A systems Approach, Firewall Media, Edition 2010.
3. George F Luger, "Artificial Intelligence, structures and strategies for complex problem solving", Pearson Education, Delhi, Edition 2001
4. Sharbani Bhattacharya," Artificial Intelligence", University Science Press, New Delhi, 2008.
5. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.

PROFESSIONAL ELECTIVE LAB – I COURSES

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124CAL01 ADVANCED DATA STRUCTURES AND ALGORITHMS LAB

BASIC PREREQUISITES:

- Knowledge of Structure in C
- Understanding of Pointers in C
- Concept in Array and Linked List.

COURSE OBJECTIVES :

- Learn to implement stacks, queues, and linked lists.
- Develop skills in managing binary search trees, red-black trees, and Fibonacci heaps
- Use algorithms for shortest paths and minimum spanning trees.
- Evaluate the time and space complexity of various algorithms.
- Implement algorithms like Floyd-Warshall and Warshall's for solving graph problems.

LIST OF EXPERIMENTS

1. Implement forward substitution and Backward Substitution.
2. Measure the execution time of any algorithms.
3. Create a Binary Search Tree with traversal.
4. Implement the operation of Red Black Tree
5. Create and Process Fibonacci Heaps
6. Implement Prism and Kruskal Algorithm
7. Find the Shortest Path Algorithm using Dijkstra Algorithms.
8. Generate Floyds Algorithm and Warshall Algorithm
9. Computation of polynomial time.

Total No. of Periods : 60

COURSE OUTCOMES:

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

CO1 : Proficient in implementing and using basic data structures.
CO2 : Skilled in handling complex tree and heap structures.
CO3 : Apply graph algorithms to solve practical problems.
CO4 : Analyze and optimize algorithm performance.
CO5 : Implementing algorithms for shortest paths and transitive closures.

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124CAL02 NETWORK PROGRAMMING LAB

BASIC PREREQUISITES:

- Basic Linux Command
- Concept of Protocols like TCP/IP, UDP
- Structure of Packets.

COURSE OBJECTIVES :

- Understands the fundamental concepts of computer networking and OSI Reference model.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Learn and understand the advanced networking concepts, preparing the student for entry advanced courses in computer networking.
- Develop and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.
- To study about Client-Server models, Processes, Semaphores and their programming.

LIST OF EXPERIMENTS

1. Implement the following forms of IPC.
   a) Pipes
   b) FIFO
2. Implement file transfer using Message Queue form of IPC
3. Write a programme to Create an integer variable using shared memory concept and increment the variable
4. Simultaneously by two Processes. Use Semaphores to avoid race conditions
5. Design TCP iterative Client and Server application to reverse the given input sentence
6. Design TCP Client and Server application to transfer file
7. Design a TCP concurrent Server to convert a given text into uppercase using Multiplexing system call "select"
8. Design a TCP concurrent Server to echo given set of sentences using poll functions
9. Design UDP Client and Server application to reverse the given input sentence.
10. Design UDP Client server to transfer a file
11. Design using poll Client-Server application to multiplex TCP and UDP requests for converting a given text into upper case.
12. Design a RPC application to add and subtract a given pair of integers.

Total No. of Periods : 60

COURSE OUTCOMES :

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

- **CO1 :** Demonstrate proficiency in implementing Pipes and FIFOs for inter-process communication (IPC)
- **CO2 :** Learn to manage shared memory variables among multiple processes and implement semaphores to ensure synchronized access.
- **CO3 :** Design TCP client-server applications for tasks like text manipulation, file transfer, and concurrent server operations using advanced network programming techniques.
- **CO4 :** Design and implement a UDP Client-Server application
- **CO5 :** Develop network security and define various protocols such as FTP, HTTP, Telnet, DNS

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124CAL03 SOFTWARE TESTING LAB

BASIC PREREQUISITES:

- Knowledge in Scripting and database.

COURSE OBJECTIVES :

- Master basic scripting in web programming languages (Java/PHP) to support web applications.
- Understand and apply test automation for web applications using Selenium, including writing and executing test cases.
- Gain proficiency in mobile app testing by using Appium for automating test scenarios on mobile platforms.
- Develop the ability to write and validate test cases for various web
- Learn and implement unit testing to verify the functionality of individual components in web and mobile applications.

LIST OF EXPERIMENTS

1. Write a simple script using Java / PHP.
2. Understanding Test Automation. Using Selenium write a simple test script to validate each field of the registration page.
3. Using Selenium IDE, write a test suite containing minimum 4 test cases
4. Write and test a program to login a specific web page.
5. Write test cases to validate a mobile number using one time pin identification(OTP)
6. Write and test any program using Unit Testing.
7. Write and test a program to provide total number of objects present / available on the page
8. Write and test a program to get the number of list items in a list / combo box.
9. Write and test a program to count number of check boxes on the page checked and unchecked count. Demonstrate mobile app testing using APPIUM.

Total No. of Periods : 60

COURSE OUTCOMES :

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

- **CO1 :** Ability to write and execute simple web scripts in Java/PHP to support application functionalities.
- **CO2 :** Proficiency in automating web application tests using Selenium, including creating test suites and validating form elements.
- **CO3 :** Ability to design and run mobile application tests using Appium to ensure mobile app functionality.
- **CO4 :** Competence in writing test cases for specific web application scenarios, such as validating OTPs and interacting with web elements like checkboxes and combo boxes.
- **CO5 :** Capability to write unit tests for verifying code correctness and ensure individual components function as intended

EMPLOYABILITY ENHANCEMENT LAB – I COURSES

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124CAL04 - EXECUTIVE COMMUNICATION LAB

BASIC PREREQUISITES:

- Basic Concept of Communication Skills
- Idea about Active Listening

COURSE OBJECTIVES:

- Understand concept of soft skills such as communication, teamwork, problem-solving, adaptability, and emotional intelligence.
- To develop students' listening and reading comprehension skills by exposing them to various linguistic elements
- Emphasizes the importance of non-verbal communication and body language to enhance overall presentation effectiveness.
- To equip the skills necessary to excel in group discussions, personal interviews, resume writing, and letter writing.
- To prepare clear, well-structured, and professionally presented reports

SOFT SKILLS

Team Skills :

Team building and leadership - Evolution of groups into teams - Group dynamics - Emergence of leadership - Intra-group dynamics - Inter-group dynamics - Stress management - Inter dependency - Assessment of team-based projects

Time Management:

Goal setting - Effective time management

Interpersonal Skills:

Negotiations - Conflict management - Social skills - Assertive skills - Cross-cultural communications

Leadership Skills:

Concepts of leadership - Leadership styles - Insights from great leaders

Listening:

Scientific lectures - Educational videos - Gap filling exercises - Presentations - Formal Job interviews - Debates - Panel discussions - INK talks

Speaking:

Narrating personal experiences - Presentation - Group discussion - Simulations - Find the difference - Giving and asking for directions - News brief - Extempore/Impromptu

Reading:

Brochures - Social media messages - Newspaper - Editorials - Case studies - Critical reviews - Excerpts of interview with professionals - Technical texts

Writing:

Résumé - Letter writing - E-mail etiquettes - Report - Developing hints - Note-making - Note-taking

Grammar:

Concord - Error correction - Editing - Verbal analogy - Arranging sentences

Total No. of Periods: 60

COURSE OUTCOMES:

- **CO1 :** Able to demonstrate strong soft skills, including effective communication, active listening, collaboration, adaptability, and conflict resolution
- **CO2 :** Able to comprehend spoken language effectively
- **CO3 :** Design and deliver compelling presentations tailored to their audience
- **CO4 :** Effectively participate in group discussions and personal interviews, demonstrating strong communication, critical thinking, and interpersonal skills.
- **CO5 :** Able to create detailed and organized reports tailored to their audience

REFERENCES:

1. Andrea J. Rutherford, "Basic Communication Skills for Technology", 1st Edition, Pearson Education Asia (Singapore) Pvt. Ltd., Bangalore, 2001.
2. Bhatia R.C., "Business Communication", Ane Books India, New Delhi, 2008.
3. Raman, Meenakshi and Sangeetha Sharma, "Technical Communication – English Skills for Engineers", 2nd Edition. Oxford University Press, New Delhi, 2009.
4. Ashraf M Rizvi, "Effective Technical Communication", 5th Edition, The McGraw-Hill PublishingCompany Ltd., New Delhi, 2007.
5. Mohan Krishna Banerjee Developing Communications Skills Macmillan India Ltd. 2009.
6. R S Aggarwal , "Objective English" , Macmillan India Ltd. 2007.

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124CAL05 - REPORT WRITING LAB

BASIC PREREQUISITES:

- Fundamental concepts of Ms Office Packages
- Basic functionalities of DBMS
- Concept of Research Methodology.

COURSE OBJECTIVES:

- To create professional reports using both MS Word and LaTeX.
- To introduce students to various open source report writing tools
- To guide in preparing comprehensive and structured reports for application projects
- To Learn and design reports with structured and informative headers, accurate and well-organized body content, and coherent footers that provide necessary information and references
- To guide the process of writing a comprehensive thesis by teaching them how to structure and organize a thesis from the introduction to the conclusion

LIST OF EXPERIMENTS

1. Use of MS Word and Latex for report preparation.
2. Use of Excel for graphs
3. Use of report writing tools – Oracle Report Builder, Crystal Reports – Visual Basic
4. Report Writing for an application project on any one of the following;
    - Student Information System
    - Banking Operation
    - Admission System
    - Railway reservation System
5. Header, Body computation and Footer generation for Reports.
6. Thesis writing:
    - Introduction on Problems
    - Literature survey – Existing work
    - Architecture Design
    - Algorithms and Implementation
    - Presentation and results
    - Writing Conclusion
    - Display of Reference

Total No. of Periods: 60

COURSE OUTCOMES:

CO1 : Able to use MS Word and LaTeX to prepare well-structured, clear, and visually appealing reports tailored to their audience and purpose.

CO2 : Able to use open source report writing tools efficiently to create clear, well-organized, and visually appealing reports

CO3 : Able to write detailed reports for application projects, providing clear descriptions of system functionality, design, and implementation

CO4 : Able to create professional reports with properly formatted headers, footers, and body content

CO5 : Able to write a structured and well-organized thesis, presenting a clear introduction to problem

BRIDGE COURSE

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124CAB01 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING -I

COURSE OBJECTIVES :

- Understand the fundamentals of computers, including their evolution, classification, and basic organization.
- Learn essential data structures and algorithms, with a focus on their real-world applications.
- Gain knowledge of operating systems, including process management and scheduling.
- Explore software engineering principles, life cycle models, and modern development methodologies.
- Develop proficiency in C programming, focusing on core concepts and program development

MODULE – I INTRODUCTION TO COMPUTERS **6**

Introduction – Characteristics of Computer – Evolution of Computer – Computer Generation – Classification of Computers – Basic Computer Organization – Number Systems.

MODULE – II DATA STRUCTURES AND ALGORITHMS **6**

Introduction – Abstract Data Types – Stack ADT – Application of Stack – Queue ADT – Application of Queue – Linked List – Doubly Linked List – Circular Linked List – Application of Linked List.

MODULE – III OPERATING SYSTEMS **6**

Getting Connected to Internet Applications- Operating System Components – System Services– System calls – System Programs – Process Concepts – Process Scheduling – Operation on Process- Cooperation Process – Inter Process communications – CPU Scheduling and Criteria – Scheduling algorithm.

MODULE –IV SOFTWARE ENGINEERING **6**

Introduction-Nature of Software-Software Engineering- Importance of Software Engineering-Software Engineering Life Cycle-Software Process-Software Myths, Generic Process Model-Prescriptive Process model: The Waterfall-Incremental-Evolutionary-Concurrent Models-Specialized Process Models-Component based Developments-Formal Methods Model-Aspect Oriented Software Development-The Unified Process-Agile Software Development Model

MODULE – V INTRODUCTION TO C PROGRAMMING **6**

Overview of C Programming – Constants, Variable and Data Types – Operators and Expression Managing Input and Output Operators – Decision Making - Branching and Looping Handling of Character String – User Defined Functions – Definition – Declarations – Call by Reference – Call by Value- Structure and Unions – Pointers - Arrays – The Preprocessor – Developing C Program

Total Number of Hours : 30

COURSE OUTCOMES :

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

- **CO1 :** Explain the characteristics, classification, and basic organization of computers, along with number systems.
- **CO2 :** Implement and apply abstract data types like stacks, queues, and linked lists to solve problems.
- **CO3 :** Understand operating system concepts, including process scheduling and inter-process communication.
- **CO4 :** Apply software engineering methodologies, including waterfall, Agile, and unified models, to software development.
- **CO5 :** Write and develop efficient C programs using data types, control structures, functions, and pointers.

REFERENCES :

1. Herbert Schildt, "C: The Complete Reference",4th Edn., 2017
2. Pradip Dey, Manas Ghoush, "Programming in C", Oxford University Press. (2007).
3. Byron Gottfried, "Programming with C", 2 nd Edition, (Indian Adapted Edition), TMH publications, (2006).
4. Stephen G.Kochan, "Programming in C", Third Edition, Pearson Education India, (2005).
5. Brian W.Kernighan and Dennis M.Ritchie, "The C Programming Language", Pearson Education Inc., (2005).
6. E.Balagurusamy, "Computing fundamentals and C Programming", Tata McGraw-Hill Publishing Company Limited, (2008).
7. S.Thamarai Selvi and R.Murugan, "C for All", Anuradha Publishers, (2008).
8. Abhraham Silberschatz, Greg Gagne, Peter B Galvin,"Operating System Concepts", Eight Edition, Wiley Publication 2019.

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124CBP01 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING LAB – I

COURSE OBJECTIVES :

- To understand the fundamental concepts of Operators and Conditions statement in C.
- To familiarize students with the concept of loops and their significance in programming.
- To demonstrate various operations and manipulations that can be performed on arrays, such as sorting and searching
- Deep understanding of functions and pointers in C programming
- Understanding of structures and unions in C programming.

LIST OF EXPERIMENTS

1. Implement arithmetic operators using C.
2. Implement Looping Statements using C
3. Implement Conditional Statements using C.
4. Implement Arrays using C.
5. Implement Functions in C.
6. Implement Structure and Union in C.
7. Implement Pointers in C.
8. Implement Stack Operation and Queue Operation using Array
9. Write a C Code for Polynomial addition using Linked list.

Total No. of Periods: 30

COURSE OUTCOMES :

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

CO1 : Demonstrate proficiency in using addition, subtraction, multiplication, division, and modulus operators in C.
CO2 : Write C programs that utilize loops to execute code iteratively based on specific conditions
CO3 : Develop simple application using Array.
CO4 : Deploy programming concepts such as function pointers and pointer
CO5 : Build and Develop an application with structures and unions.

AUDIT COURSES

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124CAE06 - CONSTITUTION OF INDIA

COURSE OBJECTIVES :

- Understand the concept of Historical Movements, principles, and processes involved in the framing of the Indian Constitution
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional.
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolutionin1917and its impact on the initial drafting of the Indian Constitution.
- To understand the functioning of Union, State and Local Governments in Indian federal system.

UNIT - I HISTORY OF MAKING OF THE INDIAN CONSTITUTION **5**

History, Drafting Committee, (Composition & Working)

UNIT - II PHILOSOPHY OF THE INDIAN CONSTITUTION **5**

Preamble, Salient Features

UNIT - III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES **5**

Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT - IV ORGANS OF GOVERNANCE **5**

Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT - V LOCAL ADMINISTRATION **5**

District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: ZilaPachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy(Different departments), Village level:Role of Elected and Appointed officials, Importance of grass root democracy.

UNIT - VI ELECTION COMMISSION **5**

Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

Total Number of Hours : 30

COURSE OUTCOMES :

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

- **CO1 :** Analyze the significance of Indian Constitution as the fundamental law of the land.
- **CO2 :** Evaluate the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- **CO3 :** Examine the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
- **CO4 :** Assess the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
- **CO5 :** Summarize the passage of the Hindu Code Bill of 1956.

REFERENCES :

1. The Constitution of India,1950(Bare Act), Government Publication.
2. Dr.S.N.Busi, Dr.B. R.Ambedkar framing of Indian Constitution,1st Edition,2015.
3. M.P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis,2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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124CAE07 - DISASTER MANAGEMENT

COURSE OBJECTIVES :

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT - I INTRODUCTION **6**

Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.

UNIT - II REPERCUSSIONS OF DISASTERS AND HAZARDS **6**

Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.

UNIT - III DISASTER PRONE AREAS IN INDIA **6**

Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami; Post-Disaster Diseases and Epidemics

UNIT - IV DISASTER PREPAREDNESS AND MANAGEMENT **6**

Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT - V RISK ASSESSMENT **6**

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival

Total Number of Hours : 30

COURSE OUTCOMES :

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

- **CO1 :** Summarize basics of disaster management
- **CO2 :** Evaluate the key concepts in disaster risk reduction and humanitarian response.
- **CO3 :** Analyze disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- **CO4 :** Examine the humanitarian response and practical relevance in specific types of disasters and conflict situations.
- **CO5 :** Assess the strengths and weaknesses of disaster management approaches.

REFERENCES :

1. Goel S. L., Disaster Administration And Management Text And Case Studies",Deep & Deep Publication Pvt. Ltd., New Delhi,2009.
2. NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", NewRoyal book Company,2007.
3. Sahni, PardeepEt.Al. ," Disaster Mitigation Experiences And Reflections", Prentice Hall of India, New Delhi,2001.

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224CAT01 APPLIED STATISTICS FOR DATA ANALYSIS

COURSE OBJECTIVES :

- To learn the basic concepts of statistics like frequency distributions, graphical representations and curve fitting.
- To impart the knowledge of statistical measures of central tendency and dispersion.
- To introduce the notion of sampling distributions and acquire the knowledge of statistical techniques useful in decision making.
- To expose the statistical methods for analysis of variance and control limits.
- To study the statistical tools of data analysis such as Correlation, Regression, Principal Component analysis.

UNIT I STATISTICAL DATA REPRESENTATIONS 6+3

Frequency distributions of data: cumulative and relative frequency distributions- Graphical representation of data – Pie charts, Bar graphs, Histogram, Frequency Polygon and Ogives.

UNIT-II QUANTITATIVE STASTICAL MEASURES 9+3

Measures of Central tendency: Arithmetic Mean, Median, Mode - Measures of Dispersion: Range, Quartile deviation, Standard deviation, Variance and Co-efficient of Variation.

UNIT III TESTING OF HYPOTHESIS 9+3

Sampling distributions – Testing of hypothesis for large samples by Z-test and small samples by Student's t-test for single Mean, Proportion, equality of means and equality of proportions – F-test for single variance and equality of variances – Chi-square test for Goodness of fit and Independence of attributes.

UNIT IV DESIGN OF EXPERIMENTS 9+3

ANOVA(Analysis of variance) – Completely Randomized Design(CRD-one way classification) – Randomised Block Design (RBD-two way classification) - Latin Square Design (LSD-Three way classification) - Control charts for measurements: mean chart or $\overline{x}$ - chart, R-chart.

UNIT-V DATA ANALYSIS 12+3

Correlation analysis : Karl Pearson's Coefficient of Correlation - Regression Analysis: Least Square fit of a Linear Regression -Two lines of Regression - Multivariate Analysis: Random vectors and matrices - mean vectors and covariance matrices – multivariate normal density function- Principal Component Analysis - Population Principal Components.

Total No. of Periods : 45 + 15

***Note** : Use of approved statistical table is permitted in the examination.*

COURSE OUTCOMES:

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

- **CO1 :** Represent and interpret statistical data through bar graphs, pie graphs, histograms, frequency polygons and ogives.
- **CO2 :** Calculate the measure of Central tendencies and Dispersion of the frequency distributions of data.
- **CO3 :** Draw conclusions through hypothesis testing.
- **CO4 :** Acquaint with the knowledge of analysis of variance for decision making and analyse the control limits of a sample.
- **CO5 :** Apply statistical tools of data analysis such as Correlation, Regression, Principal Component analysis.

REFERENCES :

1. Gupta.S.C., & Kapoor,V.K., "Fundamentals of mathematical statistics", 11th edition, Sultan Chand & Sons publishers, New Delhi, 2013.
2. Levin R.I., Rubin S. David, "Statistics for Management", Eight edition, Pearson, 2017. [e-resource: Levin R.I., Rubin S. David, "Statistics for Management", Pearson, 2019].
3. Veerarajan.T., "Probability, Statistics and Random Processes", Tata McGraw-Hill publishing company Limited, New Delhi, 2014.
4. R.E. Walpole, R.H. Myers, S.L. Myers, and K Ye, "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8th edition, 2007.
5. Miller and Freund., "Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, 2012.
6. Arora.P.N. and Arora.S., "Statistics for Management", S.Chand & Company Ltd, 2009.
7. Keller, G, "Statistics for Management and Economics", Cengage Learning (Textbook/ eBook), 2019.

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224CAT02 ADVANCED JAVA PROGRAMMING

BASIC PREREQUISITES:

- Fundamental of Core Java.

COURSE OBJECTIVES:

- Understand server-side scripting and servlet architecture for dynamic web applications.
- Explore the core features of the Spring framework, including IoC and DI.
- Learn AOP and Java API for managing entities and persistence.
- Develop secure and scalable Spring Boot applications with advanced tools.
- Gain hands-on experience with Hibernate for database operations.

UNIT - I SERVER-SIDE SCRIPTING 9

Web Server: Web Containers - Web Components, Servlet: Lifecycle - Request - Servlet Context - Response - Filter - Session - Dispatching Requests, WebSocket, Logging - Log4j2, Build tool - Gradle. **Introduction to Spring:** IoC Container and Dependency Injection (DI).

UNIT - II SPRING 9

Spring Configuration and Spring Boot, Spring MVC, Spring Bean Lifecycle - Dispatcher Servlet and Configuration - Interceptors – Annotations, Controllers - Views - Input Validation -File Upload Container, Dependency and IOC

UNIT – III ASPECT ORIENTED PROGRAMMING and JAVA API 9

Aspect Oriented Programming (AOP) - Entity: Basic, Embeddable and Collection Types - Identifiers - Entity Relationship - Inheritance, Persistence Context and Entity Manager, JPQL, Criteria API, Spring Data JPA - Specification and Projection.

UNIT - IV SPRING BOOT 9

Spring Boot JDBC - Spring Boot Actuator - Spring Cloud -Spring Boot Testing - Spring Security Architecture, Spring Cache - Building RESTful Web Services.

UNIT – V HIBERNATE 9

Spring Hibernate Configuration and Create Table – Hibernate Life Cycle – Spring ORM – Hibernate Mapping – Cache – Pagination – Validator – CRUD Operation – Deploy simple application using Hibernate.

Total No. of Periods: 45

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

- **CO1:** Design dynamic web applications using server-side scripting and servlets.
- **CO2:** Build Spring-based applications with IoC, DI, and MVC.
- **CO3:** Apply AOP and JPA for managing entities and relationships.
- **CO4:** Create secure Spring Boot applications with RESTful web services.
- **CO5:** Implement database-driven applications using Hibernate ORM.

REFERENCES :

1. Craig Walls - Spring in Action, Sixth Edition - Manning Publications - 6th Edition - 2022.
2. Greg L. Turnquist - Learning Spring Boot 3.0 - Packt Publishing - 3rd Edition - 2023
3. Josh Long & Kenny Bastani - Cloud Native Java - O'Reilly Media - 2nd Edition - 2024
4. Laurentiu Spilca - Spring Security in Action - Manning Publications - 2023
5. Oleh Dokuka & Igor Lozynskyi - Hands-On Reactive Programming in Spring 5 - Packt Publishing - 1st Edition - 2023
6. Ashish Sarin & J Sharma - Getting Started with Spring Framework - CreateSpace Independent Publishing Platform - 4th Edition - 2023
7. Magnus Larsson - Hands-On Microservices with Spring Boot and Spring Cloud - Packt Publishing - 1st Edition - 2023
8. Jeffrey Zeldman - Spring Boot Up and Running - O'Reilly Media - 1st Edition - 2023

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224CAT03 BIG DATA ANALYTICS

BASIC PREREQUISITES:

- Knowledge in Data structure / Data mining

COURSE OBJECTIVES:

- To Understand the Fundamentals of Big Data and Analytics & Hadoop
- To understand the design and components of HDFS, Map Reduce & YARN.
- To learn how to set up, configure, secure, and administer a Hadoop cluster.
- To explore the basic Hadoop ecosystem Tools.
- To explore advanced Hadoop ecosystem tools & Real World Applications of Hadoop.

UNIT I: INTRODUCTION TO BIG DATA ANALYTICS AND HADOOP 9

Overview of Big Data: Definition of Big Data - Characteristics and Scope - Big Data vs. Traditional Data - Challenges in Big Data Analytics - Applications of Big Data – Big Data Analytics Life Cycle - Statistical Concepts: Types of Sampling - Sampling Distributions – Prediction Error - Big Data Analytics Tools - Introduction to Hadoop: History of Hadoop – Architecture of Hadoop - Hadoop Streaming – Hadoop Pipes.

UNIT II: HDFS, MAP REDUCE & YARN 9

HDFS (Hadoop Distributed File System): The Design of HDFS, Core components: Name Node, Data Node, Secondary Name Node - - Hadoop I/O: Compression, Serialization, Avro File Formats. Map Reduce: Anatomy of a Map Reduce Job Run, Failures in Map Reduce, Job Scheduling, Shuffle and Sort, Map Reduce Types and Formats. YARN Architecture & Overview.

UNIT III: HADOOP INSTALLATION AND OPERATIONS 9

Hadoop Operations - Setting Up a Hadoop Cluster - Basic HDFS Commands – Hadoop Configuration – Security – Benchmarking a Hadoop Cluster – Administrating Hadoop – Monitoring – Maintenance – Develop a simple Map Reduce program.

UNIT IV: HADOOP ECOSYSTEM 9

Hadoop Ecosystem Overview - Pig: Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive: Hive Architecture, Comparison with Traditional Databases, HiveQL, Querying Data with Hive. Columnar Databases: Apache HBase, Comparison with Traditional Databases

UNIT V: ADVANCED HADOOP ECOSYSTEM AND REAL-WORLD APPLICATIONS 9

Advanced Hadoop Tools and Ecosystem: Apache Spark - Introduction to Apache Spark, Spark Architecture, Apache Flume: Architecture, Components – Apache Kafka – Kafka Architecture – Apache Oozie – Architecture - Workflow Scheduling and Management – Real World Applications of Hadoop: Healthcare - Financial Analysis – Social Media Analytics.

Total No. of Periods: 45

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

CO1 : Evaluate the Process of Big Data Analytics & Hadoop
CO2 : Ability to understand the concepts of HDFS, Map Reduce & YARN
CO3 : To configure and manage commands in Hadoop & MapReduce
CO4 : To understand the Hadoop ecosystem tools
CO5 : To explore and apply advanced Hadoop tools with Real World Applications

REFERENCES

1. Raj Kamal, Preeti Saxena, "Big Data Analytics: Introduction to Hadoop, Spark and Machine – Learning", Mc Graw Hill, 2019.
2. Seema Acharya, Subhashini Chellappan, "Big Data and Analytics", Wiley India Pbt. Ltd, 2019.
3. Bianca Szasz, "Data Anlytics Essentials", Vibrant Publishers, 2022.
4. G.Sudha Sadasivam, R.Thirumahal, "Big Data Analytics", Oxford University Press, 2020.
5. Mayank Bhushan, "Big Data and Hadoop", BpB Publications, 2nd edition, 2023.
6. Jules S. Damji, Brooke Wenig, Tathagata Das & Denny Lee, "Learning Spark", Shroff Publishers & Distributors Pvt. Ltd, 2nd Edition, 2020.

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224CAT04 - SERVICE ORIENTED ARCHITECTURE

BASIC PREREQUISITES:

- Knowledge in HTML / Java programming / Computer Network

COURSE OBJECTIVES:

- To understand the fundamental concepts XML.
- To learn the basic Concept of Service Oriented Architecture.
- To identify the service oriented analysis and design.
- To learn the importance of SOA Platforms.
- To Understand and use Spring Data and Spring Boot's support for it.

UNIT – I XML FUNDAMENTALS 9

XML – structuring with schema DTD – XML Schema – XML Processing DOM – SAX – Present XSL – Transformation XSLT – XPath – XQuery – XML Security and meta framework.

UNIT – II INTRODUCTION TO SOA 9

Roots of SOA – Characteristics of SOA – Anatomy of SOA – How components in an SOA interrelate – Principles of service orientation Messaging with SOAP – Message exchange Patterns – Coordination – Atomic Transactions– Business activities – Orchestration – Choreography – Service layer abstraction – Application Service Layer – Business Service Layer.

UNIT - III SERVICE ORIENTED ANALYSIS AND DESIGN 9

Service oriented analysis – Business-centric SOA–Deriving business services-service modelling –Service Oriented Design – WSDL basics–SOAP basics – SOA composition guidelines –Entity-centric business service design – Application service design – Task centric business service design.

UNIT - IV SOA PLATFORMS 9

SOA platform basics – SOA support in J2EE – Java API for XML based web services (JAX-WS) – Java architecture for XML binding (JAXB) – Java API for XML Registries (JAXR) – Java API for XML based RPC (JAX-RPC) - Web Services Interoperability Technologies (WSIT) – JAX-RS SOA support in .NET – ASP.NET web services.

UNIT - V SPRING BOOT & SECURITY 9

Spring Boot: Introduction - DevTools and Actuator - Application Properties - Running Spring Boot Apps from command line - Spring Security: Introduction and Overview - Form Login with Database - TagsLib - OAuth2 with JWT.

Total No. of Periods: 45

COURSE OUTCOMES:

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

CO1 : To learn about fundamental of XML.
CO2 : Gain the knowledge about SOA.
CO3 : Improve the analysis and design in SOA.
CO4 : Experience in SOA Platform.
CO5 : Developing Spring applications using Spring Boot.

REFERENCES:

1. Craig Walls," Spring in Action", 6th Edition, Manning Publications, 2022.
2. Kirti seth, Ashish Seth, **"**Understanding Service-Oriented Architecture**"**, BPB Publications, 2020.
3. Mick Knutson, Robert Winch, Peter Mularien," Spring Security", 3rd Edition, Packt Publisher, 2017.
4. Thomas Erl**, "**Service-Oriented Architecture: Concepts, Technology, and Design", Pearson Education, 2016.
5. Thomas Erl, "SOA Principles of Service Design ", Prentice Hall Service, 2008.
6. Ron Schmelzer et al. "XML and Web Services", Pearson Education, 2008.

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224CAI01 FULL STACK WEB DEVELOPMENT

BASIC PREREQUISITES:

- Fundamental of HTML, CSS

COURSE OBJECTIVES :

- Introduce web development fundamentals including HTML, CSS, JavaScript, and AJAX.
- To Construct the Web Page using PHP Framework
- Provide experience with server-side programming using Node.js and Express.
- Explore advanced topics like NoSQL databases (MongoDB) and client-side React.js.
- Build proficiency in integrating client-side frameworks with backend services.

UNIT I INTRODUCTION TO CSS and JAVASCRIPT 9

Introduction to Web: Structure of HTML Documents – Basic Markup tags – Working with Text and Images with CSS– CSS Selectors – CSS Flexbox - JavaScript: Data Types and Variables - Functions - Events – AJAX: GET and POST –JQuery Fundamental - MUI

UNIT II PHP 9

Getting PHP - PHP's Internal Data types- PHP Array Functions - Creating functions in PHP – Nesting Functions-Handling Form Control- Session - Database Introduction – CRUD Operation - File Operations –Cookies – Introduction to typescript

UNIT III SERVER-SIDE PROGRAMMING WITH NODE JS 9

Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines – Static Files - async/await - Fetching JSON from Express

UNIT IV ADVANCED NODE JS AND DATABASE 9

Introduction to NoSQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS MongoDB connection – Adding and retrieving data to MongoDB from NodeJS Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS

UNIT V ADVANCED CLIENT-SIDE PROGRAMMING 9

React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - -JS Localstorage - Events - Lifting State Up - Composition and Inheritance

Total No. of Periods: 45

LIST OF EXPERIEMENTS

1. Create a responsive web page using CSS Flexbox to structure content in a grid layout.
2. Build a simple form validation using JavaScript to validate input fields like name, email, and password.
3. Implement Session using PHP
4. Create a simple web application using PHP with MySQL.
5. Create a simple web server using the http module to serve static files.
6. Build a basic RESTful API using Express to fetch and display JSON data from a sample database.
7. Set up a MongoDB database and perform CRUD operations (Create, Read, Update, Delete) using Node.js.
8. Connect to a SQL database using Node.js and perform basic queries.
9. Create a simple React application with components, state management, and lifecycle methods.
10. Use the Fetch API to retrieve data from a RESTful service and display it on a React component.

COURSE OUTCOMES:

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

- **CO1:** Demonstrate proficiency in HTML, CSS, and JavaScript for web development.
- **CO2:** Build interactive web applications using PHP.
- **CO3:** Implement server-side applications using Node.js and Express.
- **CO4:** Perform database operations using MongoDB with Node.js.
- **CO5:** Develop advanced client-side applications using React.js for state and event management.

REFERENCES:

1. John Duckett**,** *"JavaScript and JQuery: Interactive Front-End Web Development"* Wiley,1st Edition , 2014
2. Andy Budd **,***"CSS Mastery: Advanced Web Standards Solutions"*, A Book Apart , 3rd Edition ,2020
3. David Herron **,***"Learning Node.js Development"* ,Packt Publishing, 1st Edition,2022
4. Mario Casciaro**,** *"Node.js Design Patterns"* ,O'Reilly Media, 2nd Edition ,2019
5. Shannon Bradshaw & Kristina Chodorow**,** *"MongoDB: The Definitive Guide"*, O'Reilly Media ,4th Edition,2021
6. Anthony Alicea**,** *"Express.js: The Complete Guide"*, Manning Publications, 1st Edition 2019
7. Tim Leung**,***"SQL Server Node.js"*, Packt Publishing ,1st Edition,2020.

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224CAP01 ADVANCED JAVA PROGRAMMING LAB

BASIC PREREQUISITES:

- Fundamental knowledge in Core Java

COURSE OBJECTIVES :

- Gain hands-on experience in server-side scripting and servlet management.
- Design Spring-based applications using DI, MVC, and AOP.
- Implement database interactions using JPA and Hibernate.
- Build secure RESTful APIs with Spring Boot.
- Use open-source tools for scalable application development.

LIST OF EXPERIMENTS

1. Write a Java program to implement and demonstrate the servlet lifecycle
2. Develop a simple RESTful API using **Apache Tomcat** as the server
3. Create a Spring application demonstrating Dependency Injection (DI)
4. Set up a Spring Boot application using **Spring Initializr** and run it locally using **Eclipse IDE** or **IntelliJ IDEA**.
5. Create a Spring application to log method execution time using Aspect-Oriented Programming (AOP).
6. Develop a small project using **Hibernate ORM** to demonstrate entity relationships and CRUD operations.
7. Create a Spring Boot application to monitor application metrics using Actuator.
8. Build and deploy a RESTful web service using **Spring Boot** and test it with **Swagger/OpenAPI**.
9. Develop a Hibernate application to perform CRUD operations on a MySQL database.
10. Use **H2 Database** with Hibernate to map entities and implement pagination in a Spring Boot project.

COURSE OUTCOMES:

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

CO1: Develop web apps using Servlets and Tomcat.
CO2: Create robust Spring applications with advanced features.
CO3: Perform CRUD operations and manage data using Hibernate.
CO4: Build and secure RESTful APIs with Spring Boot.
CO5: Utilize open-source tools like Gradle for project management.

PROFESSIONAL ELECTIVE – II COURSES

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224CAE01 MACHINE LEARNING TECHNIQUES

BASIC PREREQUISITES:

- Basic programming knowledge (preferably in Python), linear algebra, and statistics.

COURSE OBJECTIVES:

- To introduce machine learning concepts, types of learning.
- To explore decision trees and Naive Bayes classifiers.
- To cover linear regression, regression trees, and logistic regression.
- To introduce clustering techniques and dimensionality reduction methods
- To explore advanced Ensemble Learning Models.

UNIT I INTRODUCTION TO MACHINE LEARNING AND SUPERVISED LEARNING 9

Overview of Machine Learning: Types of Learning (Supervised, Unsupervised, Reinforcement) - Key Terminology: Features - Labels - Training and Test Data - Supervised Learning: Classification vs. Regression- Evaluation Metrics for Classification (Accuracy, Precision, Recall, F1-Score)- Introduction to Regression and Linear Regression.

UNIT II DECISION TREES AND NAIVE BAYES 9

Decision Trees: Representation, ID3, and C4.5 Algorithms - Pruning Techniques and Overfitting in Decision Trees - Bayes Theorem and Naive Bayes Classifier - Classifying with Bayes Decision Theory and Conditional Probability - Applications of Naive Bayes in Real-world Problems.

UNIT III REGRESSION TECHNIQUES AND LOGISTIC REGRESSION 9

Linear Regression: Predicting Numerical Values, Best Fit Line, Gradient Descent - Regression Trees: CART for Regression - Logistic Regression: Classification with Sigmoid Function - Model Evaluation for Regression and Logistic Regression - Regularization in Linear and Logistic Regression.

UNIT IV CLUSTERING AND DIMENSIONALITY REDUCTION 9

Unsupervised Learning and Clustering Algorithms - K-Means Clustering, Expectation-Maximization (EM) Algorithm - Hierarchical Clustering and Dendrograms - Dimensionality Reduction Techniques: Principal Component Analysis (PCA) - Anomaly Detection using Dimensionality Reduction.

UNIT V ADVANCED MACHINE LEARNING TECHNIQUES 9

Ensemble Learning: Introduction - Types of Ensembles - Bagging (Bootstrap Aggregation, Random Forests) - Boosting - Stacking (Base Learners, Meta-Models) - Applications (Finance, Healthcare, Marketing) - Challenges and Best Practices (Overfitting, Hyperparameter Tuning).

Total No. of Periods: 45

REFERENCES:

1. Aurelien Geron, "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow", 3rd Edition, O'Reilly Media, 2022.
2. Andriy Burkov, "Machine Learning Engineering", 1st Edition, True Positive Inc, 2020.
3. Andriy Burkov, "The Hundred-Page Machine Learning Book", 1st Edition, Pearson, 2019.
4. Ivo D. Dinov, "Data Science and Predictive Analytics: Biomedical and Health Applications using R", 2nd Edition, Springer, 2023.
5. Richard S. Sutton and Andrew G. Barto, "Reinforcement Learning: An Introduction", 2nd Edition, MIT Press, 2018.

COURSE OUTCOMES:

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

CO1 : Understanding key ML concepts and apply supervised learning methods.

CO2 : To implement decision trees and Naive Bayes classifiers, understand their limitations.

CO3 : Ability to implement linear regression, regression trees (CART), and logistic regression for prediction and classification.

CO4 : Apply Key concepts of clustering algorithms like K-Means and EM, and use dimensionality reduction techniques like PCA for data analysis.

CO5 : Able to design and evaluate ensemble learning models, apply bagging and boosting techniques, and implement stacking methods to enhance machine learning performance in real-world applications.

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224CAE02 INTERNET OF THINGS

COURSE OBJECTIVES:

- To learn the basics of IoT, including components, protocols, and enabling technologies.
- To explore IoT communication protocols and standardization challenges.
- To gain hands-on experience with Arduino and Raspberry Pi for IoT projects.
- To understand security, privacy, and governance issues in IoT systems.
- To study real-world IoT applications and platforms in various industries.

UNIT I FUNDAMENTALS OF IOT 9

Definition and Characteristics of IoT, Sensors, Actuators, Physical Design of IoT – IoT Protocols communication models, IoT Communication APIs, IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Embedded Systems, IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment, Energy, Agriculture and Industry.

UNIT II IOT PROTOCOLS 9

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Issues with IoT Standardization – Unified Data Standards – Protocols – IEEE802.15.4–BACNet Protocol– Modbus – KNX – Zigbee– Network layer – APS layer – Security

UNIT III IOT PHYSICAL DEVICES AND ENDPOINTS 9

Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming –Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, and reading input from pins**.**

UNIT IV INTERNET OF THINGS PRIVACY, SECURITY AND GOVERNANCE 9

Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT-Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security

UNIT V APPLICATIONS 9

IOT APPLICATIONS - IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc**.**

Total No. of Periods: 45

COURSE OUTCOMES:

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

- **CO1:** Explain IoT basics, protocols, and domains like smart homes and cities.
- **CO2:** Identify and compare IoT communication protocols.
- **CO3:** Build and program IoT systems using Arduino and Raspberry Pi.
- **CO4:** Address IoT security and privacy issues.
- **CO5:** Implement IoT solutions in real-world applications like smart factories and cities.

REFERENCES:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete. Rob Barton and Jerome Henry, "loT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2020
2. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach, Universities Press, 2017
3. Olivier Hersent, David Boswarthick, Omar Elloumi, ―The Internet of Things – Key applications and Protocols‖, Wiley, 2015
4. Jan Ho¨ ller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
5. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds),Architecting the Internet of Things, Springer, 2011.
6. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance your projects, 2nd Edition, O'Reilly Media, 2011.

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224CAE03 – C# AND DOT NET PROGRAMMING

BASIC PREREQUISITES:

- Fundamental of Procedure Programming in C
- Basic concept of OOPs in C++

COURSE OBJECTIVES:

- The fundamental concepts and syntax of the C# programming language.
- To equip students with a deep understanding of object-oriented programming principles
- To enable students to comprehend and utilize advanced features of the C# programming language
- To provide students with the knowledge and skills necessary to design and develop user-friendly Windows application forms using graphical user interface (GUI) components.
- To familiarize students with the concepts and techniques of data access using ADO.NET for building database-driven applications

UNIT - I C# LANGUAGE FUNDAMENTALS 9

The Building Block of the .NET Platform (CLR,CTS, and CLS) – Overview of Assemblies - The Anatomy of a Simple C# Program - Defining Classes and Creating Objects - The System Console Class-Establishing Member Visibility - Default Values of Class Member Variables-Member Variable Initialization Syntax- Static Keyword - Method Parameter Modifiers - Iteration Constructs - Decision Constructs and the Relational / Equality Operators - Understanding Value Types and Reference Types-Boxing and Unboxing - Working with .NET Enumerations - Overriding Some Default Behaviors of System. Object - The System Data Types - String Data Type - .NET Array Types - Custom Namespaces.

UNIT - II OBJECT ORIENTED PROGRAMMING WITH C# 9

Understanding the C# Class Type - Reviewing the Pillars of OOP - The First Pillars: C#'s Encapsulation Services, The Second Pillar: C#'s Inheritance Support - Programming for Containment/Delegation - The Third Pillar: C#'s Polymorphic Support-C# Casting Rules - Understanding Object Lifetime - Basics of Object Lifetime - Role of Application Roots - Garbage Collection - Building Finalizable and Disposable Types. Exception Handling - Throwing a Generic Exception - Catching Exceptions.

UNIT - III C# ADVANCED FEATURES 9

Defining Interfaces in C#-Implementing an Interface in C# - Contrasting Interfaces to Abstract Base Classes-Building Interface Hierarchies - Building Enumerable Types (IEnumerable and IEnumerator) Building Cloneable Objects (ICloneable) -Building Comparable Objects (IComparable) -The Interfaces of the System - Collections Namespace - Defining a Delegate in C# -Simplest Possible Delegate Example-Enabling Multicasting -C# Events - Lamdas Expression.

UNIT-IV DEVELOPING WINDOW APPLICATION FORMS 9

Windows Forms Types - Application Class- Functionality of the Control Class - Functionality of the Form Class- Building Windows Applications - Working with Status Strips - Working with ToolStrips - Building an MDI Application - Basic Controls.

UNIT-V ADO.NET AND ASP.NET 9

ADO.NET: Introduction, ADO.NET architecture, The Connected Layer: DataProviders, DataAdapter, DataReader, ExecuteNonQuery method, ExecuteReader method,ADO.NET Overview – Using Database Connections, Commands, The Data Reader, The DataSet Class, Introducing ASP.NET web forms: Server Controls, Data Binding – Crystal Report- ASP.NET State Management, Tracing, Caching, Error Handling, Security, Deployment, User and Custom Controls - Master Pages - Windows Communication Foundation (WCF) – Introduction to Web Services.

Total No. of Periods: 45

COURSE OUTCOMES:

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

- **CO1 :** Able to write, compile, and debug basic C# programs.
- **CO2 :** Proficient in designing, implementing, and testing object-oriented programs in C#
- **CO3 :** Students will be proficient in designing and implementing C# programs
- **CO4 :** Able to design, implement, and test interactive Windows application forms that meet specified requirements.
- **CO5 :** Implement data access functionalities in their applications using ADO.NET, including connecting to databases

REFERENCES

1. Andrew Troelsen, “Pro C# 5.0 and the .NET 4.5 Framework” Apress, Sixth Edition,2021 ISBN: 978-1-4302-4233-8
2. Christian Nagel et al. “Professional C# 2012 with .NET 4.5”, Wiley India, 2012.
3. Herbert Schildt, “The Complete Reference: C# 4.0”, Tata McGraw Hill, 2012.
4. E. Balagurusamy, “Programming in C#”, Tata McGraw-Hill, 2004.
5. O`Reilly “Programming C# 5.0” ,O'Reilly Media ISBN: 978-1-4493-2041-6 | ISBN 10:1-4493-2041-4, October 2012.
6. Michael Schmalz “C# Database Basics” O'Reilly Media ISBN:978-1-4493-0998-5, 2012

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224CAE04 – CLOUD COMPUTING

BASIC PREREQUISITES:

- Basic concept of Centralized vs Distributed System
- Idea about Client Server Technology.
- Fundamental concept of Database Management System.

COURSE OBJECTIVES:

- To understand the need of cloud computing in the IT sector.
- To know the cloud service providers and the kind of services offered by them.
- To analyse the benefits of cloud in business continuity by applying cloud services, security and virtualization feature.
- To enable the learner for aspiring careers in Cloud / Software Product development areas.
- Learn about the security used in cloud computing

UNIT I - CLOUD FUNDAMENTALS 9

Cloud computing Definition – Cloud Models such as NIST, Cube, Private, Public, Hybrid and Community clouds – Cloud Characteristics – Benefits, Disadvantages, Challenges and obstacles of Cloud Computing – Cloud Cost Measurement, Capital expenditure, Total cost and SLA – Cloud Architecture – Types of Cloud Services (IaaS, PaaS, SaaS, IdaaS).

UNIT II - CLOUD PLATFORMS 9

Abstraction – Load balancing and virtualization: case study Google cloud – Hypervisors : Case study VMware vSphere - Machine Imaging – Capacity Planning with baseline metrics, measurement, load testing, network capacity and scaling – PaaS services : Case study Force.com – PaaS Frameworks: Case study Drupal, Eccenbtex AppBase Spuarespace ,WaveMaker and Wolf

UNIT III - CLOUD SERVICE PROVIDERS 9

Google Web Services: Explore and survey Google Application, Google analytics, Google Translate, Google Toolkit, APIs and Google App Engine - Amazon Web services: Components, Elastic Compute Cloud (EC2), Amazon Storage Systems, Amazon Elastic Block Store, and Amazon Database Services – Microsoft Cloud Services: Windows Azure platform and Windows Live - Clustering.

UNIT IV - CLOUD INFRASTRUCTURE AND SECURITY 9

Cloud Management: Responsibilities, Lifecycle, Management Products and Standards -Cloud security: CSA Cloud Reference Model – Implement Cloud security 88 for Infrastructure, Data, Network, Storage and Host - Disaster recovery and management.

UNIT V - SOA, STORAGE AND BACKUP 9

Network service model infrastructure, Communication and Management of SOA – Moving applications to cloud, Service attributes and Cloud bursting – Cloud storage, provisioning, unmanaged and managed storage – Cloud backup, types and features and storage interoperability – Cloud Mail services.

Total No. of Periods: 45

COURSE OUTCOMES:

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

- **CO1:** Understand cloud models, services, costs, benefits, challenges, and architectural components.
- **CO2:** Understand load balancing, virtualization, PaaS services, frameworks, and capacity planning.
- **CO3:** Explore and analyse Google, Amazon, and Microsoft cloud services and components.
- **CO4:** Understand cloud management, security, disaster recovery, and related standards and practices.
- **CO5:** Understand network services, cloud storage, backup, SOA, and cloud migration.

REFERENCES

1. Thomas Erl, Eric Barcel Monroy, “Cloud Computing: Concepts, Technology, Security & Architecture”, 2nd Edition - Pearson Paperback, 2024.
2. Dr. Kumar Saurabh, “Cloud Computing, Architecting Next-Gen Transformation Paradigms” Wiley, 4th Edition, 2017.
3. Dr.Shweta, Dr. Jagtar Singh, Dr. Sandeep Kumar, “Mastering Cloud Computing”, Agrobios, Paperback, 2024.
4. Vitthal Srinivasan “Google Cloud Platform for Architects”, 1st Edition, 2020.
5. Michael K. Keeling, “"Architecting the Cloud: Design Decisions and Tradeoffs", 2nd Edition,2021.

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224CAE05 BLOCK CHAIN TECHNOLOGY

BASIC PREREQUISITES:

- Knowledge of Distributed system and Cryptographic primitives
- Functionalities of Bitcoin transactions, Exploring Ethereum concepts
- Evolution of smart contracts and understanding Hyper ledger's framework

COURSE OBJECTIVES :

- To learn the fundamentals of Blockchain.
- To understand key management techniques and authentication techniques To understand the Bitcoin and its transactions & Structure
- To learn the components of Ethereum
- To understand the concept of smart contracts and their role in blockchain, with a focus on Hyperledger technologies and Smart Contracts.

UNIT-1 INTRODUCTION TO BLOCKCHAIN TECHNOLOGY 9

Introduction to Blockchain Technology – Distributed systems – The history of blockchain – Introduction to blockchain – CAP theorem and blockchain – Benefits and limitations of blockchain – Decentralization using blockchain - Methods of decentralization – Routes to decentralization.

UNIT – II CYPTOGRAPHY IN BLOCKCHAIN 9

Cryptography in Blockchain: Introduction – cryptographic primitives – Assymetric cryptography – public and private keys -line interface – Bitcoin improvement proposals (BIPs) – Consensus Algorithms.

UNIT – III BITCOIN 9

BitCoin - Introduction – Transactions – Structure - Transactions types – The structure of a block– The genesis block – The bitcoin network– Wallets and its types– Bitcoin payments– Bitcoin investment and buying and selling bitcoins – Bitcoin installation – Bitcoin programming and the command-line interface – Bitcoin improvement proposals (BIPs).

UNIT -IV ETHEREUM 9

Ethereum - Ethereum block chain- Elements of the Ethereum block chain– Precompiled contracts – Accounts and its types – Block header- Ether – Messages – Mining - Clients and wallets – Trading and investment – The yellow paper - The Ethereum network - Applications developed on Ethereum - Scalability and security issues.

UNIT -V SMART CONTRACT AND HYPERLEDGER 9

Smart Contract and Hyper ledger – History of Smart Contract – Ricardian 9 contracts - The DAO. Hyper ledger projects – Hyperledger as a protocol – Fabric - Hyperledger Fabric - Sawtooth lake – Corda Architecture.

Total No. of Periods: 45

COURSE OUTCOMES:

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

CO1 : Understand Block chain's fundamental components.
CO2 : Apply key management and authentication techniques to provide secure communication.
CO3 : Understand Block chain's fundamental components.
CO4 : Implement Blockchain applications using the Ethereum platform.
CO5 : Apply knowledge of implementations of Hyperledger to develop solutions in the appropriate.

REFERENCES

1. Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd Revised edition edition. Birmingham: Packt Publishing, 2018.
2. Subramanian, Chandramouli& George A., Asha & K.A., Abhilash&Karthikeyan, Meena. 2020."BLOCKCHAIN TECHNOLOGY," Universities Press (India) Pvt. Ltd., First edition, ISBN10: 9389211638, ISBN-13:978-9389211634.
3. M. Antonopoulos, Mastering bitcoin, First edition. SebastopolCA: O'Reilly,2015.
4. Z. Zheng, S. Xie, H. Dai, X. Chen, andH. Wang, ―An Overviewof Blockchain Technology: Architecture, Consensus, and Future Trends,‖ in 2017 IEEE International Congress on Big Data (BigData Congress), 2017, pp.557–564.

PROFESSIONAL ELECTIVE LAB – II COURSES

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224CAL01 MACHINE LEARNING TECHNIQUES LAB

BASIC PREREQUISITES:

Fundamentals of Machine Learning Concepts

COURSE OBJECTIVES:

- To understand about data cleaning and data preprocessing
- To familiarize with the Supervised Learning algorithms and implement them in practical situations.
- To familiarize with unsupervised Learning algorithms and carry on the implementation part.
- To involve the students to practice ML algorithms and techniques.
- Learn to use algorithms for real time data sets.

LIST OF EXPERIMENTS

1. Implement data preprocessing techniques on real time dataset
2. Implement Feature subset selection techniques
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm.
4. Write a program to implement the naïve Bayesian classifier for a sample training data set.
5. Implement the linear regression algorithm.
6. Implement the logistic regression algorithm.
7. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
8. Apply EM algorithm to cluster a set of data stored in a .CSV file
9. Implement Support Vector Classification for linear kernels.

COURSE OUTCOMES:

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

CO1 : Apply data preprocessing technique and explore the structure of data to prepare for predictive modelling
CO2 : Understand how to select and train a model and measure the performance.
CO3 : Apply feature selection techniques in Machine Learning
CO4 : Construct Bayesian Network for appropriate problem
CO5 : Learn about parametric and non-parametric machine Learning algorithms and implement to practical situations

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224CAL02 BIG DATA ANALYTICS LAB

BASIC PREREQUISITES:

- Concepts in data visualization & Statistical Analysis
- Knowledge in big data concepts

COURSE OBJECTIVES:

- Understand and apply basic data visualization techniques using Python for effective data representation.
- Learn and implement big data processing techniques using Hadoop ecosystem components like HDFS, MapReduce, Hive, HBase, and Pig.
- Develop proficiency in statistical analysis, including sampling distributions and error prediction from datasets.
- Gain hands-on experience with Apache PySpark for distributed data processing and analytics.
- Install, configure, and work with Apache Kafka for real-time data streaming in a single-node setup.

LIST OF EXPERIMENTS

1. Visualize Data Using Basic Plotting Techniques in Python.
2. Implement a sampling distribution in the histogram for the given big data.
3. Write a script to predict the error from the dataset.
4. Implement Basic HDFS Commands.
5. Implement word count / frequency program using MapReduce.
6. Create a database, table and add rows using HiveQL.
7. Implement NoSQL HBase Concepts.
8. Create a pig latin program using apache pig.
9. Create a simple application using apache PySpark.
10. Install Apache Kafka on single node.

Total No. of Periods: 60

COURSE OUTCOMES:

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

CO1 : Ability to visualize data and create insightful plots using basic Python plotting techniques.

CO2 : Develop the capability to implement sampling distributions and analyze large datasets through histograms.

CO3 : Gain proficiency in writing scripts for error prediction and statistical analysis from real-world datasets.

CO4 : Understand and apply basic HDFS commands, MapReduce operations, and HiveQL for big data management and analysis.

CO5 : Acquire hands-on experience with Apache Kafka, HBase, Pig, and PySpark to manage and process big data in a distributed environment.

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224CAL03 C# AND DOT NET PROGRAMMING LAB

BASIC PREREQUISITES:

- Fundamental of Procedure Programming in C
- Basic concept of OOPs in C++

COURSE OBJECTIVES:

- Teach students the fundamental concepts of programming, including the use of branching and looping structures, as well as methods, arrays, and strings.
- Equip students with advanced programming concepts, focusing on object-oriented programming (OOP) features
- Students to advanced programming concepts, particularly the use of lambda expressions for designing simple applications.
- Provide students with the knowledge and skills to design and develop window-based applications using delegates and events.
- Teach students how to design and develop window applications using ADO.NET for data management

LIST OF EXPERIMENTS

1. Programs using Branching, and Looping.
2. Programs using Methods, Arrays, and Strings.
3. Programs using Inheritance.
4. Programs using Delegates, Events, Errors and Exceptions.
5. Program to Build a Calculator Widget.
6. Design a simple application based on LAMDA Expression
7. Design and develop any window application using Delegates.
8. Design and Deploy a MDI Application using Events
9. Implement ADO.Net Window applications
10. Design and develop user and custom control in ASP.Net

Total No. of Periods: 60

COURSE OUTCOMES:

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

CO1 : Able to write and understand programs that effectively utilize branching and looping structures.
CO2 : Design and implement programs that utilize inheritance to promote code reuse and extend functionalities
CO3 : Design and implement simple applications using lambda expressions.
CO4 : Design and develop a window application using delegates to handle events efficiently
CO5 : Able to design and develop user and custom controls in ASP.NET

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224CAL04 – CLOUD COMPUTING LAB

BASIC PREREQUISITES:

- Basic concept of Virtual Box
- Idea about Client Server Technology.
- Fundamental concept of online cloud platform.

COURSE OBJECTIVES:

- To develop web applications in cloud.
- To learn the design and development process involved in creating a cloud-based application.
- To learn to implement and use parallel programming using Hadoop.
- Introduce students to practical methods for managing Virtual Machines (VMs)
- Experience in installing and configuring a single Hadoop Cluster.

LIST OF EXPERIMENTS

1. Installation and configuration of Virtual Machine using VMWare.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.
3. Install Google App Engine. Create hello world app and other simple web applications using python/java.
4. Use GAE launcher to launch the web applications.
5. Find a procedure to transfer the files from one virtual machine to another virtual machine.
6. Install Hadoop single node cluster and run simple applications like word count
7. Creating and Executing Your First Container Using Docker.
8. Run a Container from Docker Hub
9. Using Hadoop for Counting Word Frequency using Map Reduce.

Total No. of Periods: 60

COURSE OUTCOMES:

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

CO1 : Configure various virtualization tools such as Virtual Box, VMware workstation.
CO2 : Familiarity with Cloud Development and Deployment.
CO3 : Learn how to simulate a cloud environment to implement new schedulers.
CO4 : Mastery of Docker and Containerization.
CO5 : File Management and System Integration Across Virtual Machines.

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224CAL05 – INTERNET OF THINGS LAB

COURSE OBJECTIVES:

- Understand IoT fundamentals, including sensors, communication protocols, and IoT architecture using open-source tools.
- Design and implement IoT-based applications using open-source hardware (Arduino, Raspberry Pi, ESP8266) and software.
- Gain hands-on experience with open-source IoT communication protocols such as MQTT, LoRa, and HTTP for efficient data exchange.
- Implement security mechanisms like encryption, firewalls, and authentication to safeguard IoT data and devices.
- Build and deploy IoT applications for smart homes, agriculture, and industry using open-source IoT platforms.

LIST OF EXPERIMENTS

1. Interfacing a Temperature Sensor with Arduino using Open-Source Tools
2. Controlling an LED via Web Interface using ESP32 and Open-Source Tools
3. Implementing MQTT Protocol for IoT Communication using Open-Source Tools
4. Implementing Wi-Fi Communication using ESP32
5. Interfacing a Sensor with Raspberry Pi.
6. Reading Analog / Digital Sensor Data Using Arduino.
7. Encrypting IoT Sensor Data using Open-Source Cryptography Libraries
8. Implementing a Basic Firewall for IoT Devices Using Open-Source Tools
9. Building a Smart Home Automation System using Open-Source Platforms
10. Developing an IoT-Based Smart Agriculture System using Open-Source Tools

Total No. of Periods: 60

COURSE OUTCOMES:

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

CO1 : Develop IoT solutions using open-source tools like Arduino, Raspberry Pi, and ESP8266.
CO2 : Implement and test IoT communication protocols such as MQTT and LoRa for real-time data transmission.
CO3 : Apply cryptographic techniques and firewall configurations to enhance IoT security.
CO4 : Design and deploy IoT-based smart home automation and agriculture systems using open-source platforms.
CO5 : Troubleshoot IoT hardware and software issues while optimizing performance for real-world applications.

BRIDGE COURSE

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224CAB01 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING - II

COURSE OBJECTIVES :

- To provide a strong foundation in Core Java programming, focusing on object-oriented principles.
- To enable effective handling of exceptions and utilization of multithreading for robust applications.
- To equip with skills to design and develop web content using HTML and CSS.
- To introduce dynamic and interactive web programming with JavaScript.
- To impart knowledge of essential management functions, including human resource, marketing, and manufacturing management.

UNIT –I CORE JAVA 6

Java Features – Java Platform – Java Fundamental – Expression – Operators – Control Structures – Classes and Object – Inheritance – Polymorphism – Abstract Class – Interface – Packages.

UNIT-II EXCEPTIONAL HANDLING 6

Exception Handling Fundamentals – Exception Types – Java Built-in Exception – Creating Your Own Exception Subclasses – Chained Exception – The Java Thread Model – Thread Priorities Creating Thread: Implementing Runnable Interface – Synchronization – Inter thread communications.

UNIT- III HTML INTRODUCTION 6

Basic tags – elements – attributes – phrase tags – meta tags – Commends tag – formatting – images – tables – list – forms – embedded with multimedia – div tag – CSS – inline – embedded – external.

UNIT – IV JAVASCIRPT 6

JavaScript Prototypes – Object Oriented Programming – Class – Modules - Functions Expression – DOM – Events

UNIT- V HUMAN RESOURCE MANAGEMENT 6

Introduction to management function: Human Resource Development – selection & training, Marketing Management- Concept, Scope and four components i.e. product, Price, Place and Promotion, Manufacturing Management: - Production System, Production Planning and Control, Strategic Planning.

Total Number of Hours : 30

COURSE OUTCOMES :

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

- **CO1:** Apply object-oriented programming concepts to develop efficient Java applications.
- **CO2:** Demonstrate the ability to handle exceptions and implement multithreading for concurrent execution.
- **CO3:** Design well-structured, visually appealing web pages using HTML and CSS.
- **CO4:** Create interactive and dynamic web applications using JavaScript and DOM manipulation.
- **CO5:** Exhibit understanding of management principles and apply them in practical scenarios like HR, marketing, and manufacturing operations.

REFERENCES :

1. Cay S. Horstmann, Core Java Volume I – Fundamentals, Pearson Education, 2022
2. Joshua Bloch, Effective Java (3rd Edition), Addison-Wesley, 2018
3. Jon Duckett, HTML and CSS: Design and Build Websites, Wiley, 2014
4. David Flanagan, JavaScript: The Definitive Guide (7th Edition), O'Reilly Media, 2020
5. Herbert Schildt, Java: The Complete Reference (12th Edition), McGraw-Hill Education, 2021
6. Gary Dessler, Human Resource Management (15th Edition), Pearson, 2023
7. Philip Kotler, Kevin Lane Keller, Marketing Management (16th Edition), Pearson, 2022

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224CBP01 - FUNDAMENTALS OF COMPUTING AND PROGRAMMING LAB – II

COURSE OBJECTIVES :

- To provide an understanding of core Java programming concepts and object-oriented principles.
- To explore exception handling and multithreading mechanisms in Java.
- To teach the fundamentals of HTML for web page creation and design.
- To introduce JavaScript for dynamic web functionality and DOM manipulation.
- To provide knowledge of human resource, marketing, and manufacturing management principles.

LIST OF EXPERIMENTS

1. Write a program to create a class, define methods, and access them using objects.
2. Develop a program to demonstrate inheritance and polymorphism using method overriding.
3. Create an interface with multiple methods and implement it in two classes.
4. Write a program to create and handle custom exceptions using try-catch-finally.
5. Create multiple threads using the Runnable interface and assign priorities.
6. Implement a synchronized method to manage shared resources in multithreading.
7. Create a simple HTML page using basic tags, meta tags, and phrase tags. Include formatting elements like bold, italic, and headings.
8. Develop a webpage with a form (input fields, checkboxes, radio buttons) and embed multimedia elements like an image, video, and audio.
9. Write a JavaScript program to dynamically update the content of a web page by manipulating DOM elements (e.g., changing text, color, and styles).
10. Create a program to demonstrate JavaScript event handling by responding to user actions like button clicks, mouseover, and form submission.

Total Number of Hours : 30

COURSE OUTCOMES :

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

CO1: Demonstrate the ability to develop Java applications using object-oriented programming concepts.

CO2: Effectively handle exceptions and implement multithreading for concurrent operations in Java.

CO3: Design and develop structured, well-formatted web pages using HTML.

CO4: Create dynamic and interactive web pages using JavaScript and DOM manipulation.

CO5: Apply management principles in human resource, marketing, and manufacturing contexts.

AUDIT COURSES

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224CAE06 - WASTE TO ENERGY

COURSE OBJECTIVES:

- To learn fundamental and practical aspects for the treatment and simultaneous valorization of waste (including wastewater) toward energy generation
- To enable students to understand of the concept of Waste to Energy.
- To link legal, technical and management principles for production of energy form waste.
- To learn about the best available technologies for waste to energy.
- To analyze of case studies for understanding success and failures.

UNIT-I INTRODUCTION TO ENERGY FROM WASTE 6

Classification of waste as fuel – Agro based, Forestresidue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT-II BIOMASS PYROLYSIS 6

Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT-III BIOMASS GASIFICATION 6

Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power – Equilibrium and kinetic consideration in gasifier operation.

UNIT-IV BIOMASS COMBUSTION 6

Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

UNIT-V BIOGAS 6

Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system - Design and constructional features – Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.

Total No. of Periods: 30

COURSE OUTCOMES:

CO1 : Become aware of global energy scenarios
CO2 : Understand actions that can be applied in the context of environmental protection and sustainability
CO3 : Develop skills on main principles of chemical and biotechnological waste-to energy processes
CO4 : Understand the advantages of waste-to-energy conversion and their difficulties to be implemented
CO5 : Known and apply tools for the techno-economic analysis of the studied processes

REFERENCES:

1. Non-Conventional Energy, Desai, Ashok V., Wiley Eastern Ltd., 1990.
2. Biogas Technology - A Practical Hand Book - Khandelwal, K. C. and Mahdi, S. S., Vol. I & II, Tata McGraw Hill Publishing Co. Ltd., 1983.
3. Food, Feed and Fuel from Biomass, Challal, D. S., IBH Publishing Co. Pvt. Ltd., 1991.
4. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996.

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224CAE07 - FUNDAMENTALS LAW AND ETHICS

COURSE OBJECTIVES:

- To gain basic knowledge in Laws and Ethics to understand the concepts of regulatory compliance, requirements.
- Desired ethics expected from professionals.
- Acquire adequate knowledge of the basic concepts of laws
- Understand the basic knowledge of ethics including allied regulatory compliance and requirements
- To understand the fundamental of Ethics

UNIT - I FUNDAMENTALS OF COMMERCIAL LAWS 6

Laws of Contracts-Essential elements of a contract, offer and acceptance-Void and voidable agreements-Consideration, legality of object and consideration-Capacity of Parties, free consent-Quasi-contracts, contingent contracts, termination or discharge of contracts-Laws relating to Sale of Goods-Definition-Transfer of ownership-Performance of the Contract of Sale

UNIT- II NEGOTIABLE INSTRUMENTS ACT & INDIAN PARTNERSHIP ACT 6

Negotiable Instruments Act,1881-Acceptance and negotiation -Rights and liabilities of Parties-Dishonour of a Negotiable Instrument-Hundis-Bankers and Customers-Indian Partnership Act,1932-Nature of Partnership-Rights and liabilities of Partners -Dissolution of Firms

UNIT – III FUNDAMENTALS OF INDUSTRIAL LAWS 6

Factories Act,1948-Objective, Scope-Applicability of Factories Act,1948-Payment of Wages Act, 1936 and Minimum Wages Act, 1948-Objective, Scope-Applicability of Payment of Wages Act, 1936 and Minimum Wages Act, 1948-The Employees' State Insurance Act, 1948-Objective, Scope-Applicability of ESI Act, 1948

UNIT- IV THE CHILD LABOUR (PROHIBITION AND REGULATION) ACT 6

The Child Labour (Prohibition and Regulation) Act, 1986 – Concepts and Definition Prohibition of Children in certain Occupations and Processes (Sec 3) -Regulation of Conditions of Works of Children -Penalties (Section 14) -Power of Central / Appropriate Government Where to make a Complaint -Prohibited Occupations -Prohibited Processes.

UNIT –V FUNDAMENTALS OF ETHICS 6

Ethics – meaning, importance- The Seven Principles of Public Life –selflessness, integrity, objectivity, accountability, openness, honesty and leadership-The relationship between Ethics and Law

Total No. of Periods: 30

COURSE OUTCOMES:

CO1 : Define, distinguish and apply the basic concepts and terminology of the law of contract.
CO2 : Define and distinguish amongst the various processes involved in contract formation
CO3 : Demonstrate ethical awareness, the ability to do ethical reflection, and the ability to apply ethical principles in decision-making.
CO4 : Developing a student's ethical awareness, reflection, and decision-making ability is central to a Core Curriculum.
CO5 : Analyze the process of Fundamental Ethics.

REFERENCES:

1. Barrett, Edward F., "The Adversary System and the Ethics of Advocacy," Notre Dame Lawyer 37: 479–88 (1962).
2. Alexy, Robert, The Argument from Injustice (Oxford: Oxford University Press, Paulson, Bonnie Litschewski and Paulson, Stanley L., trans. 2002).
3. Amsterdam, Anthony, and Bruner, Jerome, Minding the Law (Cambridge, Mass.: Harvard University Press 2000).

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324CAT01 DEVOPS AND MICROSERVICES

BASIC PREREQUISITES:

- Basic programming knowledge (preferably in Python)- linear algebra- and statistics.

COURSE OBJECTIVES :

- To introduce the foundational concepts- practices- and history of DevOps and Microservices.
- To understand the differences between Monolithic and Microservices architectures and their applications.
- To explore build automation tools like Maven and Gradle for compiling and building applications.
- To study the integration of Microservices with DevOps in cloud environments.
- To examine continuous delivery practices- test strategies- and infrastructure responsibilities in DevOps

UNIT – I INTRODUCTION TO DEVOPS & MICROSERVICES 9

DevOps Definition- Practices – History of DevOps – DevOps Essentials – DevOps Life Cycle Process – Need for DevOps – Barriers. MicroServices: Definition – Characteristics – Micro services and Containers – Monitoring and securing the services.

UNIT - II MICRO SERVICES CONCEPTS 9

Microservice architecture concepts: Microservice software architecture - patterns and techniques – Monolithic Architecture – Monolithic vs Microservies – Benefits – Drawbacks of Microservices – Decomposing Monolithic applications into Microservices.

UNIT - III COMPILE AND BUILD USING MAVEN & GRADLE 9

Introduction - Installation of Maven - POM files - Maven Build lifecycle - Build phases - Maven Profiles- Maven repositories - Maven plugins - Jenkins CI/CD Plugins - Maven create and build Artifacts - Dependency management - Installation of Gradle - understand build using Gradle.

UNIT - IV MICROSERVICES IN DEVOPS ENVIRONMENT 9

Evolution of Microservices and DevOps – Benefits of combining DevOps and Microservices - working of DevOps and Microservices in Cloud environment - DevOps Pipeline representation for a NodeJS based Microservices

UNIT - V VELOCITYAND CONTINUOUS DELIVERY 9

Velocity - Delivery Pipeline- test stack - Small/Unit Test – medium /integration testing – system testing- Job of Development and DevOps - Job of Test and DevOps – Job of Op and Devops- Infrastructure and the job of Ops.

Total No. of Periods : 45

COURSE OUTCOMES:

At the end of course- the Student will be able to:

- **CO1:** Understand the fundamental principles- history- and life cycle of DevOps along with key characteristics and benefits of Microservices.
- **CO2:** Analyze Microservices architecture patterns- compare them with Monolithic systems- and perform decomposition of applications into services.
- **CO3:** Demonstrate proficiency in using build tools like Maven and Gradle for managing dependencies and automating the software build process.
- **CO4:** Understand the synergy between DevOps and Microservices in a cloud environment.
- **CO5:** Apply concepts of continuous delivery and testing strategies to enhance the velocity and reliability of software deployment in DevOps culture.

REFERENCES :

1. Len Bass- Ingo Weber and Liming Zhu- ―"DevOps: A Software Architect's Perspective"- Pearson Education- 2016.
2. Joakim Verona - "Practical DevOps" - Packet Publishing - 2016.
3. Viktor Farcic -"The DevOps 2.1 Toolkit: Docker Swarm" - Packet Publishing- 2017
4. Mark Treveil- and the Dataiku Team-"Introducing MLOps" - O'Reilly Media- 2020
5. Irakli Nadareishvili- Ronnie Mitra- Matt McLarty- Mike Amundsen- Microservice
6. Architecture: Aligning Principles- Practices- and Culture- Shroff/O'Reilly.
7. Michael Hüttermann- DevOps for Developers- 1st Edition- APress- e-book- 2012

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324CAT02 SOFTWARE DEVELOPMENT METHODOLOGY

BASIC PREREQUISITES:

- Fundamental of software engineering

COURSE OBJECTIVES:

- To provide a comprehensive understanding of Agile methodologies- including their principles- values- and key differences from traditional models.
- Comprehensive Understand of the Agile Scrum framework
- The principles and practices of Agile testing- to integrate testing into the Agile development process.
- Understand the values- principles- and practices of Extreme Programming (XP).
- To introduce SAFe foundations- principles- and ART implementation steps.

UNIT – I FUNDAMENTALS OF AGILE 9

Introduction to agile methodology- Agile vs traditional models- Classification of Agile methods- Agile Manifesto & Principles- Agile project management- teamwork- ethics- Agile in design/testing- documentation- drivers- capabilities & values-Agile Process-Lean Software development- Agile information systems & decision-making- Knowledge management lifecycle in software engineering - Migration challenges- Knowledge sharing.

UNIT – II AGILE SCRUM FRAMEWORK 9

Introduction to Scrum- Project phases- Agile Estimation- Planning game- Product backlog- Sprint backlog- Iteration planning- User story definition- Characteristics and content of user stories- Acceptance tests and Verifying stories- Project velocity- Burn down chart- Sprint planning and retrospective- Daily scrum.

UNIT – III AGILE TESTING 9

The Agile lifecycle and its impact on testing- Test-Driven Development (TDD)- xUnit framework and tools for TDD- Testing user stories - acceptance tests and scenarios- Planning and managing testing cycle- Exploratory testing- Risk based testing- Regression tests- Test Automation- Tools to support the Agile tester.

UNIT – IV EXTREME PROGRAMMING 9

Introduction to Extreme Programming- Origin and evolution of XP - XP Values and Principles- Key XP Practices- XP Lifecycle and Workflow- Iteration planning- Development cycle- Tools and Technologies Supporting XP- Version control systems (Git- SVN)- xUnit frameworks (JUnit- NUnit- PyTest)- Advantages- Limitations and Real-world Applications.

UNIT – V SAFe (Scaled Agile Framework) 9

SAFe Foundation : Lean Agile Leaders – Core Values – Lean Agile Mindset – Implementation Roadmap: Identity Values Strems and ART – ART Launch – SAFe Principles – Program Level

Total No. of Periods: 45

COURSE OUTCOMES:
At the end of course- the Student will be able to:

- **CO1 :** Identify the core principles of Agile methodologies.
- **CO2 :** Interpret the functioning of Scrum in an Agile project environment.
- **CO3 :** Implement Agile testing practices in their projects.
- **CO4 :** Apply the core principles- practices- and tools of Extreme Programming Software development.
- **CO5 :** Apply SAFe principles and roadmap to plan and launch Agile Release Trains.

REFERENCES :

1. Charles G. Cobb- Project Manager's Guide to Mastering Agile – John Wiley & Sons P&T - 2023.
2. Ayan Mann - Agile Release Train- Dutta House – 2024.
3. Lisa Crispin- Janet Gregory - Agile Testing: A Practical Guide for Testers and Agile Teams- Addison-Wesley – 2009.
4. James Shore- Shane Warden – The Art of Agile Development - O'Reilly- 2022.
5. Susheela Hooda- Vandana Mohindru Sood - Agile Software Development - John Wiley & Sons – 2023.
6. Gerardus Blokdyk - Rapid Application Development: A Complete Guide - John Wiley & Sons - 2020.

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324CAT03 DATA SCIENCE

BASIC PREREQUISITES:

- Basic understanding of Linear Algebra- Probability- and Calculus
- Proficiency in Python programming and data handling libraries (e.g.- NumPy- Pandas)

COURSE OBJECTIVES:

- To introduce the fundamental concepts- process- and significance of Data Science.
- To enable students to clean- preprocess- and explore data for analysis.
- To impart foundational knowledge of statistics for analyzing and interpreting data.
- To introduce the role of data science techniques in solving healthcare problems using real-world health data.
- To introduce key advanced concepts in data science including dimensionality reduction- time series- NLP- and ethical AI.

UNIT – I INTRODUCTION TO DATA SCIENCE 9

Definition – Evolution – Importance of Data Science – Data Science Process – Role of Data Scientist – Data Types – Data Sources – Data Formats – Applications in Various Domains

UNIT - II DATA PRE-PROCESSING AND EXPLORATION 9

Data Cleaning – Handling Missing Values – Outliers – Duplicates – Data Transformation – Normalization – Standardization – Encoding – Feature Selection – Feature Extraction – Exploratory Data Analysis – Descriptive Statistics – Data Visualization – Tools: Python (pandas- NumPy)

UNIT - III STATISTICAL FOUNDATIONS FOR DATA SCIENCE 9

Probability Concepts – Probability Distributions – Sampling Methods – Estimation – Hypothesis Testing – t-test – z-test – ANOVA – Correlation – Regression Analysis – Chi-Square Test – Statistical Inference

UNIT - IV DATA SCIENCE FOR HEALTH CARE 9

Introduction to Health Data Science – Data Preprocessing in Health Care – Predictive Modeling for Clinical Outcome – Medical Imaging and Diagnostics – Case Study: Predictive Analytics in Patient Monitoring.

UNIT - V ADVANCED TOPICS IN DATA SCIENCE 9

Dimensionality Reduction – Principal Component Analysis (PCA) – Singular Value Decomposition (SVD) – Time Series Analysis – Stationarity – Autocorrelation – ARIMA Models – Natural Language Processing (NLP) – Text Preprocessing – Sentiment Analysis

Total No. of Periods: 45

COURSE OUTCOMES:

At the end of course- the Student will be able to:

- **CO1:** Understand and explain the basic principles and real-world applications of Data Science.
- **CO2:** Apply data cleaning and exploratory techniques to prepare datasets for analysis.
- **CO3:** Use statistical methods and tests to draw meaningful inferences from data.
- **CO4:** Apply data science tools and methods to analyze and interpret healthcare datasets.
- **CO5:** Evaluate advanced data science techniques for effectiveness and ethical impact in real-world applications.

REFERENCES

1. Joel Grus- Data Science from Scratch: First Principles with Python- O'Reilly Media- 2nd Edition- 2023
2. Vasant Dhar- Data Science and Prediction: Fundamental Principles and Practices- MIT Press- 1st Edition- 2023
3. Cathy O'Neil- Rachel Schutt- Doing Data Science: Straight Talk from the Frontline- O'Reilly Media- Updated Edition- 2023
4. Field Cady- The Data Science Handbook- Wiley- 2nd Edition- 2024
5. Klaus-Peter Adlassnig- Bernd Blobel- Applied Data Science in Health and Medicine- Springer- 2021
6. Aurélien Géron- Hands-On Machine Learning with Scikit-Learn- Keras- and TensorFlow- O'Reilly Media- 3rd Edition- 2023
7. Sebastian Raschka- Yuxi (Hayden) Liu- Vahid Mirjalili- Machine Learning with PyTorch and Scikit-Learn: Develop machine learning and deep learning models with Python- Packt Publishing- 2022.

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324CAI01 – SMART DEVICE PROGRAMMING

BASIC PREREQUISITES:

- Basic Knowledge of Java or Kotlin Programming
- Understanding of Object-Oriented Programming (OOP) Concepts

COURSE OBJECTIVES :

- To familiarize students with the basic syntax- structure- and control flow of Kotlin programming.
- To introduce functional and object-oriented programming concepts in Kotlin.
- To teach students the use of Kotlin collections- null safety features- and robust error handling.
- To explore advanced Kotlin features and functional programming paradigms.
- To provide practical knowledge of Android development using Kotlin and introduce asynchronous programming with coroutines.

UNIT - I INTRODUCTION TO KOTLIN PROGRAMMING 9

Overview of Kotlin - Features and Benefits - Setting Up Development Environment (IntelliJ-Android Studio) - Kotlin vs Java - Basic Syntax and Structure - Data Types- Variables- Constants - Input/output Operations - Type Inference and Type Conversion - Operators and Expressions - Control Flow - if- when- for- while- do-while

UNIT - II FUNCTIONS- LAMBDAS- AND OBJECT-ORIENTED CONCEPTS 9

Functions - Declaration- Expression- Default & Named Arguments - Lambda Expressions and Higher-Order Functions - Recursion and Tail Recursion - Object-Oriented Programming in Kotlin - Classes and Objects - Constructors and Initialization Blocks - Inheritance and Overriding - Abstract Classes and Interfaces - Visibility Modifiers

UNIT - III COLLECTIONS- NULL SAFETY- AND EXCEPTION HANDLING 9

Arrays and Ranges - Collections - List- Set- Map (Immutable and Mutable) - Iterating over Collections - Filtering- Mapping- and Transforming Collections - Null Safety - Nullable Types- Safe Calls- Elvis Operator - Smart Casts and Not-null Assertions - Exception Handling - try-catch-finally- throw- custom exceptions

UNIT - IV ADVANCED KOTLIN FEATURES AND FUNCTIONAL PROGRAMMING 9

Data Classes and Sealed Classes - Enum Classes - Object Declarations and Companion Objects - Extension Functions and Properties - Delegated Properties - Functional Programming Concepts in Kotlin - Inline Functions and Closures - Scope Functions - let- run- with- also- apply

UNIT - V KOTLIN FOR ANDROID AND COROUTINES 9

Kotlin for Android Development – Overview - Activities- Intents- and UI Components - Event Handling and Lifecycle - Introduction to Kotlin Coroutines - Coroutine Builders - launch- async-runBlocking - Suspending Functions - Working with API Calls using Coroutines - Kotlin DSL and Jetpack Integration Overview

Total No. of Periods: 45

LIST OF EXPERIEMENTS

1. Write a Kotlin program to demonstrate the use of variables- constants- data types- and type conversion.
2. Develop a Kotlin application that accepts user input and uses control flow statements to display appropriate output.
3. Implement a Kotlin program using functions with default and named arguments- and demonstrate a lambda expression with higher-order function.
4. Create a class hierarchy in Kotlin demonstrating constructors- inheritance- and interface implementation with visibility modifiers.
5. Write a Kotlin program to create and manipulate immutable and mutable collections using map- filter- and other transformation operations.
6. Develop a Kotlin application that demonstrates null safety features (safe call- Elvis operator- not-null assertion) and handles exceptions using try-catch-finally.
7. Create a Kotlin program using data classes and sealed classes to model a simple message system.
8. Demonstrate the use of scope functions and extension functions in a Kotlin program.
9. Build a simple Android app in Kotlin that displays a UI with basic components and handles button click events.
10. Write a Kotlin coroutine-based application to fetch data asynchronously using launch- async- and suspending functions.

COURSE OUTCOMES:

At the end of course- the Student will be able to:

CO1: Execute basic Kotlin programs using appropriate syntax and control structures.
CO2: Implement object-oriented designs and use lambda expressions effectively in Kotlin.
CO3: Manage data using collections and implement safe and error-resilient Kotlin code.
CO4: Develop modular- reusable- and concise Kotlin code using functional constructs.
CO5: Build basic Android apps and handle asynchronous tasks using Kotlin coroutines.

REFERENCES:

1. Sebastian Aigner- Roman Elizarov & Svetlana Isakova – Kotlin in Action- Second Edition – Manning Publications – April 2024
2. Alexey Soshin – Kotlin Design Patterns and Best Practices – Packt Publishing – April 2024
3. Mounir Boussetta – Building Kotlin Applications – BPB Publications – November 2023
4. Dave Leeds – Kotlin: An Illustrated Guide – Leanpub – April 2025
5. Faisal Islam – Kotlin from Scratch: A Project-Based Introduction for the Intrepid Programmer – No Starch Press – January 2025

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324CAP01 MINI PROJECT

COURSE OBJECTIVES:

- Understand and apply SDLC phases in project development.
- Identify and define a problem for individual implementation.
- Design and develop software using suitable tools and techniques.
- Enhance analytical, coding, and debugging skills.
- Prepare documentation and presentation as per SDLC standards.

COURSE OUTCOMES:

At the end of course- the Student will be able to:

CO1 : Formulate a problem and gather requirements
CO2 : Create a system and design models
CO3 : Develop and code the application
CO4 : Test and debug for quality assurance
CO5 : Document and present the project

PROFESSIONAL ELECTIVE – III COURSES

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324CAE01 DEEP LEARNING

BASIC PREREQUISITES:

- Fundamentals of Linear Algebra and Probability
- Basic Knowledge of Machine Learning and Python Programming

COURSE OBJECTIVES:

- Build foundational knowledge in deep learning principles
- Understand and implement deep and convolutional networks.
- Learn sequence modelling and training strategies.
- Explore unsupervised learning and data representations.
- Study advanced topics like generative models.

UNIT - I: FOUNDATIONS OF APPLIED MATHEMATICS FOR DEEP LEARNING 9

Linear Algebra: Vectors- matrices- operations- eigenvalues/eigenvectors– Probability and Information Theory: Random variables- probability distributions- conditional probability- entropy- KL divergence - Numerical Computation: Floating-point precision- computational graphs- automatic differentiation

UNIT - II: DEEP FEEDFORWARD AND CONVOLUTIONAL NEURAL NETWORKS 9

Deep Feedforward Networks: Perceptron- multilayer perceptrons- backward propagation – Activation Functions: ReLU- Sigmoid- Tanh – Optimization Techniques: SGD- momentum- Adam – Regularization: L1/L2- dropout- early stopping – Convolutional Neural Networks (CNNs): Filters- pooling- padding- CNN architectures

UNIT - III: SEQUENCE MODELS AND PRACTICAL TRAINING STRATEGIES 9

Recurrent Neural Networks (RNNs): Basic RNN- vanishing gradient problem – LSTM and GRU Networks: Structure and applications – Recursive Neural Networks – Training Methodologies: Data pre-processing- model selection- hyperparameter tuning- evaluation metrics – Applications: NLP- time series- speech processing

UNIT - IV: REPRESENTATION LEARNING AND AUTOENCODERS 9

Representation Learning Concepts – Autoencoders: Basic- denoising- sparse- variational autoencoders (VAE) – Linear Factor Models – Manifold Learning – Dimensionality Reduction in Deep Learning

UNIT - V: DEEP GENERATIVE MODELS 9

Generative Models: Overview and taxonomy – GANs (Generative Adversarial Networks): Architecture- training challenges- applications – Monte Carlo Methods – Approximate Inference and Partition Functions – Structured Probabilistic Models

Total No. of Periods: 45

COURSE OUTCOMES:

At the end of course- the Student will be able to:

CO1: Understand mathematical and ML concepts in deep learning.
CO2: Apply deep learning techniques for classification tasks.
CO3: Develop models for sequence-based data.
CO4: Analyze and implement autoencoders for dimensionality reduction.
CO5: Create and evaluate generative models for data synthesis.

REFERENCES:

1. Ian Goodfellow- Yoshua Bengio- and Aaron Courville- *Deep Learning*- MIT Press- 2016.
2. François Chollet- *Deep Learning with Python*- Manning Publications- 2018.
3. Michael Nielsen- *Neural Networks and Deep Learning*- Determination Press- 2015.
4. Aurélien Géron- *Hands-On Machine Learning with Scikit-Learn- Keras- and TensorFlow*- O'Reilly Media- 2019.
5. Charu C. Aggarwal- *Neural Networks and Deep Learning: A Textbook*- Springer- 2018.

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324CAE02 DIGITAL FORENSICS

BASIC PREREQUISITES:

- Basic knowledge of computer networks and operating systems
- Understanding of file systems (Windows- UNIX- macOS)

COURSE OBJECTIVES:

- To introduce the fundamentals of digital forensics- cybercrimes- and handling of electronic evidence.
- To explore information warfare tactics- cyber threats- and related legal frameworks.
- To understand and apply digital investigation process models and crime scene handling techniques.
- To study data acquisition- authentication- and forensic analysis across various file systems.
- To familiarize with forensic tools and techniques for recovering and processing electronic evidence.

UNIT - I INTRODUCTION TO DIGITAL FORENSICS AND COMPUTER CRIME 9

Introduction to Digital Forensics- Definition and types of cybercrimes- electronic evidence and handling- electronic media- collection- searching and storage of electronic media- introduction to internet crimes- hacking and cracking- credit card and ATM frauds- web technology- cryptography- emerging digital crimes and modules.

UNIT - II INFORMATION WARFARE 9

Information warfare: Arsenal – Surveillance Tools – Hackers and Theft of Components – Contemporary Computer Crime -Identity Theft and Identity Fraud – Organized Crime & Terrorism – Avenues Prosecution and Government Efforts – Applying the First Amendment to Computer Related Crime -The Fourth Amendment and other Legal Issues.

UNIT - III DIGITAL FORENSICS PROCESS MODEL & ANALYSIS 9

Conducting Digital Investigations - Digital Investigation Process Models - Scaffolding for Digital – Investigations - Applying the Scientific Method in Digital Investigations - Investigative Scenario: Security Breach. Handling a Digital Crime Scene - Published Guidelines for Handling Digital - Crime Scenes- Fundamental Principles - Authorization- preparing to Handle Digital Crime – Scenes - Surveying the Digital Crime Scene- Preserving the Digital Crime Scene.

UNIT - IV COMPUTER FORENSICS 9

Computer Forensics: Definition and Cardinal Rules- Data Acquisition and Authentication Process- Windows Systems-FAT12- FAT16- FAT32 and NTFS- UNIX file Systems- mac file systems- computer artifacts- Internet Artifacts- OS Artifacts and their forensic applications

UNIT - V FORENSIC TOOLS AND PROCESSING OF ELECTRONIC EVIDENCE 9

Introduction to Forensic Tools - Usage of Slack space- tools for Disk Imaging - Data Recovery- Vulnerability Assessment Tools - Encase and FTK tools - process of computer forensics and digital investigations - processing of digital evidence - digital images - damaged SIM and data recovery - multimedia evidence - retrieving deleted data: desktops - laptops and mobiles - retrieving data from slack space – ghosting - compressed files.

Total No. of Periods: 45

COURSE OUTCOMES:

At the end of course- the Student will be able to:

- **CO1:** Explain the fundamentals of digital forensics- cybercrime types- and methods for handling electronic evidence.
- **CO2:** Analyze tools- techniques- and legal issues in information warfare and computer-related crimes.
- **CO3:** Apply digital investigation process models and scientific methods in forensic scenarios.
- **CO4:** Examine forensic acquisition techniques and evaluate system- internet- and OS artifacts across various file systems.
- **CO5:** Utilize forensic tools and methods for analyzing- recovering- and processing electronic evidence from multiple digital sources.

REFERENCES:

1. C. Altheide& H. Carvey Digital Forensics with Open Source Tools- Syngress- 2011
2. John R. Vacca- "Computer Forensics: Computer Crime Scene Investigation"- Cengage Learning- 2nd Edition- 2005.
3. Digital Evidence and Computer Crime- Eoghan Casey- Third Edition- 2011- Elsevier Inc.
4. Computer Forensics: Computer Crime Scene Investigation- 2nd Edition- John R. Vacca-
5. Computer Forensics and Cyber Crime: An Introduction"-Pearson Education- 2nd Edition- 2008.
6. File System Forensic Analysis- Brian CarrierEdition: 1st Edition (2005) Addison-Wesley

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324CAE03 – SOFT COMPUTING TECHNOLOGIES

BASIC PREREQUISITES:

- Basic understanding of linear algebra to follow neural network computations.
- Basic programming Skills to implement soft computing algorithms effectively.

COURSE OBJECTIVES:

- Understand fuzzy logic principles and applications.
- Learn basic neural models and learning techniques.
- Study multilayer networks and BP algorithm.
- Explore SOM- LVQ- and ART models.
- Learn GA concepts and genetic operations.

UNIT I FUZZY COMPUTING 9

Basic Concepts of Fuzzy Logic- Fuzzy Sets and Crisp Sets- Fuzzy Set Theory and Operations- Properties of Fuzzy Sets- Fuzzy and Crisp Relations- Fuzzy to Crisp Conversion Membership Functions- Interference in Fuzzy Logic- Fuzzy If – Then Rules- Fuzzy Implications and Fuzzy Algorithms- Fuzzification and Defuzzification- Fuzzy Controller- Industrial Applications.

UNIT II FUNDAMENTALS OF NEURAL NETWORKS 9

Neuron- Nerve Structure and Synapse- Artificial Neuron and its Model- Activation Functions- Neural Network Architecture: Single Layer and Multilayer Feed Forward Networks- Recurrent Networks. Various Learning Techniques; Perception and Convergence Rule- Auto-Associative and Hetero-Associative Memory

UNIT III BACKPROPAGATION NETWORKS 9

Back Propagation Networks Architecture: Perceptron Model- Solution- Single Layer Artificial Neural Network- Multilayer Perceptron Model; Back Propagation Learning Methods- Effect of Learning Rule Co – Efficient- Back Propagation Algorithm- Factors Affecting Backpropagation Training- Applications

UNIT IV COMPETITIVE NEURAL NETWORKS 9

Kohenen's Self Organizing Map – SOM Architecture- learning procedure – Application; Learning Vector Quantization – learning by LVQ; Adaptive Resonance Theory – Learning procedure – Applications.

UNIT V GENETIC ALGORITHM 9

Basic Concepts- Working Principle- Procedures of GA- Flow Chart of GA- Genetic Representations- (Encoding) Initialization and Selection- Genetic Operators- Mutation- Generational Cycle- Applications

Total No. of Periods: 45

COURSE OUTCOMES:

At the end of course- the Student will be able to:

- **CO1:** Apply fuzzy rules and systems in industrial control.
- **CO2:** Explain neuron models and learning in networks.
- **CO3:** Analyze backpropagation training and its effects.
- **CO4:** Apply competitive models for pattern classification.
- **CO5:** Design solutions using genetic algorithm steps.

REFERENCES

7. **Sivanandam S. N.- Sumathi S.- Deepa S. -** *Introduction to Neural Networks using MATLAB 6.0* – McGraw Hill Education – 2023
8. **Satish Kumar** – *Neural Networks: A Classroom Approach* – McGraw Hill Education – 2022
9. **Rajasekaran S.- Vijayalakshmi Pai G. A.** – *Neural Networks- Fuzzy Logic and Genetic Algorithms: Synthesis and Applications* – PHI Learning Pvt. Ltd. – 2022
10. **Timothy J. Ross** – *Fuzzy Logic with Engineering Applications* – Wiley India – 2021
11. **Simon O. Haykin** – *Neural Networks and Learning Machines* – Pearson Education – 2021

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324CAE04 – HUMAN COMPUTER INTERACTION

BASIC PREREQUISITES:

- Basic knowledge of Computer Science and Programming concepts
- Understanding of User Interface (UI) design principles and human cognition

COURSE OBJECTIVES:

- Understand the basic syntax- structure- and control flow of Kotlin programming.
- Develop functions- lambdas- and implement object-oriented principles in Kotlin.
- Explore collection operations- ensure null safety- and handle exceptions in Kotlin.
- Learn Kotlin's advanced features and integrate functional programming paradigms.
- Introduce Android development using Kotlin and manage asynchronous operations with coroutines.

UNIT - I FOUNDATIONS OF HUMAN-COMPUTER INTERACTION 9

Introduction to HCI – The Human: I/O Channels – Memory – Reasoning and Problem Solving – The Computer: Devices – Memory – Processing – Networks – Interaction: Models – Frameworks – Ergonomics – Styles of Interaction – Interaction Elements – Interactivity – Paradigms of Interaction – User-Centric Design: Concepts and Principles – History of HCI – Key Issues and Challenges in HCI

UNIT – II ENGINEERING AND COMPUTATIONAL PERSPECTIVES OF USER-CENTRIC DESIGN 9

User-Centric Design: An Engineering Perspective – Engineering a Software System for Usability – Usability Principles and Metrics – User-Centric Design Process – Case Studies in User-Centric Engineering – User-Centric Design: A Computational Perspective – Framework for User-Centric Computing – User-Centric Models and Taxonomy – Models for User-Centric Computing

UNIT - III USER MODELS AND INTERACTION TECHNIQUES 9

Computational Models of Users – Classical Models and GOMS Model – Models of Specific User Behavior – Integration of Models into Computational Frameworks – Contemporary Interfaces and Interactions – WIMP Interactions – 2D Pointing and Scrolling – Constrained Navigation – Mobile Typing – Touch-Based Interactions – Design Implications – Case Study on Virtual Keyboard – Learning-Based Models – Non-Traditional Interactions

UNIT - IV FORMAL MODELS AND EVALUATION IN USER-CENTRIC COMPUTING 9

User-Centric Computing with Matrix Algebra – Use and Issues of Formal Models – Formal Modelling of Dialog and Interactions – Other Formal Models and Emerging Trends – Evaluation Approaches in HCI – Expert Evaluation – User Evaluation – Model-Based Evaluation Techniques – Framework for Usability Evaluation and Design – User-Centric Computing Beyond GUI: Concepts and Trends

UNIT - V EMERGING INTERFACES AND ASSISTIVE TECHNOLOGIES 9

Assistive Technologies in HCI – Case Studies on Assistive and Inclusive Design – HCI Using Mechanical Sensors – Brain-Computer Interfaces (BCI): Concepts and Applications – Gesture Recognition in HCI – Video-Based Eye Tracking Systems – Speech Interfaces and Natural Interaction – Emerging Trends in Interactive Systems – Enabling Technologies and Future of HCI

Total No. of Periods: 45

COURSE OUTCOMES:

At the end of course- the Student will be able to:

- **CO1 :** Explain Kotlin's core syntax- data types- input/output- and control structures.
- **CO2 :** Apply functional and object-oriented programming constructs to build reusable Kotlin code.
- **CO3 :** Use Kotlin collections effectively and implement robust error and null handling mechanisms.
- **CO4 :** Analyze and utilize advanced Kotlin constructs such as data classes- extension functions- and scope functions.
- **CO5 :** Design Android applications with asynchronous features using Kotlin coroutines and modern development practices.

REFERENCES

1. Alan Dix- Janet Finlay- Gregory Abowd- Russell Beale- Human-Computer Interaction- Pearson Education – 2013
2. Ben Shneiderman- Catherine Plaisant- Maxine Cohen- Steven Jacobs- Designing the User Interface: Strategies for Effective Human-Computer Interaction- Pearson – 2017
3. Jenny Preece- Yvonne Rogers- Helen Sharp- Interaction Design: Beyond Human-Computer Interaction- Wiley – 2019
4. Donald A. Norman- The Design of Everyday Things- Basic Books – 2013
5. Debashis Saha- Human–Computer Interaction: Principles and Practice- Oxford University Press – 2022

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324CAE05 DIGITAL IMAGE PROCESSING

BASIC PREREQUISITES:

- Basic Knowledge in Image Data Analysis and Image Technologies

COURSE OBJECTIVES :

- To introduce Digital Image Processing concepts & Fundamentals.
- To explore Image Enhancement in Spatial and Frequency Domain.
- To learn models of image restoration- and wavelet-based multi-resolution techniques.
- To introduce techniques used for Image Compression and Segmentation.
- To explore Morphological & Image Representation in images.

UNIT - I INTRODUCTION TO DIGITAL IMAGE PROCESSING & DIGITAL IMAGE FUNDAMENTALS 9

Introduction: Origin of Digital Image Processing - use of Digital Image processing - Fundamental Steps in Digital Image Processing - Components of an Image Processing System – Mathematical Tools of Digital Image Processing – Color Image Processing - Digital Image Fundamentals: Elements of Visual Perception - Image Sensing and Acquisition - Image Sampling and Quantization - Relationships between Pixels.

UNIT - II IMAGE ENHANCEMENT IN THE SPATIAL DOMAIN & FREQUENCY DOMAIN 9

Basic Gray Level Transformation & Frequency Domain: Histogram Processing - Enhancement Using Arithmetic/Logic Operations - Basics of Spatial Filtering - Smoothing Spatial Filters - Sharpening Spatial Filters. Image Enhancement in the Frequency Domain: Introduction to the Fourier Transform and the Frequency Domain - Smoothing frequency-domain Filters - Sharpening Frequency-domain Filters - Homomorphic Filtering - Implementation.

UNIT - III IMAGE RESTORATION 9

Image Degradation/Restoration Process: Linear - Position- Invariant Degradations - Inverse Filtering - Minimum Mean Square Error (Wiener) Filtering - Constrained Least Squares Filtering. Wavelets and Multi resolution Processing: Multi resolution Expansions - Wavelet Transforms in one Dimension - The Fast Wavelet Transform - Wavelet Transforms in Two Dimensions.

UNIT - IV IMAGE COMPRESSION AND SEGMENTATION 9

Image Compression Models: Error-free Compression – Lossless Compression (Huffman Coding- Arithmetic Coding) - Lossy Compression: Transform Coding- Wavelet Based Compression. Image Compression Standard - Image Segmentation: Detection of Discontinuities - Edge Linking and Boundary Detection – Thresholding - Region-Based Segmentation.

UNIT - V MORPHOLOGICAL IMAGE PROCESSING- IMAGE REPRESENTATION AND DESCRIPTION 9

Binary Morphology: Erosion – Dilation – Opening - Closing - Hit-or-Miss Transform Morphological Algorithms: Boundary Extraction - Region Filling - Thinning. Representation and Description: Various schemes for representation - boundary descriptors - regional descriptors.

Total No. of Periods: 45

COURSE OUTCOMES:

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

- **CO1:** Understanding key Digital Image Processing concepts
- **CO2:** Able to apply Gray-level transformations- histogram processing- and filtering techniques in both spatial and frequency domains to enhance image features.
- **CO3:** Apply Image degradation models and implement restoration techniques using filtering and wavelet-based approaches.
- **CO4:** Compare different image compression techniques and perform image segmentation using edge detection- thresholding- and region-based methods.
- **CO5:** Construct effective representations of image objects using boundary and region descriptors.

REFERENCES

1. S. Esakkirajan- T. Veerakumar & B. N. Subudhi- Digital Image Processing: Illustration Using Python- Springer Singapore- 1st edition- July 2025
2. Dr. P. S. Rajakumar- Dr. S. Geetha & Dr. T. V. Ananthan- Fundamentals of Image Processing- Jupiter Publications- 1st edition- Sept 2023
3. Z. Mehmood- M. S. Shahzad & U. Khan- Digital Image Processing: Advanced Technologies and Applications- MDPI- August 2024
4. Francisco Cuevas- Pier L. Mazzeo & Alessandro Bruno- Digital Image Processing – Latest Advances and Applications- IntechOpen- July 2024
5. Khanna Publishing House- *Digital Image Processing*- 1st edition- 2024
6. Scott E. Umbaugh- Digital Image Processing and Analysis: Applications with MATLAB and CVIPtools- CRC Press (Taylor & Francis)- 4th edition- Jan 2023.

OPEN ELECTIVE – I COURSES

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324CAO01 DIGITAL MARKETING

BASIC PREREQUISITES:

- Knowledge in Product and Services

COURSE OBJECTIVES:

- Know the important and growing role of digital marketing plays in both consumer and organizational target markets.
- Discussing current issues in digital marketing and customer service strategies-
- It focuses on effective CRM; key service delivery elements; and service recovery strategies that lead to the successful implementation of a customer focus.
- The Course aims at developing understating about the concepts- strategies- various functions- operations- activities and problems of Retail business decisions.
- To enhance student ‘s capability to identify and analyze business environment and its opportunities and limitations- Digital copy rights and Electronics commerce and Multimedia and digital video

UNIT – I INTRODUCTION 9

Going Digital – The changing face of advertising – The Technology behind digital marketing – Strategic thinking: Why you need a digital marketing strategy – Defining your digital marketing strategy – Understanding the digital marketing strategy – Understanding the digital consumer – Mind your Ps – Your window to the digital world – Mobile Marketing.

UNIT – II SEARCH ENGINE MARKETING 9

The search for success: Search: the online marketer`s holy grail – About the engines – Optimizing your site for the engines – Advertising on the search engines – Black Hat- the darker side of search – Bringing in the pros – Universal search –more opportunities to rank – Website intelligence and return on investment- display advertising Techniques

UNIT – III MARKETING TRENDS 9

E-mail marketing: The new direct mail – what exactly is e-mail marketing – Planning your campaign – Dos and Don`ts of an e-mail marketing campaign – Measuring your success – Still a vital component of digital marketing – Social media and online consumer engagement: join the conversation – What is social media – The different forms of social media – The rules of engagement – Social Media Analytics-Adding social media to your own site – Online PR and reputation management.

UNIT – IV AFFILIATE AND MARKETING ON INTERNET 9

Affiliate marketing and strategic partnerships: Recognizing opportunities for strategic partnership – What is affiliate marketing – The click that really counts – What advertisers should do – Digital media creative: Creative application of digital media – using an agency Digital creative: what works and what doesn`t – The age of new Information-Based marketing – Advertising on internet – Charting the on-line Marketing Process.

UNIT – V CONSUMER SEARCH AND RESOURCE DISCOVERY 9

Search and resource discovery paradigms – Information search and retrieval – Information filtering – On-demand education and digital copy rights: Computer based education and training – Digital copy rights and Electronics commerce – Multimedia and digital video: Key multimedia concepts – Desk top video processing – Desk top video conferencing.

Total No. of Periods: 45

COURSE OUTCOMES:

CO1 : Students would be familiar with digital business and the opportunities and obstacles.
CO2 : Acquire clarity in digital management practices and Advertising on the search engines.
CO3 : Students would be familiar with use of technology in retailing business.
CO4 : Analyze and critically evaluate by adding social media and the practice of digital marketing.
CO5 : Identify and analyses the different components of Computer based education and training in digital marketing.

REFERENCES:

1. Dawn McGruer- "Dynamic Digital Marketing"- Wiley Publication- 2020.
2. Damian Ryan - Understanding Digital Marketing : Marketing Strategies for Engaging the Digital Generation- Kogan Page publisher- 3rd Edition- 2014.
3. Ravi Kalakota and Andrew B.Whinston- 'Frontiers of Electronic Commerce'- Pearson Edu Inc.- 9th Ed- 2009.
4. Deepak Bansal- A Complete Guide To Search Engine Optimization- B.R Publishing Corporation- Ist Edition- 2009.
5. Grienstein and Feinman- 'E-commerce –Security- Risk Management and Control'- McGraw-Hill Inc.-US- Ed 2- 2009.
6. Jonah Berger- Contagious Why Things Catch On- Simon & Schuster- 2013.
7. E-Marketing: The essential guide to marketing in a digital world- Rob Stokes- Quirk eMarketing (Pty) Ltd. 5th Ed- 2013.

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324CAO02 HUMAN RESOURCE MANAGEMENT

PREREQUISITES:

- To provide knowledge about management issues related to staffing- training& compensation

COURSE OBJECTIVES:

- To provide a foundational understanding of human resource management practices and theories.
- To equip with a comprehensive understanding of human resource planning- recruitment- and selection processes
- Understand of compensation management- including wage and salary administration
- To provide in-depth understanding of training methods and strategies for employee development.
- To expose to the latest advancements and emerging trends in human resources management

UNIT - I INTRODUCTION TO HRM 9

Meaning- Scope- Definition and Objectives of HRM –Importance of human Factor-Challenges Inclusive growth and Affirmative action- Functions of HRM and Models of HRM - Activities and Challenges of HRM - Role of HR Manager - Human Resource Policy - HRM as Linked to Environmental changes.

UNIT - II HUMAN RESOURCE PLANNING &RECRUITMENT- SELECTION 9

HR Planning process - Job analysis- Job description & Job specification - Job Rotation- Job enlargement & Job enrichment - Job evaluation – RECRUITMENT: - Recruitment -Process & Methods of Recruitment. SELECTION: - Selection process - type of tests & types of interviews - Designing and conducting the effective interview - Induction and Placement.

UNIT - III WAGE AND SALARY ADMINISTRATION & APPRAISING AND MANAGING PERFORMANCE 9

Principles and techniques of wage fixation - Incentive schemes and plans. Appraisal process- methods- and potential problems in performance evaluations- Traditional Modern methods - Potential Appraisal - Methods to improve performance - Career Planning and Development.

UNIT – IV TRAINING AND EXECUTIVE DEVELOPMENT 9

Nature of Training - Methods of Training - Training Need Analysis- Training Design Training Evaluation-Management Development –Succession Planning-Coaching

UNIT – V RECENT TRENDS IN HR 9

HR outsourcing - Managing Attrition and Retention - Collective Bargaining - Grievance Management - Quality of work life – HR Accounting and Audit – Whistle Blowing – Employee poaching - HRIS- Diversity of Workforce Programs. –Emerging trends in HRM-HRM audit

Total No. of Periods: 45

COURSE OUTCOMES:

CO1 : Able to apply key concepts and best practices of human resource management to real-world situations.
CO2 : Design and execute strategic human resource plans- recruit top talent effectively.
CO3 : Design and implement equitable and strategic compensation plans.
CO4 : Able to Create comprehensive executive development plans that enhance leadership capabilities and contribute to the strategic advancement of the organization.
CO5 : Able to identify- analyze- and apply modern HR practices and trends in various organizational contexts.

REFERENCES

1. K.Aswathappa Human Resource Management TMH- 2017.
2. Dessler Human Resource Management- Pearson Education Limited- 2017
3. Luis R.Gomez-Mejia- David B.Balkin- Robert L Cardy. Managing Human Resource. PHI Learning. 2015 2. Bernadin- Human Resource Management- Tata Mcgraw Hill- 14th edition 2015
4. Scott Snell & George Bohlander Human Resource Management Thomson Learning 2009.
5. VSP Rao Human Resource Management -2016.
6. Raymond A. Noe John R. Hollenbeck Patrick M Wright Human Resource Management – Gaining a competitive advantage TMH 2007.

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324CAO03 FUNDAMENTALS OF ACCOUNTING

PREREQUISITES:

- The student they have the in-depth knowledge and the basic concept of according and working capital principle for better decision making.

COURSE OBJECTIVES:

- To understand the basic principles of Double entry system and preparation of balance sheet.
- To understand the process of estimating the cost of a particular product.
- To prepare the estimate for various business activities such as purchase- sale- production and cash budgets.
- To ensure decision making process of an organization
- To understand the elements of working capital.

UNIT - I INTRODUCTION TO ACCOUNTING **9**

Meaning and Scope of Accounting – Principles – Concepts – Accounting Standards – Final Accounts –Trial Balance – Trading Account – Profit and Loss Account – Balance Sheet.

UNIT - II MARGINAL COSTING **9**

Meaning – Objectives – Elements of Cost – Cost Sheet – Marginal Costing and Cost Volume Profit Analysis – Break Even Analysis – Applications – Limitations.

UNIT - III BUDGETS AND BUDGETARY CONTROL **9**

Budgets and Budgetary Control – Meaning – Types – Sales Budget – Production Budget – Cost of Production Budget –Fixed& Flexible Budget – Cash Budget – Master Budget - Zero Base Budgeting.

UNIT – IV INVESTMENT DECISION AND COSTOF CAPITAL **9**

Time Value of Money Concepts –Risk-Return Trade off- Capital Budgeting – Methods of Appraisal – Cost of Capital Factors Affecting Cost of Capital – Computation for Each Source of Finance and Weighted Average Cost of Capital.

UNIT - V WORKING CAPITAL MANAGEMENT **9**

Concepts of Working Capital – Working Capital Policies – Factors Affecting Working Capital – Estimation of Working Capital Requirements.

Total No. of Periods: 45

COURSE OUTCOMES:

CO1 : To understand the balance sheet preparation and do analysis
CO2 : To understand the Cost and its elements
CO3 : To understand the budget preparation and control of a company**.**
CO4 : Ensures the factors to be considered in investment policies
CO5 : Helps to understand policies and its requirements

REFERENCES:

1. Anutam Paul- "Financial Management"- McGraw Hill Publication- 2020.
2. Steven J. Peterson -Construction Accounting and Financial Management- Pearson Education- 2019.
3. Len Holm- "Cost Accounting and Financial Management for Construction Project Managers"- CRC Press Publication- 2018.
4. Ravi M. Kishore- "Financial Management"- Taxman Publishers- 2013.
5. S.N.Maheshwari- "Financial and Management Accounting"- Sultan Chand & Sons- 2003.

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324CAO04 BUSINESS PROCESSES

PREREQUISITES:

- The students maybe have the in depth knowledge on the basic concepts of business process is a set of related activities.

COURSE OBJECTIVES:

- An organization must carefully analyse and document their business processes
- Continuously assess the efficiency and effectiveness of these processes to minimize cost and maximize value creation.
- Cognize the interactions between human behaviour and process design.
- Managing Change in the Global Environment-BPR
- Organizational Frame Work and Implementation of business processes

UNIT - I ORGANIZATIONAL STRUCTURE **9**

Types of Business Organizations-Organizational Structures-Definition-Complexity Formulization - Size-Technology-Culture-Forms and Outcomes - Explanations of Structures - IT Industry and Organizational Structures

UNIT - II ORGANIZATIONAL OUTCOMES **9**

Organizational Power and Power Outcomes - Leadership and Decision Making - Communication and Organizational Change-Organizational Environments and Effects-Inter and Intra organizational Relationships - Organizational Effectiveness

UNIT - III BUSINESS PROCESS RE-ENGINEERING **9**

Introduction to Business Process Re-engineering (BPR) - Meaning-Types-Process-Impetrative for Survival - Strategic Approach-Implementing Business Process Re-Engineering-Methodology and Steps – Indian Scenario of Implementing BPR

UNIT - IV BPR AND IT INDUSTRY **9**

BPR and Information Technology Process-People View and Perspectives-Empowering People through IT - Managing Change in the Global Environment - BPR Rediscovering Indian Paradigm Need of Reengineering

UNIT - V E-BUSINESS PROCESS **9**

E-Business - Introduction-E-business vs. E-Commerce-Execution of E-business - Trends-Design for Execution-Construction - Types-Organizational Frame Work and Implementation-E-business Application Areas (CRM- ERP- SCM and Selling) - E Payment - E-Government-business and India

Total No. of Periods: 45

COURSE OUTCOMES:

CO1 : Develop new or improved innovative business processes from gap analysis through process design in support of a company's strategic objectives in a socially responsible manner.
CO2 : Analyze the key business processes that drive the value chain of an organization throughout the entire product life cycle.
CO3 : Evaluate current global business issues and their impact on various enterprises.
CO4 : BPR and Information Technology Process-People View and Perspectives
CO5 : E-business Application in the areas of CRM- ERP-SCM and Selling

REFERENCES:

1. Richard H.Hall- Organizations-Structures- Processes and Outcomes"- Pearson Education- 2015
2. M.S.Jayaraman et. Al- "Business Process Reengineering"- Tata Mc Graw Hill Publications- 2015
3. Ravi Kalakota and Marcia Robinson- "E-Business; Roadmap for Success; Pearson Education- 2016
4. Gareth Jones- "Organizational Theory- Design and Change"- Pearson Education- 4th Edition- 2017
5. Dave Chaffey- "E-business and E-Commerce" Pearson Education- 2nd Edition-2016

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324CAO05 PROFESSIONAL ETHICS IN IT

COURSE OBJECTIVES:

- To Understand The Concepts Of Computer Ethics In The Work Environment.
- To Understand The Threats In Computing Environment
- To Understand The Intricacies Of Accessibility Issues
- To Ensure Safe Exits When Designing The Software Projects
- To study ethics- uses- and conduct in social networks and virtual worlds.

UNIT - I INTRODUCTION TO ETHICS 9

Definition of Ethics- Right- Good- Just- The Rational Basis of Ethics -Theories of Right: Intuitionist vs. End-Based vs. Duty-Based -Rights- Duties- Obligations -Theory of Value - Conflicting Principles and Priorities -The Importance of Integrity -The Difference Between Morals- Ethics- and Laws -Ethics in the Business World - Corporate Social Responsibility - Creating an Ethical Work Environment -Including Ethical Considerations in Decision Making

UNIT - II ETHICS IN INFORMATION TECHNOLOGY- INTERNET CRIME 9

IT Professionals - Are IT Workers Professionals- Professional Relationships That Must Be Managed -Professional Codes of Ethics - Professional Organizations - Certification – IT Professional Ethics- Three Codes of Ethics- Management Conflicts. The Reveton Ransomware Attacks -IT Security Incidents: A Major Concern - Why Computer Incidents Are So Prevalent - Types of Exploits -Types of Perpetrators-Federal Laws for Prosecuting Computer Attacks-Implementing Trustworthy Computing -Risk Assessment -Establishing a Security Policy - Educating Employees and Contract Workers

UNIT - III FREEDOM OF EXPRESSION- PRIVACY 9

First Amendment Rights -Obscene Speech-Defamation -Freedom of Expression: Key Issues - Controlling Access to Information on the Internet -Strategic Lawsuit Against Public Participation (SLAPP)-Anonymity on the Internet-Hate Speech- Privacy Protection and the Law-Information Privacy- Privacy Laws- Applications- and Court Rulings-Key Privacy and Anonymity Issues- Data Breaches -Electronic Discovery-Consumer Profiling- Workplace Monitoring -Advanced Surveillance Technology

UNIT - IV FREEDOM OF EXPRESSION- INTELLECTUAL PROPERTY RIGHTS 9

Intellectual Property Rights-Copyrights-Copyright Term - Eligible Works -Fair Use Doctrine - Software Copyright Protection –Copyright Laws and the internet-Copyright and Piracy–Patents--Software Patents -Cross-Licensing Agreements -Trade Secrets-Trade Secret Laws -Employees and Trade Secrets-Key Intellectual Property Issues-Plagiarism -Reverse Engineering-Open Source Code- Competitive Intelligence -Trademark Infringement -Cyber squatting

UNIT - V SOCIAL NETWORKING ETHICS AND ETIQUETTES 9

Social Networking Web Site- Business Applications of Online Social Networking-Social Network Advertising-The Use of Social Networks in the Hiring Process-Social Networking Ethical Issues –Cyber bullying- Online Virtual Worlds-Crime in Virtual Worlds-Educational and Business Uses of Virtual Worlds

Total No. of Periods: 45

COURSE OUTCOMES:

CO1 : Examine situations and to internalize the need for applying ethical principles-values to tackle various situations.
CO2 : Develop a responsible attitude towards the use of computers as well as the technology.
CO3 : Envision the societal impact on the products/ projects they develop in their career
CO4 : Understand the code of ethics and standards of computer professionals.
CO5 : Analyze professional responsibility and empower access to information in the workplace.

REFERENCES:

1. Caroline Whitback- ”Ethics in Engineering Practice and Research“- Cambridge University Press- 2nd Edition 2011.
2. George Reynolds- “Ethics in Information Technology”- Cengage Learning- 6thEdition 2018.
3. Barger- Robert. (2008). Computer ethics: A case-based approach. Cambridge University Press 1stEdition.
4. John Weckert and Douglas Adeney- Computer and Information Ethics- Greenwood Press-FirstEdition1997.
5. Penny Duquenoy- Simon Jones and Barry G Blundell- “Ethical- legal and professional issues in computing”- Middlesex University Press- First Edition2008.
6. Sara Baase- “A Gift of Fire: Social- Legal- and Ethical Issues for Computing Technology”- 4th Edition- Pearson India- 2018.
7. http://www.infosectoday.com/Articles/Intro_Computer_Ethics.html

PROFESSIONAL ELECTIVE LAB – III COURSES

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324CAL01 DEEP LEARNING LAB

BASIC PREREQUISITES:

- Basic Knowledge of Linear Algebra and Probability
- Fundamentals of Python Programming and Machine Learning

COURSE OBJECTIVES:

- Introduce core mathematical concepts for deep learning.
- Understand deep neural network architectures and training methods.
- Explore sequence models and training strategies.
- Study feature learning and auto encoder models.
- Introduce generative models and probabilistic methods.

LIST OF EXPERIMENTS

1. Write a Python program to compute the eigenvalues and eigenvectors of a given 2x2 matrix using NumPy.
2. Calculate the entropy and KL divergence between two given discrete probability distributions using SciPy.
3. Implement a two-layer perceptron using NumPy to classify the XOR problem with manual forward and backward propagation.
4. Use a pretrained CNN model to extract and visualize the feature maps from the first convolutional layer for a sample input image.
5. Build and train an LSTM model using Keras to predict the next value in a sine wave time series.
6. Perform hyperparameter tuning using GridSearchCV for a neural network classifier on the MNIST dataset.
7. Implement Basic and Denoising Autoencoders on MNIST Dataset
8. Implement a Variational Autoencoder (VAE) and Visualize the Latent Space.
9. Create a simple Generative Adversarial Network (GAN) in PyTorch to generate handwritten digits using the MNIST dataset.
10. Use Monte Carlo simulation in Python to estimate the value of π and the expected value of a given function over a defined interval.

Total No. of Periods: 60

COURSE OUTCOMES:

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

CO7 : Apply linear algebra- probability- and differentiation in deep learning contexts.
CO8 : Construct feedforward and convolutional neural networks for classification tasks.
CO9 : Develop RNN- LSTM- and GRU models for sequence-based applications.
CO10 : Implement auto encoders and dimensionality reduction techniques.
CO11 : Design generative models such as GANs for data generation tasks.

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324CAL02 DEVOPS AND MICROSERVICES LAB

BASIC PREREQUISITES:

- Basic understanding of Git- version control systems- and web development concepts.
- Familiarity with CI/CD tools (like Jenkins)- containerization (Docker- Kubernetes)- and cloud platforms

COURSE OBJECTIVES:

- Understand DevOps basics and microservices fundamentals.
- Learn microservice architecture and its comparison with monoliths.
- Use Maven and Gradle for building Java applications.
- Explore DevOps with microservices in cloud setups.
- Implement testing and CI/CD strategies.

LIST OF EXPERIMENTS

1. Design a shell script to simulate the DevOps workflow stages (build- test- deploy).
2. Create a local Git repository and push a version-controlled script to GitHub.
3. Create a basic RESTful microservice using Node.js with multiple endpoints.
4. Build a simple Python Flask microservice with routing and JSON response
5. Build a Java application using Maven and generate a .jar file.
6. Create and execute a Java project using Gradle with a custom build script.
7. Build and run a Docker container for a Node.js microservice.
8. Create a microservice that reads environment variables and responds accordingly
9. Design a Jenkins job to build a Maven project and display build status.
10. Create a Jenkins pipeline script to automate build and unit test stages.

Total No. of Periods: 60

COURSE OUTCOMES:

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

CO6 : Explain DevOps lifecycle and microservices features.
CO7 : Analyze and compare monolithic and microservice models.
CO8 : Apply Maven/Gradle to compile and manage Java projects
CO9 : Evaluate microservices in a DevOps cloud pipeline.
CO10 : Design a CI/CD pipeline with testing stages.

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324CAL03 SOFT COMPUTING TECHNOLOGIES LAB

BASIC PREREQUISITES:

- Basic understanding of linear algebra to follow neural network computations.
- Basic programming Skills to implement soft computing algorithms effectively.

COURSE OBJECTIVES:

- To understand fuzzy logic principles and their role in decision-making systems.
- To learn the structure and functioning of neural networks and their learning mechanisms.
- To study multilayer neural networks and train them using backpropagation techniques.
- To explore unsupervised neural networks and their application in pattern clustering.
- To understand the working and application of genetic algorithms for optimization.

LIST OF EXPERIMENTS

11. Design a Fuzzy Logic Controller for a temperature control system using fuzzification- - and defuzzification.
12. Implement Fuzzy Set Operations and visualize membership functions.
13. Simulate a Single-Layer Perceptron to perform basic logical operations in Python.
14. Visualize Activation Functions and compare their outputs using plots in Python.
15. Build a Multi-Layer Perceptron for classifying MNIST digits.
16. Train a neural network using backpropagation and Visualize learning rate effects
17. Develop a Self-Organizing Map (SOM) for unsupervised clustering
18. Implement Learning Vector Quantization (LVQ) for classifying simple datasets and analyze classification boundaries.
19. Solve a Function Optimization Problem using Genetic Algorithm in Python
20. Apply genetic algorithm on a binary-encoded solution using selection, crossover, and mutation, and visualize fitness evolution.

Total No. of Periods: 60

COURSE OUTCOMES:

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

CO1: Apply fuzzy set theory and fuzzy inference to design intelligent control systems.
CO2: Describe neuron models- architectures- and learning rules of basic neural networks.
CO3: Analyze backpropagation algorithms and evaluate network training performance.
CO4: Implement SOM- LVQ- and ART models for classification and pattern recognition.
CO5: Develop solutions to optimization problems using genetic algorithm strategies.

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324CAL04 – DATA SCIENCE LAB

BASIC PREREQUISITES:

- Foundational understanding of statistical methods and mathematical concepts
- Hands-on experience with Python and data analysis tools

COURSE OBJECTIVES:

- Understand the fundamentals- evolution- and applications of data science in real-world domains.
- Learn data cleaning- transformation- and visualization techniques using Python tools.
- Acquire statistical skills essential for analyzing data and drawing inferences.
- Develop the ability to build and evaluate machine learning models for classification and clustering.
- Explore advanced topics like dimensionality reduction- time series- and NLP for deeper insights.

LIST OF EXPERIMENTS

1. Load a CSV and display data types, structure, and samples.
2. Convert between CSV, JSON, and Excel using pandas.
3. Handle missing values, remove duplicates, and normalize data.
4. Perform EDA and visualize outliers with boxplots and histograms.
5. Simulate a normal distribution and compute basic statistics.
6. Perform a t-test or ANOVA and interpret the results.
7. Build a clinical outcome predictor from healthcare data.
8. Classify medical images using a CNN model.
9. Use PCA for dimensionality reduction and plot the 2D projection of the dataset.
10. Create a sentiment classifier with basic NLP

Total No. of Periods: 60

COURSE OUTCOMES:

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

- **CO1:** Explain core concepts- data types- formats- and the role of a data scientist in solving domain-specific problems.
- **CO2:** Apply preprocessing techniques and perform exploratory data analysis using pandas and NumPy.
- **CO3:** Analyze datasets using statistical methods such as hypothesis testing- regression- and correlation.
- **CO4:** Design and implement machine learning algorithms for predictive analytics and assess model performance.
- **CO5:** Develop solutions using PCA- time series forecasting- and NLP for advanced data science applications.

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324CAL05 – DIGITAL IMAGE PROCESSING LAB

BASIC PREREQUISITES:

- Basic Understanding in Image Representation- Matrix and Array Operations.
- Familiar in Plotting and Visualization Tools.

COURSE OBJECTIVES:

- To implement image sampling and quantization techniques using programming tools.
- To apply various intensity transformation functions for enhancing image contrast and brightness.
- To perform Discrete Fourier Transform (DFT) analysis on images for frequency domain interpretation.
- To implement and compare different image transforms such as Walsh- Hadamard- DCT- and Haar.
- To execute various image processing techniques for contrast enhancement and normalization.

LIST OF EXPERIMENTS

1. Implement image sampling and quantization techniques.
2. Analyze spatial and intensity resolution of digital images.
3. Execute histogram processing techniques for contrast enhancement.
4. Apply and evaluate spatial filtering methods for image enhancement.
5. Perform frequency domain filtering for image enhancement.
6. Apply intensity transformation functions for image compression.
7. Perform Discrete Fourier Transform (DFT) analysis on images.
8. Implement and compare various image transforms
9. Implement image segmentation techniques using edge- line- and point detection.
10. Apply basic morphological operations for shape-based image processing.

Total No. of Periods: 60

COURSE OUTCOMES:

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

CO7 : Implement image sampling- quantization- and analyze spatial and intensity resolution of digital images.

CO8 : Apply intensity transformation functions and histogram processing for image enhancement.

CO9 : Perform image analysis using Discrete Fourier Transform (DFT) and various image transforms such as Walsh- Hadamard- DCT- and Haar.

CO10 : Apply spatial and frequency domain filtering techniques to enhance image quality.

CO11 : Implement image segmentation techniques and basic morphological operations for shape-based image processing.

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324CAE06 PHYSICAL FITNESS

COURSE OBJECTIVES

- Introduce the concept- history- and benefits of Yoga.
- Explain the foundational philosophy of Yoga
- Teach basic yoga postures and their benefits.
- Develop breathing and concentration through yogic techniques
- Promote Yoga as a tool for holistic health

UNIT I – INTRODUCTION TO YOGA 2

Definition and meaning of Yoga – Origin and history of Yoga in India – Distinction between Yoga and physical exercise – Benefits of Yoga for physical- mental- emotional- and spiritual well-being – Importance of Yoga in modern lifestyle

UNIT II – YOGIC PHILOSOPHY AND PRINCIPLES 2

Overview of ancient yogic texts – Patanjali Yoga Sutras and Bhagavad Gita – Ashtanga Yoga: Eight Limbs of Yoga : Yama- Niyama- Asana- Pranayama- Pratyahara- Dharana- Dhyana- Samadhi – Concept of Pancha Kosha :five layers of human existence

UNIT III – ASANAS: POSTURES AND PRACTICE 2

Guidelines for practicing asanas – Safety measures and warm-up – Introduction to selected postures: Tadasana – Bhujangasana – Vajrasana – Trikonasana – Shavasana – Benefits of each asana and associated precautions

UNIT IV – PRANAYAMA AND MEDITATION 2

Importance of breath in Yoga – Introduction to pranayama techniques: Anulom-Vilom – Bhramari – Kapalabhati – Steps for safe and effective practice – Basics of meditation: mindfulness – guided meditation – Om chanting – Benefits on mind and body

UNIT V – YOGA FOR LIFESTYLE AND WELLNESS 2

Role of Yoga in preventing and managing lifestyle diseases – Yoga for stress and anxiety relief – Importance of sattvic diet and yogic lifestyle – Integration of Yoga in daily routine – Group practice and real-life applications of yogic methods

Total No. of Periods: 10

COURSE OUTCOME

CO1: Understand the origin and importance of Yoga in daily life.
CO2: Interpret core concepts like Ashtanga Yoga and Pancha Kosha.
CO3: Perform fundamental asanas with awareness and technique.
CO4: Practice pranayama and meditation for mental clarity.
CO5: Apply Yoga in daily life for wellness and stress management

REFERENCE BOOKS

1 Devdutt Pattanaik & Matthew Rulli – *Yoga Mythology* – HarperCollins India – 2025
2 Divyansh Sharma – *The Yoga Science: A Complete Guide to Strength- Flexibility- and Injury Prevention* – Hay House Publishers India – 2024
3 Mukundananda – *Ishavasya Upanishad* – Rupa Publications India – 2025
4 Mukundananda – *Nourish Your Soul: Inspirations from and Lives of Great Saints* – Rupa Publications India – 2024
5 Erin Motz – *Yoga Fix: Functional Movement for a Pain-Free Body* – DK / Penguin Random House – 2025

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324CAE07 FOUNDATIONS OF AYURVEDA

COURSE OBJECTIVES

- Introduce the origin and basics of Ayurveda
- Explain core Ayurvedic principles
- Explore diagnosis and treatment methods
- Promote Ayurveda-based daily practices
- Highlight Ayurveda's modern relevance

UNIT I – INTRODUCTION TO AYURVEDA 2

Meaning and definition of Ayurveda – Historical evolution and classical texts: Charaka Samhita- Sushruta Samhita- Ashtanga Hridaya – Eight branches of Ayurveda: *Ashtanga Ayurveda* – Concept of health -*Swasthya* as balance of body- mind- and spirit

UNIT II – BASIC PRINCIPLES OF AYURVEDA 2

Panchamahabhuta theory – Five great elements: Earth- Water- Fire- Air- Space – Tridosha theory: Vata- Pitta- Kapha – Qualities- functions- and imbalance of doshas – Sapta Dhatus -seven body tissues – Mala -waste elimination – Agni - digestive fire and its role in health

UNIT III – DIAGNOSIS AND TREATMENT METHODS 2

Ayurvedic diagnostic tools – *Darshana*- observation- *Sparshana* -touch- *Prashna* -questioning – Nadi Pariksha -pulse diagnosis – Concept of *Prakriti* -body constitution – Panchakarma therapy – Fivefold detoxification process – Herbs and formulations

UNIT IV – AYURVEDA IN DAILY LIFE 2

Dinacharya – daily regimen for maintaining health – Ritucharya – seasonal routines – Diet -Ahara and lifestyle -Vihara recommendations – Guidelines for sleep- digestion- physical activity – Mental health and emotional well-being in Ayurveda

UNIT V – AYURVEDA AND MODERN RELEVANCE 2

Relevance of Ayurveda in modern healthcare – Role in managing lifestyle diseases -e.g.-diabetes- stress- obesity – Integration with Yoga and meditation – Research and global recognition of Ayurveda – Career and entrepreneurship opportunities in Ayurvedic industry.

Total No. of Periods: 10

COURSE OUTCOME

CO1: Understand the foundation and classical texts of Ayurveda
CO2: Describe key concepts like Tridosha and Panchamahabhuta
CO3: Identify Ayurvedic diagnostic and treatment approaches
CO4: Apply daily and seasonal health practices from Ayurveda
CO5: Relate Ayurvedic principles to modern health and wellness

REFERENCE BOOKS

1 D. Suresh Kumar – Ayurveda in the New Millennium: Emerging Roles and Future Challenges – CRC Press / London & New York – 2025
2 Dr. Govind Pareek – Ayurveda Sangraha – Parthsarthi Prakshan – 2024
3 Dr. Vasant C. Patil – Research Methodology and Bio-Statistics (As per New NCISM PG Ayurveda Syllabus 2024) – IBP Publishing (India) – 2025.
4 Dr. Dinesh K.S. – Ayurveda Aahara: A Comprehensive Guide to Food Science and Nutrition – Vasudevi Publications (Kerala) – 2025

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424CAP01 – PROJECT WORK

COURSE OBJECTIVES

- Understand and apply SDLC phases in project development.
- Identify and define a problem for individual implementation.
- Design and develop software using suitable tools and techniques.
- Enhance analytical, coding, and debugging skills.
- Prepare documentation and presentation as per SDLC standards.

COURSE OUTCOME

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

CO1 : Formulate a problem and gather requirements
CO2 : Create a system and design models
CO3 : Develop and code the application
CO4 : Test and debug for quality assurance
CO5 : Document and present the project