

ANNA UNIVERSITY, CHENNAI
NON - AUTONOMOUS COLLEGES AFFILIATED ANNA UNIVERSITY
MASTER OF COMPUTER APPLICATIONS (2 YEARS)
REGULATIONS – 2021
CHOICE BASED CREDIT SYSTEM

1. PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

Graduates will be able to:

- I. Apply their computing skills to analyse, design and develop innovative software products to meet the industry needs and excel as software professionals.
- II. Pursue lifelong learning and do research in the computing field based on solid technical foundations.
- III. Communicate and function effectively in teams in multidisciplinary fields within the global, societal and environmental context.
- IV. Exhibit professional integrity, ethics and an understanding of responsibility to contribute technical solutions for the sustainable development of society.

2. PROGRAM SPECIFIC OUTCOMES (PSOs) :

1. Able to select suitable data models, appropriate architecture, and platform to implement a system with good performance.
2. Able to design and integrate various system based components to provide user interactive solutions for various challenges.
3. Able to develop applications for real time environments using existing and upcoming technologies.

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CHOICE BASED CREDIT SYSTEM
I TO IV SEMESTERS CURRICULA AND 1st and 2nd SEMESTER SYLLABI
SEMESTER I

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MA4151	Applied Probability and Statistics for Computer Science Engineers	FC	3	1	0	4	4
2.	RM4151	Research Methodology and IPR	RMC	2	0	0	2	2
3.	MC4101	Advanced Data Structures and Algorithms	PCC	3	0	0	3	3
4.	MC4102	Object Oriented Software Engineering	PCC	3	0	0	3	3
5.	MC4103	Python Programming	PCC	3	0	0	3	3
6.	MC4104	Fundamentals of Accounting	PCC	3	0	2	5	4
7.		Audit Course – I*	AC	2	0	0	2	0
PRACTICALS								
8.	MC4111	Advanced Data Structures and Algorithms Laboratory	PCC	0	0	4	4	2
9.	MC4112	Python Programming Laboratory	PCC	0	0	4	4	2
10.	MC4113	Communication Skills Enhancement – I	EEC	0	0	2	2	1
TOTAL				19	1	12	32	24

*Audit course is optional

SEMESTER II

S. NO.	COURSE CODE	COURSE TITLE	CATE- GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MC4201	Full Stack Web Development	PCC	3	0	0	3	3
2.	MC4202	Advanced Database Technology	PCC	3	0	0	3	3
3.	MC4203	Cloud Computing Technologies	PCC	3	0	0	3	3
4.	MC4204	Mobile Application Development	PCC	3	0	2	5	4
5.	MC4205	Cyber Security	PCC	3	0	0	3	3
6.		Professional Elective I	PEC	3	0	0	3	3
7.		Audit Course – II*	AC	2	0	0	2	0
PRACTICALS								
8.	MC4211	Advanced Database Technology Laboratory	PCC	0	0	4	4	2
9.	MC4212	Full Stack Web Development Laboratory	PCC	0	0	4	4	2
10.	MC4213	Communication Skills Enhancement– II	EEC	0	0	2	2	1
TOTAL				20	0	12	32	24

*Audit course is optional

SEMESTER III

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
THEORY								
1.	MC4301	Machine Learning	PCC	3	0	0	3	3
2.	MC4302	Internet of Things	PCC	3	0	0	3	3
3.		Professional Elective II	PEC	3	0	0	3	3
4.		Professional Elective III	PEC	3	0	0	3	3
5.		Professional Elective IV	PEC	3	0	2	5	4
6.		Open Elective	OEC	3	0	0	3	3
PRACTICALS								
7.	MC4311	Machine Learning Laboratory	PCC	0	0	4	4	2
8.	MC4312	Internet of Things Laboratory	PCC	0	0	4	4	2
TOTAL				18	0	10	28	23

SEMESTER IV

S. NO.	COURSE CODE	COURSE TITLE	CATE-GORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
PRACTICALS								
1.	MC4411	Project Work	EEC	0	0	24	24	12
TOTAL				0	0	24	24	12

TOTAL NO. OF CREDITS: 83

PROFESSIONAL ELECTIVES**SEMESTER II, ELECTIVE I**

S.No.	COURSE CODE	COURSE TITLE	CATE - GORY	CONTACT PERIODS	L	T	P	C
1.	MC4001	Software Project Management	PEC	3	3	0	0	3
2.	MC4002	Professional Ethics in IT	PEC	3	3	0	0	3
3.	MC4003	E - Learning	PEC	3	3	0	0	3
4.	MC4004	Advances in Operating System	PEC	3	3	0	0	3
5.	MC4005	Information Retrieval Techniques	PEC	3	3	0	0	3
6.	MC4006	Soft Computing Techniques	PEC	3	3	0	0	3
7.	MC4007	Operations Research	PEC	3	3	0	0	3
8.	MC4008	Business Data Analytics	PEC	3	3	0	0	3

SEMESTER III, ELECTIVE II

S.No.	COURSE CODE	COURSE TITLE	CATE- GORY	CONTACT PERIODS	L	T	P	C
1.	MC4009	DevOps and Microservices	PEC	3	3	0	0	3
2.	MC4010	Advances in Networking	PEC	3	3	0	0	3
3.	MC4011	Digital Image Processing	PEC	3	3	0	0	3
4.	MC4012	Social Network Analytics	PEC	3	3	0	0	3
5.	MC4013	Cryptocurrency and Blockchain Technologies	PEC	3	3	0	0	3
6.	MC4014	Bio Inspired learning	PEC	3	3	0	0	3
7.	MC4015	Digital Marketing	PEC	3	3	0	0	3

SEMESTER III, ELECTIVE III

S.No.	COURSE CODE	COURSE TITLE	CATE- GORY	CONTACT PERIODS	L	T	P	C
1.	MC4016	Software Architecture	PEC	3	3	0	0	3
2.	MC4017	Digital Forensics	PEC	3	3	0	0	3
3.	MC4018	Wireless Networking	PEC	3	3	0	0	3
4.	MC4019	Data Visualization Techniques	PEC	3	3	0	0	3
5.	MC4020	Data Mining and Data Warehousing Techniques	PEC	3	3	0	0	3
6.	MC4021	Agile Methodologies	PEC	3	3	0	0	3
7.	MC4022	Organizational Behavior	PEC	3	3	0	0	3

SEMESTER III, ELECTIVE IV

S.No.	COURSE CODE	COURSE TITLE	CATE-GORY	CONTACT PERIODS	L	T	P	C
1.	MC4023	Web Design	PEC	5	3	0	2	4
2.	MC4024	C# and .NET	PEC	5	3	0	2	4
3.	MC4025	Big Data Mining and Analytics	PEC	5	3	0	2	4
4.	MC4026	Software Quality and Testing	PEC	5	3	0	2	4
5.	MC4027	Advanced Java Programming	PEC	5	3	0	2	4
6.	MC4028	Network Programming and Security	PEC	5	3	0	2	4

AUDIT COURSES (AC)

Registration for any of these courses is optional to students

SL. NO	COURSE CODE	COURSE TITLE	PERIODS PER WEEK			CREDITS
			L	T	P	
1.	AX4091	English for Research Paper Writing	2	0	0	0
2.	AX4092	Disaster Management	2	0	0	0
3.	AX4093	Constitution of India	2	0	0	0
4.	AX4094	நற்றமிழ் இலக்கியம்	2	0	0	0

BRIDGE COURSES

(For the M.C.A students admitted under non-computer-science background category)

SL. NO.	COURSE CODE	COURSE TITLE	CONTACT PERIODS	L	T	P	C
Classes are to be conducted and completed before the start of the class of first semester, Examinations will be conducted along with first semester							
1.	BX4001	Data Structures and Algorithms	5	3	0	2	4
2.	BX4002	Problem Solving and Programming in C	5	3	0	2	4
Classes are to be conducted and completed before the start of the class of second semester, Examinations will be conducted along with second semester							
3.	BX4003	Introduction to Computer Organization and Operating Systems	3	3	0	0	3
4.	BX4004	Database Management Systems	5	3	0	2	4
Classes are to be conducted and completed before the start of the class of third semester, Examinations will be conducted along with third semester							
5.	BX4005	Mathematical Foundations of Computer Science	3	3	0	0	3
6.	BX4006	Basics of Computer Networks	3	3	0	0	3

L	T	P	C
3	1	0	4

- To encourage students to develop a working knowledge of the central ideas of Linear Algebra.
- To enable students to understand the concepts of Probability and Random Variables.
- To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the central limit theorem.
- To apply the small / large sample tests through Tests of hypothesis.
- To enable the students to use the concepts of multivariate normal distribution and principal components analysis.

Vector spaces – norms – Inner Products – Eigenvalues using QR transformations – QR factorization – generalized eigenvectors – Canonical forms – singular value decomposition and applications – pseudo inverse – least square approximations.

Probability – Axioms of probability – Conditional probability – Bayes theorem – Random variables – Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.

Joint distributions – Marginal and conditional distributions – Functions of two dimensional random variables – Regression curve – Correlation.

Sampling distributions – Type I and Type II errors – Small and Large samples – Tests based on Normal, t, Chi square and F distributions for testing of mean, variance and proportions – Tests for independence of attributes and goodness of fit.

Random vectors and matrices – Mean vectors and covariance matrices – Multivariate normal density and its properties – Principal components – Population principal components – Principal components from standardized variables.

COURSE OUTCOMES:

- apply the concepts of Linear Algebra to solve practical problems.
- use the ideas of probability and random variables in solving engineering problems.
- be familiar with some of the commonly encountered two dimension random variables and be equipped for a possible extension to multivariate analysis.
- use statistical tests in testing hypothesis on data.
- develop critical thinking based on empirical evidence and the scientific approach to knowledge development.

REFERENCES:

1. Dallas E Johnson, "Applied multivariate methods for data Analysis", Thomson and Duxbury press, Singapore, 1998.
2. Richard A. Johnson and Dean W. Wichern, "Applied multivariate statistical Analysis", Pearson Education, Fifth Edition, 6th Edition, New Delhi, 2013.
3. Bronson, R., "Matrix Operation" Schaum's outline series, Tata McGraw Hill, New York, 2011.
4. Oliver C. Ibe, "Fundamentals of Applied probability and Random Processes", Academic Press, Boston, 2014.
5. Johnson R. A. and Gupta C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson India Education, Asia, 9th Edition, New Delhi, 2017.

RM4151

RESEARCH METHODOLOGY AND IPR

L T P C
2 0 0 2

UNIT I RESEARCH DESIGN

6

Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II DATA COLLECTION AND SOURCES

6

Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data - Preparing, Exploring, examining and displaying.

UNIT III DATA ANALYSIS AND REPORTING

6

Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.

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-filing, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licences, Licensing of related patents, patent agents, Registration of patent agents.

TOTAL : 30 PERIODS

REFERENCES:

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, Trade Secrets", 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.

COURSE OBJECTIVES:

- To understand the usage of algorithms in computing
- To learn and use hierarchical data structures and its operations
- To learn the usage of graphs and its applications
- To select and design data structures and algorithms that is appropriate for problems
- To study about NP Completeness of problems.

UNIT I ROLE OF ALGORITHMS IN COMPUTING & COMPLEXITY ANALYSIS 9

Algorithms – 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: The Substitution Method – The Recursion-Tree Method- Data structures and algorithms.

UNIT II HIERARCHICAL DATA STRUCTURES 9

Binary Search Trees: Basics – Querying a Binary search tree – Insertion and Deletion- Red Black trees: Properties of Red-Black Trees – Rotations – Insertion – Deletion -B-Trees: Definition of B -trees – Basic operations on B-Trees – Deleting a key from a B-Tree- Heap – Heap Implementation – Disjoint Sets - Fibonacci Heaps: structure – Mergeable-heap operations- Decreasing a key and deleting a node-Bounding the maximum degree.

UNIT III GRAPHS 9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search – Topological Sort – Strongly Connected Components- Minimum Spanning Trees: Growing a Minimum Spanning Tree – Kruskal and Prim- Single-Source Shortest Paths: The Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; Dynamic Programming - All-Pairs Shortest Paths: Shortest Paths and Matrix Multiplication – The Floyd-Warshall Algorithm

UNIT IV ALGORITHM DESIGN TECHNIQUES 9

Dynamic Programming: Matrix-Chain Multiplication – Elements of Dynamic Programming – Longest Common Subsequence- Greedy Algorithms: – Elements of the Greedy Strategy- An Activity-Selection Problem - Huffman Coding.

UNIT V NP COMPLETE AND NP HARD 9

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

TOTAL : 45 PERIODS**SUGGESTED ACTIVITIES:**

1. Write an algorithm for Towers of Hanoi problem using recursion and analyze the complexity (No of disc-4)
2. Write any one real time application of hierarchical data structure
3. Write a program to implement Make_Set, Find_Set and Union functions for Disjoint Set Data Structure for a given undirected graph $G(V,E)$ using the linked list representation with simple implementation of Union operation
4. Find the minimum cost to reach last cell of the matrix from its first cell
5. Discuss about any NP completeness problem

COURSE OUTCOMES:

CO1:Design data structures and algorithms to solve computing problems.

CO2:Choose and implement efficient data structures and apply them to solve problems.

CO3:Design algorithms using graph structure and various string-matching algorithms to solve real-life problems.

CO4: Design one's own algorithm for an unknown problem.

CO5: Apply suitable design strategy for problem solving.

REFERENCES

1. S.Sridhar," Design and Analysis of Algorithms", Oxford University Press, 1st Edition, 2014.
2. Adam Drozdex, "Data Structures and Algorithms in C++", Cengage Learning, 4th Edition, 2013.
3. T.H. Cormen, C.E.Leiserson, R.L. Rivest and C.Stein, "Introduction to Algorithms", Prentice Hall of India, 3rd Edition, 2012.
4. Mark Allen Weiss, "Data Structures and Algorithms in C++", Pearson Education, 3rd Edition, 2009.
5. E. Horowitz, S. Sahni and S. Rajasekaran, "Fundamentals of Computer Algorithms", University Press, 2nd Edition, 2008.
6. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

MC4102

OBJECT ORIENTED SOFTWARE ENGINEERING

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the phases in object oriented software development
- To gain fundamental concepts of requirements engineering and analysis.
- To know about the different approach for object oriented design and its methods
- To learn about how to perform object oriented testing and how to maintain software
- To provide various quality metrics and to ensure risk management.

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

SUGGESTED ACTIVITIES:

1. Discuss the different phases in any domain like Health Monitoring System using extreme programming
2. Describe Business Requirement Specification (BRS) and SRS (Software Requirement Specification) for any Project like Automatic Intelligent Plant Watering System .using any one of requirement analysis tool
3. Identify the classes , relationship between classes and draw standard UML diagrams using any one UML modeling tool (eg: ArgoUML that supports UML 1.4 and higher)
4. for a system (eg: Conference Management System, student management system)
5. Test the above UML for all the scenarios identified using Selenium /JUnit / Apache JMeter
6. Perform COCOMO estimation for Book Management System to find effort and development time considering all necessary cost estimation factors. (Use GanttPRO Software for estimation)

COURSE OUTCOMES:

On completion of the course the student would be able to :

CO1: Design object oriented software using appropriate process models.

CO2: Differentiate software processes under waterfall and agile methodology.

CO3: Design and Develop UML diagrams for software projects.

CO4: Apply Design Patterns for a software process.

CO5: Categorize testing methods and compare different testing tools for software processes.

CO6: Analyze object oriented metrics and quality for software engineering processes.

TOTAL: 45 PERIODS

REFERENCES:

1. Yogesh Singh, RuchikaMalhotra, “ Object – Oriented Software Engineering”, PHI Learning Private Limited ,First edition,2012
2. Ivar Jacobson. Magnus Christerson, PatrikJonsson, Gunnar Overgaard, “Object Oriented Software Engineering, A Use Case Driven Approach”, Pearson Education, Seventh Impression, 2009
3. Craig Larman, “Applying UML and Patterns, an Introduction to Object-Oriented Analysis and Design and Iterative Development”, Pearson Education, Third Edition, 2008.
4. Grady Booch, Robert A. Maksimchuk, Michael W. Engle, Bobbi J. Young, Jim Conallen, Kelli A. Houston, “Object Oriented Analysis & Design with Applications, Third Edition, Pearson Education,2010

5. Roger S. Pressman, "Software Engineering: A Practitioner's Approach, Tata McGraw-Hill Education, 8th Edition, 2015

MC4103

PYTHON PROGRAMMING

LT PC

3 0 0 3

COURSE OBJECTIVES:

- To develop Python programs with conditionals, loops and functions.
- To use Python data structures – lists, tuples, dictionaries.
- To do input/output with files in Python
- To use modules, packages and frameworks in python
- To define a class with attributes and methods in python

UNIT I BASICS OF PYTHON

9

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

UNIT II DATA TYPES IN PYTHON

9

Lists, Tuples, Sets, Strings, Dictionary, Modules: Module Loading and Execution – Packages – Making Your Own Module – The Python Standard Libraries.

UNIT III FILE HANDLING AND EXCEPTION HANDLING

8

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

UNIT IV MODULES, PACKAGES AND FRAMEWORKS

10

Modules: Introduction – Module Loading and Execution – Packages – Making Your Own Module – The Python Libraries for data processing, data mining and visualization- NUMPY, Pandas, Matplotlib, Plotly-Frameworks- -Django, Flask, Web2Py

UNIT V OBJECT ORIENTED PROGRAMMING IN PYTHON

9

Creating a Class, Class methods, Class Inheritance, Encapsulation, Polymorphism, class method vs. static methods, Python object persistence.

SUGGESTED ACTIVITIES:

1. Display a multiplication Table Both players are given the same string, S ; Both players have to make substrings using the letters of the string S.
2. Player A has to make words starting with consonants. Player B has to make words starting with vowels. The game ends when both players have made all possible substrings. Do Scoring
3. Write a function definition for JTOI() in Python that would display the corrected version of entire content of the file .TXT (has wrongly alphabet J in place of alphabet I) with all the alphabets "J" to be displayed as an alphabet "I" on screen.
4. Consider a CSV file of profit of 10 items in monthly sales of a year . Read this file using Pandas or NumPy or using the in-built matplotlib function. Perform the following task.

5. Read Total profit of all months and show it using a line plot
Read all product sales data and show it using a multi-line plot
Read each item sales data of each month and show it using a scatter plot
Read each item product sales data and show it using the bar chart
Read sales data of bathing soap of all months and show it using a bar chart.
Calculate total sale data an year for each product and show it using a Pie chart
6. Create a Python class called Bank Account which represents a bank account, having as attributes: account Number (numeric type), name (name of the account owner as string type), balance. Create a constructor with parameters: account Number, name, balance. Create a Deposit() method which manages the deposit actions. Create a Withdrawal() method which manages withdrawals actions

COURSE OUTCOMES:

On completion of the course the student would be able to :

CO1: Develop algorithmic solutions to simple computational problems

CO2: Represent compound data using Python lists, tuples and dictionaries.

CO3: Read and write data from/to files in Python Programs

CO4: Structure simple Python programs using libraries, modules etc.

CO5: Structure a program by bundling related properties and behaviors into individual objects.

TOTAL : 45 PERIODS

REFERENCES

1. Reema Thareja, "Python Programming using Problem Solving Approach", Oxford University Press, First edition, 2017
2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Shroff, O'Reilly Publishers, 2016 (<http://greenteapress.com/wp/thinkpython/>)
3. Guido van Rossum, Fred L. Drake Jr., "An Introduction to Python – Revised and Updated for Python 3.2, Network Theory Ltd., First edition, 2011
4. John V Guttag, "Introduction to Computation and Programming Using Python", Revised and Expanded Edition, MIT Press, 2013
5. Charles Dierbach, "Introduction to Computer Science using Python", Wiley India Edition, First Edition, 2016

MC4104

FUNDAMENTALS OF ACCOUNTING

L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand the basic principles of Accounting
- To understand the Double entry system and the preparation of ledger.
- To understand the process and importance of the electronic accounting system.
- To Prepare the estimate for various business activities such as purchase, sale, production and cash budgets
- To ensure the decision making process of an organization.

UNIT I INTRODUCTION TO ACCOUNTING

15

Introduction to Financial, Cost and Management Accounting - Objectives of Financial Accounting – Accounting Principles, Concepts and Conventions – Bookkeeping and Accounting

Practical exercise session using Tally:

1. Company Creation, Creating Groups
2. Creation of Ledgers and Vouchers

UNIT II MANAGEMENT ACCOUNTING AND BOOKKEEPING

15

Meaning-Objectives of Management Accounting-Accounting System – Preparation of Journal, Ledger, Cash Book and Trial Balance – Errors disclosed and not disclosed by Trial Balance –Final Accounts - Ratio Analysis

Practical exercise session using Tally.:

1. Creating Contra, Journals, Credit and Debit Notes
2. Preparing Trial Balance and Final Accounts

UNIT III BUDGETS AND BUDGETARY CONTROL

15

Budgets and Budgetary Control-Meaning-Types-Sales Budget-Production Budget-Cost of Production Budget-Flexible Budgeting-Cash Budget-Master Budget-Zero Base Budgeting-Computerized Accounting – with adjustments

Practical sessions using Advanced tools in MS-Excel:

1. Preparing Revenue Management and Portfolio Selection
2. Preparing Final Accounts with Adjustments

UNIT IV FINANCIAL MANAGEMENT

15

Objectives of Financial Management- preparation of Suspense Account – Depreciation – Meaning and Types – Methods of Charging and Providing depreciation – Inventory

Practical exercise session using Tally.:

1. Preparing Inventory Creation, Purchase order, Sales Order
2. Preparing Sales Journal, Rejections, Delivery Note.

UNIT V BANK RECONCILIATION STATEMENT AND REPORTING

15

Preparing Bank Reconciliation Statement (simple problems) – Insurance Claim – Average Clause - Export and Import of Data, Data Security,

Practical exercise session using Tally.:

1. Preparing the Bank Reconciliation Statement
2. Preparing the Trading, Profit And Loss Account and Trial Balance

TOTAL : 75 PERIODS

COURSE OUTCOMES:

On completion of the course the student would be able to :

- CO1. Able to understand the basic concepts of Accounting standards.
- CO2. Able to understand the process of maintaining Accounts in an organization
- CO3. Helps to understand and calculating the financial position of an organization
- CO4. Helps to understand Financial Management concepts and its components
- CO5. It helps to understand the importance of BRS and generation of various financial reports

REFERENCES:

1. S.N.Maheswari, "Financial and Management Accounting", Sultan Chand & Sons, 5 edition, 2010
2. I.M.Pandey, "Financial Management", Vikas Publishing House Pvt. Ltd., 9th Edition, 2009.
3. M.Y.Khan and P.K.Jain, "Financial Management , Text, Problems and Cases", Tata McGraw Hill, 5th Edition, 2008.
4. Reddy and Murthy, Financial Accounting by Margham Publications, 2015, Chennai
5. I.M.Pandey, "Management Accounting", Vikas Publishing House Pvt. Ltd., 3rd Edition, 2009
6. Advanced Accounting, R.L.Gupta and P.K.Gupta, Advanced Accounting, Sultan Chand, New Delhi

COURSE OBJECTIVES:

- To acquire the knowledge of using advanced tree structures
- To learn the usage of heap structures
- To understand the usage of graph structures and spanning trees
- To understand the problems such as matrix chain multiplication, activity selection and Huffman coding
- To understand the necessary mathematical abstraction to solve problems.

LIST OF EXPERIMENTS:

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

HARDWARE/SOFTWARE REQUIREMENTS

- 1: 64-bit Open source Linux or its derivative
- 2: Open Source C++ Programming tool like G++/GCC

TOTAL : 60 PERIODS**COURSE OUTCOMES:****CO1:** Design and implement basic and advanced data structures extensively**CO2:** Design algorithms using graph structures**CO3:** Design and develop efficient algorithms with minimum complexity using design techniques**CO4:** Develop programs using various algorithms.**CO5:** Choose appropriate data structures and algorithms, understand the ADT/libraries, and use it to design algorithms for a specific problem.**REFERENCES:**

1. Lipschutz Seymour, "Data Structures Schaum's Outlines Series", Tata McGraw Hill, 3rd Edition, 2014.
2. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.
3. <http://www.coursera.org/specializations/data-structures-algorithms>
4. http://www.tutorialspoint.com/data_structures_algorithms
5. <http://www.geeksforgeeks.org/data-structures/>

COURSE OBJECTIVES:

- Develop Python programs with conditionals, loops and functions
- Represent compound data using Python lists, tuples, dictionaries
- Read and write data from/to files in Python
- Implement NumPy, Pandas, Matplotlib libraries
- Implement object oriented concepts

LIST OF EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines.

1. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
2. Scientific problems using Conditionals and Iterative loops.
3. Linear search and Binary search
4. Selection sort, Insertion sort
5. Merge sort, Quick Sort
6. Implementing applications using Lists, Tuples.
7. Implementing applications using Sets, Dictionaries.
8. Implementing programs using Functions.
9. Implementing programs using Strings.
10. Implementing programs using written modules and Python Standard Libraries (pandas, numpy, Matplotlib, scipy)
11. Implementing real-time/technical applications using File handling.
12. Implementing real-time/technical applications using Exception handling.
13. Creating and Instantiating classes

HARDWARE/SOFTWARE REQUIREMENTS

- 1: Processors: Intel Atom® processor Intel®Core™i3 processor
- 2: Disk space: 1GB.
- 3: Operating systems: Windows 7, macOS and Linux
- 4: Python versions: 2.7, 3.6, 3.8

TOTAL : 60 PERIODS**COURSE OUTCOMES:**

On completion of the laboratory course, the student should be able to

CO1: Apply the Python language syntax including control statements, loops and functions to solve a wide variety of problems in mathematics and science.

CO2: Use the core data structures like lists, dictionaries, tuples and sets in Python to store, process and sort the data

CO3: Create files and perform read and write operations

CO4: Illustrate the application of python libraries.

CO5: Handle exceptions and create classes and objects for any real time applications

REFERENCES:

1. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", Second Edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016.
2. Shroff "Learning Python: Powerful Object-Oriented Programming; Fifth edition, 2013.
3. David M. Beazley "Python Essential Reference". Addison-Wesley Professional; Fourth edition, 2009.

4. David M. Baezly "Python Cookbook" O'Reilly Media; Third edition (June 1, 2013).
5. <http://www.edx.org/>

MC4113

COMMUNICATION SKILLS ENHANCEMENT – I

L	T	P	C
0	0	2	1

COURSE OBJECTIVES:

- To provide opportunities to learners to practice English and thereby make them proficient users of the language.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of technology.
- To improve the performance of students' listening, speaking, reading and writing skills and thereby enhance their career opportunities.

LIST OF ACTIVITIES:

1. Listening:
 - Listening and practicing neutral accents
 - Listening to short talks and lectures and completing listening comprehension exercises
 - Listening to TED Talks
2. Speaking:
 - Giving one minute talks
 - Participating in small Group Discussions
 - Making Presentations
3. Reading:
 - Reading Comprehension
 - Reading subject specific material
 - Technical Vocabulary
4. Writing:
 - Formal vs Informal Writing
 - Paragraph Writing
 - Essay Writing
 - Email Writing

REFERENCES / MANUALS / SOFTWARE: Open Sources / websites

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Listen and comprehend lectures in English
- Articulate well and give presentations clearly
- Participate in Group Discussions successfully
- Communicate effectively in formal and informal writing
- Write proficient essays and emails

OBJECTIVES:

- To understand the fundamentals of web programming and client side scripting.
- To learn server side development using NodeJS.
- To understand API development with Express Framework.
- To understand and architect databases using NoSQL and SQL databases.
- To learn the advanced client side scripting and ReactJS framework

UNIT I INTRODUCTION TO CSS and JAVASCRIPT 9

Introduction to Web: Server - Client - Communication Protocol (HTTP) – 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

UNIT II 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 III 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 IV 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

UNIT V APP IMPLEMENTATION IN CLOUD 9

Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes

SUGGESTED ACTIVITIES:

1. Build an online MCQ quiz app. The questions and options should be fetched based on the chosen topic from a NodeJS server. The questions can be stored in a JSON file in the backend. Once the user has answered the questions, the frontend must send the chosen options to the backend and the backend must identify the right answers and send the score back to the front end. The frontend must display the score in a separate neatly designed page.
2. Build a blog website where you can add blog posts through a simple admin panel and the users can view the blog posts. The contents of the blog posts can be stored in either MongoDB or MySQL database. The home page should contain the titles of the blog post and the full post can be viewed by clicking the title. Frontend can be built either using React or through template engines served by the NodeJS server.
3. Take any ecommerce or social media website/app. Analyze what the API endpoints would have been used for and how the frontend interacts with the backend. The networks tab in the browser's developer tools can be used if required.
4. Architect an entire database structure for an E-Commerce application for MongoDB. Discuss how the database would have been structured if you were using a SQL database.

- Build a simple calculator app with React. The user should be able to add numbers and operations to the app by clicking on buttons, just like you would do in a mobile phone. The moment the operation and the two operations are defined, the answer should be displayed

OUTCOMES:

Upon completion of the course the students should be able to:

- Write client side scripting HTML, CSS and JS.
- Implement and architect the server side of the web application.
- Implement Web Application using NodeJS.
- Architect NoSQL databases with MongoDB.
- Implement a full-stack Single Page Application using React, NodeJS and MongoDB and deploy on Cloud.

TOTAL PERIODS: 45

REFERENCES

- David Flanagan, "Java Script: The Definitive Guide", O'Reilly Media, Inc, 7th Edition, 2020
- Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019
- Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020
- Marc Wandschneider, "Learning Node", Addison-Wesley Professional, 2nd Edition, 2016
- Joe Beda, Kelsey Hightower, Brendan Burns, "Kubernetes: Up and Running", O'Reilly Media, 1st edition, 2017
- Paul Zikopoulos, Christopher Bienko, Chris Backer, Chris Konarski, Sai Vennam, "Cloud Without Compromise", O'Reilly Media, 1st edition, 2021

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	√	√	√		√								√	
CO 2	√	√	√										√	
CO 3	√	√	√	√	√	√	√	c	√	√	√		√	√
CO 4	√	√	√	√			√	√	√	√	√	√	√	√
CO 5	√	√	√	√	√	√	√					√	√	√

MC4202

ADVANCED DATABASE TECHNOLOGY

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand the working principles and query processing of distributed databases.
- To understand the basics of spatial, temporal and mobile databases and their applications.
- To distinguish the different types of NoSQL databases.
- To understand the basics of XML and create well-formed and valid XML documents.
- To gain knowledge about information retrieval and web search.

UNIT I DISTRIBUTED DATABASES

9

Distributed Systems – Introduction – Architecture – Distributed Database Concepts – Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing

UNIT II SPATIAL AND TEMPORAL DATABASES**9**

Active Databases Model – Design and Implementation Issues - Temporal Databases - Temporal Querying - Spatial Databases: Spatial Data Types, Spatial Operators and Queries – Spatial Indexing and Mining – Applications – Mobile Databases: Location and Handoff Management, Mobile Transaction Models – Deductive Databases - Multimedia Databases.

UNIT III NOSQL DATABASES**9**

NoSQL – CAP Theorem – Sharding - Document based – MongoDB Operation: Insert, Update, Delete, Query, Indexing, Application, Replication, Sharding–Cassandra: Data Model, Key Space, Table Operations, CRUD Operations, CQL Types – HIVE: Data types, Database Operations, Partitioning – HiveQL – OrientDB Graph database – OrientDB Features

UNIT IV XML DATABASES**9**

Structured, Semi structured, and Unstructured Data – XML Hierarchical Data Model – XML Documents – Document Type Definition – XML Schema – XML Documents and Databases – XML Querying – XPath – XQuery

UNIT V INFORMATION RETRIEVAL AND WEB SEARCH**9**

IR concepts – Retrieval Models – Queries in IR system – Text Preprocessing – Inverted Indexing – Evaluation Measures – Web Search and Analytics – Current trends.

TOTAL: 45 PERIODS**Suggested Activities:**

1. Create a distributed database for any application (ex. book store) and access it using PHP and Python
2. Create spatial database of any place and perform query operations
3. Creating Databases and writing simple queries using MongoDB, DynamoDB, Voldemort Key-Value Distributed Data Store Hbase and Neo4j.
4. Creating XML Documents, Document Type Definition and XML Schema for any e-commerce website and perform XML Querying
5. Perform sentiment analysis for any web document using text preprocessing techniques

COURSE OUTCOMES:

On completion of the course, the student will be able to:

1. Design a distributed database system and execute distributed queries.
2. Manage Spatial and Temporal Database systems and implement it in corresponding applications.
3. Use NoSQL database systems and manipulate the data associated with it.
4. Design XML database systems and validate with XML schema.
5. Apply knowledge of information retrieval concepts on web databases.

REFERENCES:

1. Abraham Silberschatz, Henry F Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2019.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education/Addison Wesley, 2017.
3. Guy Harrison, "Next Generation Databases, NoSQL, NewSQL and Big Data", First Edition, Apress publishers, 2015

4. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining: Concepts and Techniques", Third Edition, Morgan Kaufmann, 2012.
5. Brad Dayley, "Teach Yourself NoSQL with MongoDB in 24 Hours", Sams Publishing, First Edition, 2014.
6. C. J. Date, A. Kannan, S. Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006

MC4203

CLOUD COMPUTING TECHNOLOGIES

L T P C

3 0 0 3

OBJECTIVES:

- To understand the basic concepts of Distributed systems.
- To learn about the current trend and basics of Cloud computing.
- To be familiar with various Cloud concepts.
- To expose with the Server, Network and storage virtualization.
- To be aware of Microservices and DevOps.

UNIT I DISTRIBUTED SYSTEMS

9

Introduction to Distributed Systems – Characterization of Distributed Systems – Distributed Architectural Models – Remote Invocation – Request-Reply Protocols – Remote Procedure Call – Remote Method Invocation – Group Communication – Coordination in Group Communication – Ordered Multicast – Time Ordering – Physical Clock Synchronization – Logical Time and Logical Clocks.

UNIT II BASICS OF CLOUD COMPUTING

9

Cloud Computing Basics – Desired features of Cloud Computing – Elasticity in Cloud – On demand provisioning - Applications – Benefits – Cloud Components: Clients, Datacenters & Distributed Servers – Characterization of Distributed Systems – Distributed Architectural Models - Principles of Parallel and Distributed computing - Applications of Cloud computing – Benefits – Cloud services – Open source Cloud Software: Eucalyptus, Open Nebula, Open stack, Aneka, Cloudsim.

UNIT III CLOUD INFRASTRUCTURE

9

Cloud Architecture and Design – Architectural design challenges – Technologies for Network based system - NIST Cloud computing Reference Architecture – Public, Private and Hybrid clouds – Cloud Models : IaaS, PaaS and SaaS – Cloud storage providers - Enabling Technologies for the Internet of Things – Innovative Applications of the Internet of Things.

UNIT VI CLOUD ENABLING TECHNOLOGIES

9

Service Oriented Architecture – Web Services – Basics of Virtualization – Emulation – Types of Virtualization – Implementation levels of Virtualization – Virtualization structures – Tools & Mechanisms – Virtualization of CPU, Memory & I/O Devices – Desktop Virtualization – Server Virtualization – Google App Engine – Amazon AWS - Federation in the Cloud.

UNIT V MICROSERVICES AND DEVOPS

9

Defining Microservices - Emergence of Microservice Architecture – Design patterns of Microservices – The Mini web service architecture – Microservice dependency tree – Challenges with Microservices - SOA vs Microservice – Microservice and API – Deploying and maintaining Microservices – Reason for having DevOps – Overview of DevOps – Core elements of DevOps – Life cycle of DevOps – Adoption of DevOps - DevOps Tools – Build, Promotion and Deployment in DevOps.

SUGGESTED ACTIVITIES:

1. Write a client and server program to calculate the value of PI, in which server calls the remote procedure of the client side (C programming)
2. Create an word document of your class time table and store locally and also on cloud and share it (use www.zoho.com , docs.google.com)
3. Create your resume in a neat format using google and zoho cloud Programs on PaaS
4. Discuss processor virtualization, memory virtualization, I/O virtualization in VMWare
5. Set up Azure DevOps, Import Code and Create the Azure DevOps Build Pipeline

OUTCOMES:

Upon completion of the course, the students will be able to

- Use Distributed systems in Cloud Environment.
- Articulate the main concepts, key technologies, strengths and limitations of Cloud computing.
- Identify the Architecture, Infrastructure and delivery models of Cloud computing.
- Install, choose and use the appropriate current technology for the implementation of Cloud.
- Adopt Microservices and DevOps in Cloud environments.

TOTAL PERIODS:45

REFERENCES

1. Kai Hwang, Geoffrey C. Fox & Jack J.Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, First Edition, 2012
2. Andrew S. Tanenbaum & Maarten Van Steen, "Distributed Systems - Principles and Paradigms", Third Edition, Pearson, 2017.
3. Thomas Erl, Zaigham Mahood & Ricardo Puttini, "Cloud Computing, Concept, Technology & Architecture", Prentice Hall, Second Edition, 2013.
4. Richard Rodger, "The Tao of Microservices", ISBN 9781617293146, Manning Publications, First Edition, December 2017.
5. Magnus Larsson, "Hands-On Microservices with Spring Boot and Spring Cloud: Build and deploy microservices using spring cloud, Istio and kubernetes", Packt Publishing Ltd, First Edition, September 2019.
6. Jim Lewis, "DEVOPS: A complete beginner's guide to DevOps best practices", ISBN-13:978-1673259148, ISBN-10: 1673259146, First Edition, 2019

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	√	√	√					√			√	√	√	
CO 2	√	√	√	√	√	√	√	√	√	√		√		
CO 3	√		√		√	√		√	√	√	√	√	√	
CO 4	√			√	√	√	√	√	√	√	√	√	√	
CO 5	√	√			√	√		√			√	√	√	√

OBJECTIVES:

- To understand the need and characteristics of mobile applications.
- To design the right user interface for mobile applications.
- To understand the design issues in the development of mobile applications.
- To understand the development procedure for mobile applications.
- To develop mobile applications using various tools and platforms.

UNIT I INTRODUCTION**15**

Mobile Application Model – Infrastructure and Managing Resources – Mobile Device Profiles – Frameworks and Tools

- Installation of necessary components and software

UNIT II USER INTERFACE**15**

Generic UI Development - Multimodal and Multichannel UI –Gesture Based UI – Screen Elements and Layouts – Voice XML.

Lab Component:

- i. Implement mobile applications using UI toolkits and frameworks.
- ii. Design an application that uses Layout Managers and event listeners.

UNIT III APPLICATION DESIGN**15**

Memory Management – Design Patterns for Limited Memory – Workflow for Application development – Java API – Dynamic Linking – Plugins and rule of thumb for using DLLs – Multithreading in Java - Concurrency and Resource Management.

Lab Component:

- i. Design a mobile application that is aware of the resource constraints of mobile devices.
- ii. Design an application that uses Dynamic Linking

UNIT IV MOBILE OS**15**

Mobile OS: Android, iOS – Android Application Architecture – Understanding the anatomy of a mobile application - Android basic components –Intents and Services – Storing and Retrieving data – Packaging and Deployment – Security and Hacking.

Lab Component:

- i. Develop an application that makes use of mobile database
- ii. Implement an android application that writes data into the SD card.

UNIT V APPLICATION DEVELOPMENT**15**

Communication via the Web – Notification and Alarms – Graphics and Multimedia: Layer Animation, Event handling and Graphics services – Telephony – Location based services

Lab Component:

- i. Develop a web based mobile application that accesses internet and location data.
- ii. Develop an android application using telephony to send SMS.

OUTCOMES:

On completion of the course, the student will be able to

- Understand the basics of mobile application development frameworks and tools.
- Develop a UI for mobile applications.
- Design mobile applications that manage memory dynamically.
- Build applications based on mobile OS like Android, iOS.
- Build location based services.

TOTAL PERIODS:75

SOFTWARE REQUIREMENTS

1. JDK, ECLIPSE IDE / equivalent, ANDROID STUDIO

REFERENCES

1. Reto Meier, Ian Lake, "Professional Android", 4th Edition, Wrox, 2018.
2. Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, "Programming Android", O'Reilly, 2nd Edition, 2012.
3. Alasdair Allan, "Learning iOS Programming", O'Reilly, Third Edition, 2013.
4. Bill Phillips, Chris Stewart, Brian Hardy, and Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, 4th edition, 2019.
5. Christian Keur, Aaron Hillegass, iOS Programming: The Big Nerd Ranch Guide, 6th Edition, O'Reilly, 2016.
6. Barry Burd, "Android Application Development All-In-One for Dummies", 3rd Edition, 2021.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2	PSO3
CO 1		√			√	√			√		√		√	
CO 2	√	√	√		√				√	√	√		√	
CO 3	√	√		√							√	√	√	
CO 4	√	√	√	√							√	√		√
CO 5		√	√	√		√	√	√	√		√	√	√	√

MC4205

CYBER SECURITY

L T P C
3 0 0 3

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

UNIT II	SECURITY CONTROLS	9
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9

UNIT III	CYBER SECURITY FOR BUSINESS APPLICATIONS AND NETWORKS	9
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9

UNIT VI TECHNICAL SECURITY 9

9

UNIT V SECURITY ASSESSMENT 9

9

SUGGESTED ACTIVITIES:

- Discuss the common security flaws present in web applications and demonstrate how they can be identified using tools like ACUNETIX (or similar tools)

- OUTCOMES:**

- Develop a set of risk and security requirements to ensure that there are no gaps in an organization's security practices.

- Achieve management, operational and technical means for effective cyber security.
- Audit and monitor the performance of cyber security controls.
- Spot gaps in the system and devise improvements.
- Identify and report vulnerabilities in the system

TOTAL PERIODS: 45

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.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1		√			√	√			√		√		√	
CO 2	√	√	√		√				√	√	√		√	
CO 3	√	√		√							√	√	√	
CO 4	√	√	√	√					√		√	√		√
CO 5		√	√	√		√			√		√	√	√	

MC4211

ADVANCED DATABASE TECHNOLOGY LAB

L T P C
0 0 4 2

COURSE OBJECTIVES:

- To understand the process of distributing tables across multiple systems
- To understand the process of storing, retrieving spatial and temporal data
- To understand the process of storing, retrieving objects in a database
- To understand the process of storing and retrieving data from a XML Database
- To use the open source database for building a mobile application

LIST OF EXPERIMENTS:

1. NOSQL Exercises
 - a. MongoDB – CRUD operations, Indexing, Sharding
 - b. Cassandra: Table Operations, CRUD Operations, CQL Types
 - c. HIVE: Data types, Database Operations, Partitioning – HiveQL
 - d. OrientDB Graph database – OrientDB Features
2. MySQL Database Creation, Table Creation, Query
3. MySQL Replication – Distributed Databases
4. Spatial data storage and retrieval in MySQL
5. Temporal data storage and retrieval in MySQL

6. Object storage and retrieval in MySQL
7. XML Databases , XML table creation, XQuery FLWOR expression
8. Mobile Database Query Processing using open source DB (MongoDB/MySQL etc)

TOTAL: 60 PERIODS

SOFTWARE REQUIREMENTS

1. Java / Python / R / Scala
2. Oracle, MySQL, MongoDB, Casandra, Hive

COURSE OUTCOMES:

On completion of the course, the student will be able to:

- Design and implement advanced databases.
- Use big data frameworks and tools.
- Formulate complex queries using SQL.
- Create an XML document and perform Xquery.
- Query processing in Mobile databases using open source tools.

MC4212

FULL STACK WEB DEVELOPMENT LABORATORY

L T P C
0 0 4 2

COURSE OBJECTIVES:

- To implement the client side of the web application using javascript.
- To understand Javascript on the desktop using NodeJS.
- To develop a web application using NodeJS and Express.
- To implement a SPA using React.
- To develop a full stack single page application using React, NodeJS, and a Database (MongoDB or SQL).

List of EXPERIMENTS:

1. Create a form and validate the contents of the form using JavaScript.
2. Get data using Fetch API from an open-source endpoint and display the contents in the form of a card.
3. Create a NodeJS server that serves static HTML and CSS files to the user without using Express.
4. Create a NodeJS server using Express that stores data from a form as a JSON file and displays it in another page. The redirect page should be prepared using Handlebars.
5. Create a NodeJS server using Express that creates, reads, updates and deletes students' details and stores them in MongoDB database. The information about the user should be obtained from a HTML form.
6. Create a NodeJS server that creates, reads, updates and deletes event details and stores them in a MySQL database. The information about the user should be obtained from a HTML form.
7. Create a counter using ReactJS
8. Create a Todo application using ReactJS. Store the data to a JSON file using a simple NodeJS server and retrieve the information from the same during page reloads.
9. Create a simple Sign up and Login mechanism and authenticate the user using cookies. The user information can be stored in either MongoDB or MySQL and the server should be built using NodeJS and Express Framework.

10. Create and deploy a virtual machine using a virtual box that can be accessed from the host computer using SSH.
11. Create a docker container that will deploy a NodeJS ping server using the NodeJS image.

TOTAL : 60 PERIODS

SOFTWARE REQUIREMENTS

1. NodeJS/Express JS, ReactJS, Docker, any IDE like NOTEPAD++/visual studio code/sublime text etc.,
2. MySQL, MongoDB

COURSE OUTCOMES:

- To implement and deploy the client side of the web application.
- To develop and deploy server side applications using NodeJS.
- To use Express framework in web development.
- To implement and architect database systems in both NoSQL and SQL environments.
- To develop a full stack single page application using React, NodeJS, and a Database and deploy using containers.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	√	√	√	√	√	√	√		√			√	√	
CO 2	√	√	√	√	√	√	√		√			√	√	
CO 3	√	√	√	√	√				√			√	√	
CO 4	√	√	√	√	√				√			√	√	
CO 5	√	√	√	√	√		√		√	√	√	√	√	√

MC4213

COMMUNICATION SKILLS ENHANCEMENT - II

L T P C
0 0 2 1

OBJECTIVES:

- To provide opportunities to learners to practice their communication skills to make them become proficient users of English.
- To enable learners to fine-tune their linguistic skills (LSRW) with the help of Technology to communicate globally.
- To enhance the performance of learners at placement interviews and group discussions and other recruitment procedures

1. **SOFT SKILLS**

- People skills
- Interpersonal skills
- Team building skills
- Leadership skills
- Problem solving skills

2. **PRESENTATION SKILLS**

- Preparing slides with animation related to the topic
- Introducing oneself to the audience
- Introducing the topic

- Presenting the visuals effectively – 5 minute presentation

3. **GROUP DISCUSSION SKILLS**

- Participating in group discussions
- Brainstorming the topic
- Activities to improve GD skills.

4. **INTERVIEW SKILLS**

- Interview etiquette – dress code – body language
- Attending job interviews
- Answering questions confidently
- Technical interview – telephone/Skype interview
- Emotional and cultural intelligence
- Stress Interview

TOTAL: 30 PERIODS

REFERENCES / MANUALS / SOFTWARE: Open Sources / websites

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Students will be able to make presentations and participate in Group discussions with confidence.
- Students will be able to perform well in the interviews.
- Students will make effective presentations.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1									√	√				
CO2									√	√				
CO3									√	√				
CO4										√				
CO5										√				

PROFESSIONAL ELECTIVES

MC4001

SOFTWARE PROJECT MANAGEMENT

L T P C
3 0 0 3

OBJECTIVES:

- To know how to do project planning for the software process.
- To learn the cost estimation techniques during the analysis of the project.
- To understand the quality concepts for ensuring the functionality of the software

UNIT SOFTWARE PROJECT MANAGEMENT CONCEPTS 9

Introduction to Software Project Management: An Overview of Project Planning: Select Project, Identifying Project scope and objectives, infrastructure, project products and Characteristics. Estimate efforts, Identify activity risks, and allocate resources- Six Sigma, Software Quality: defining software quality, ISO9126, External Standards.

UNIT II SOFTWARE EVALUATION AND COSTING 9

Project Evaluation: Strategic Assessment, Technical Assessment, cost-benefit analysis, Cash flow forecasting, cost-benefit evaluation techniques, Risk Evaluation. Selection of Appropriate Project approach: Choosing technologies, choice of process models, structured methods.

UNIT III SOFTWARE ESTIMATION TECHNIQUES 9

Software Effort Estimation: Problems with over and under estimations, Basis of software Estimation, Software estimation techniques, expert Judgment, Estimating by analogy. Activity Planning: Project schedules, projects and activities, sequencing and scheduling Activities, networks planning models, formulating a network model.

UNIT IV RISK MANAGEMENT 9

Risk Management: Nature of Risk, Managing Risk, Risk Identification and Analysis, Reducing the Risk. Resource Allocation: Scheduling resources, Critical Paths, Cost scheduling, Monitoring and Control: Creating Framework, cost monitoring, prioritizing monitoring.

UNIT V GLOBALIZATION ISSUES IN PROJECT MANAGEMENT 9

Globalization issues in project management: Evolution of globalization- challenges in building global teams-models for the execution of some effective management techniques for managing global teams. Impact of the internet on project management: Introduction – the effect of the internet on project management – managing projects for the internet – effect on project management activities. Comparison of project management software: dot Project, Launch pad, openProj. Case study: PRINCE2

SUGGESTED ACTIVITIES:

1. Reducing process variability using six-sigma model DMAIC on software company applications with respect to factors like quality aspects, production bugs classified and measured, the causes of the large number of production bugs leading to different improvement suggestions
2. Do cost benefit analysis using Ms-Excel for Selecting the project (from available data in the web like <https://img.chandoo.org/a/24-cost-benefit-analysis.xlsx>)
3. Frequencying and Scheduling the Project activities using open source Ms-Project
4. Risk analysis of any project with special reference to performance time cost trilogy
5. Set up a project and its tasks; Communicate with everyone on the project team from within dotProject software.

OUTCOMES:

- Understand the activities during the project scheduling of any software application.
- Learn the risk management activities and the resource allocation for the projects.
- Apply the software estimation and recent quality standards for evaluation of the software projects
- Acquire knowledge and skills needed for the construction of highly reliable software project
- Create reliable, replicable cost estimation that links to the requirements of project planning and managing

TOTAL PERIODS:45**REFERENCES**

1. Bob Hughes, Mike Cotterell & Rajib Mall "Software Project Management", McGraw-Hill Publications, 6th Edition 2017.
2. Ian Somerville, "Software Engineering", 10th Edition, Pearson Education, 2017.
3. Robert T. Futrell , "Quality Software Project Management", Pearson Education India, 2008.
4. Gopalaswamy Ramesh, "Managing Global Software Projects: How to Lead Geographically Distributed Teams, Manage Processes and Use Quality Models", McGraw Hill Education, 2017.
5. Richard H.Thayer "Software Engineering Project Management", 2nd Edition, Wiley, 2006.
6. S. A. Kelkar," Software Project Management" PHI, New Delhi, Third Edition ,2013

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1						√		√	√	√				√	
CO2						√		√	√	√	√				
CO3						√		√	√	√					√
CO4						√		√	√	√				√	√
CO5						√		√	√	√					√

MC4002**PROFESSIONAL ETHICS IN IT****L T P C
3 0 0 3****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

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 -

UNIT II ETHICS IN INFORMATION TECHNOLOGY, INTERNET 9
CRIME

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 9
RIGHTS

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

SUGGESTED ACTIVITIES:

1. Prepare a report of CSR activities of any three organizations.
2. Study of the government rules and regulations for prosecuting Computer Attacks
3. Do case study of two incidents that lead to IT Security breach in any of the organizations
4. Recent cases (within last 5 years duration) of infringement of intellectual property rights
5. A study on Creative commons and its effect on Open Educational Resources
6. A study on the role of social networking advertising in the development of Business and Educational Sectors

OUTCOMES:

Upon Completion of the course, the students will be able to

- Examine situations and to internalize the need for applying ethical principles, values to tackle various situations.
- Develop a responsible attitude towards the use of computers as well as the technology.
- Envision the societal impact on the products/ projects they develop in their career

- Understand the code of ethics and standards of computer professionals.
- Analyze professional responsibility and empower access to information in the workplace.

TOTAL PERIODS:45

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, 6th Edition 2018.
3. Barger, Robert. (2008). Computer ethics: A case-based approach. Cambridge University Press 1st Edition.
4. John Weckert and Douglas Adeney, Computer and Information Ethics, Greenwood Press, First Edition 1997.
5. Penny Duquenoy, Simon Jones and Barry G Blundell, "Ethical, legal and professional issues in computing", Middlesex University Press, First Edition 2008.
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

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1						√		√	√	√				√	
CO 2						√		√	√	√					
CO 3						√		√	√	√					√
CO 4						√		√	√	√				√	√
CO 5						√		√	√	√					√

MC4003

E - LEARNING

L T P C
3 0 0 3

OBJECTIVES:

- To learn the various E-learning approaches and Components.
- To explore Design Thinking.
- To understand the types of design models of E-learning.
- To learn about E-learning Authoring tools.
- To know about evaluation and management of E-learning solutions

UNIT I INTRODUCTION

9

Need for E-Learning – Approaches of E-Learning – Components of E-Learning – synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – WorkFlow to Produce and Deliver E-Learning Content – Design Thinking: Introduction – Actionable Strategy – Act to Learn – Leading Teams to Win

UNIT II DESIGNING E-LEARNING COURSE CONTENT

9

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis – Analyzing the Target Audience – Identifying Course Content – Defining Learning Objectives – Defining the Course Sequence – Defining Instructional Methods – Defining Evaluation and Delivery Strategies – Case Study

Preparing Content: Tips for Content Development and Language Style – Creating Storyboards: Structure of an Interactive E-Lesson – Techniques for Presenting Content – Adding Examples – Integrating Multimedia Elements – Adding Examples – Developing Practice and Assessment Tests—Adding Additional Resources – Courseware Development Authoring Tools – Types of Authoring Tools – Selecting an Authoring Tool.

Types of Learning Platforms – Proprietary Vs. Open – Source LMS – LMS Vs LCMS – Internally Handled and Hosted LMS – LMS Solutions – Functional Areas of LMS.

Components of an Instructor-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation

1. Prepare the E-Learning Components and how will you measure the quality of the contents. Also, analyze synchronous and Asynchronous Modes of Learning, and discuss the advantages and disadvantages of both.
2. Explain how the course instructor design and create effective E-Learning content
3. List the types of authoring tools and discuss which tool is best according to you.
4. Explain about different types of Learning Platforms
5. Discuss about the Evaluation process of E-Learning courses in detail.

- Distinguish the phases of activities in models of E-learning.
- Identify appropriate instructional methods and delivery strategies.
- Choose appropriate E-learning Authoring tools.
- Create interactive E-learning courseware.
- Evaluate the E-learning courseware

1. Clark, R. C., Mayer, R. E., "E-Learning and the Science of Instruction". Third Edition, Wiley Publisher, 2016.
2. Crews, T. B., Sheth, S. N., Horne, T. M., "Understanding the Learning Personalities of Successful Online Students", 1st Edition, Educause Review, 2014.
3. Johnny Schneider, "Understanding Design Thinking, Lean and Agile", 1st Edition, O'Reilly Media, 2017.
4. Madhuri Dubey, "Effective E-learning Design, Development and Delivery", 1st Edition, University Press, 2011.
5. Vladimir L. Uskov, Robert J. Howlett, Lakhmi C. Jain, Smart Education and E-Learning, 1st Edition, Springer Singapore, 2019.
6. William Horton, "E-Learning by design", 2nd Edition, John Wiley & Sons, 2011.

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO1	PO 2	PO 3	PO 4	PO5	P O6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3

CO1	√	√	√	√										
CO2	√	√	√	√	√								√	
CO3	√	√	√	√	√								√	
CO4	√	√	√	√									√	√
CO5	√	√	√								√		√	

MC4004

ADVANCES IN OPERATING SYSTEMS

L T P C
3 0 0 3

OBJECTIVES:

- To review the fundamentals of Operating Systems
- To gain knowledge on Distributed Operating System concepts that includes issues, Mutual exclusion algorithms, Deadlock detection algorithms
- To gain insight on the distributed resource management components viz. the algorithms for implementation of distributed shared memory, and distributed scheduling.
- To know the components and management aspects of Real time, Mobile operating systems
- To acquire knowledge on the basics of Linux and Mobile OS like iOS, Android

UNIT I FUNDAMENTALS OF OPERATING SYSTEMS 9

Overview – Synchronization Mechanisms – Processes and Threads - Process Scheduling – Models of Resources - Deadlocks: Detection, Prevention and Recovery

UNIT II DISTRIBUTED OPERATING SYSTEMS 9

Issues in Distributed Operating System – Communication Primitives – Lamport's Logical clocks – Causal Ordering of Messages – Distributed Mutual Exclusion Algorithms – Centralized and Distributed Deadlock Detection Algorithms

UNIT III DISTRIBUTED RESOURCE MANAGEMENT 9

Distributed File Systems – Design Issues – Distributed Shared Memory – Algorithms for Implementing Distributed Shared Memory – Distributed Scheduling – Issues in Load Distributing – Load Distributing Algorithms

UNIT IV REAL TIME AND MOBILE OPERATING SYSTEMS 9

Basic Model of Real Time Systems - Characteristics- Applications of Real Time Systems – Real Time Task Scheduling - Handling Resource Sharing - Mobile Operating Systems – Microkernel Design - Client Server Resource Access – Processes and Threads - Memory Management - File system.

UNIT V CASE STUDIES 9

Linux System: Design Principles - Kernel Modules - Process Management - Scheduling - Memory Management – Input Output Management - File System – Interprocess Communication. iOS and Android: Architecture and SDK Framework - Media Layer - Services Layer - Core OS Layer - File System.

SUGGESTED ACTIVITIES:

1. Consider the following preemption method to prevent deadlocks: All processes are assigned unique priorities that can be totally ordered. A requesting process is allowed to preempt another process that holds the needed resource only if the requesting

- process has higher priority, otherwise, it is blocked. Demonstrate that this method prevents deadlock.
2. Consider a distributed system where each node has its own clock. Assume that all the clocks in the system are perfectly synchronized. Also, assume that the communication network is reliable. Give an algorithm for recording the global state. Note that your algorithm should be simpler than the Chandy- Lamport algorithm.
 3. Predict the performance of the receiver-initiated load sharing algorithm when the entire system workload is generated at only a few nodes in the system instead of equally at all the nodes in the system. (Hint : performance depends on how successful receivers will be in locating senders)
 4. Consider two processes, P1 and P2, where $p1 = 50$, $t1 = 25$, $p2 = 75$, and $t2 = 30$.
 - a. Can these two processes be scheduled using Rate-Monotonic Scheduling? Illustrate your answer by displaying a Gantt chart
 - b. Implement the scheduling of these two processes using Earliest Deadline-First (EDF) scheduling.
 5. Developers David and Peter of R & D belong to group A. Administrative staff Jack and Mike belong to group B.
 - a. Create a shared directory `"/ project_a"`. The files in this directory can only be read, added, deleted, modified, and executed by developers in the R & D department. Other users cannot perform any access operation in this directory.
 - b. Create a directory `"/ project_b"`. The files in this directory can only be read, added, deleted, modified and executed by the staff of the Administration Department, other users cannot do anything to this directory Access operation.
 - c. Create a directory `"/ project"`. The files in this directory can be read, added, deleted, modified, and executed by personnel in the R & D department and administrative department. Users in other departments can only use this directory and perform read-only access operations.

OUTCOMES:

Upon Completion of the course, students should be able to:

- Discuss various synchronization, scheduling and deadlock issues
- Demonstrate mutual exclusion and deadlock detection of Distributed Operating system
- Discuss various resource management techniques for distributed systems
- Identify the different features of real time and mobile operating systems
- Perform administrative tasks on Linux Servers, iOS and Android

TOTAL PERIODS: 45

REFERENCES

1. Mukesh Singhal, Niranjana G. Shivaratri, "Advanced Concepts in Operating Systems – Distributed, Database, and Multiprocessor Operating Systems", Tata McGraw-Hill, First Edition, 1994.
2. Abraham Silberschatz; Peter Baer Galvin; Greg Gagne, "Operating System Concepts- Essentials", Ninth Edition, John Wiley & Sons, 2013.
3. Love Robert, "Linux Kernel Development", Pearson Education India, Third Edition, 2018.
4. Neil Smyth, "iOS 12 App Development Essentials", Payload media, 2018.
5. Rajib Mall, "Real-Time Systems: Theory and Practice", Pearson Education India, First Edition 2006.

TOTAL: 45 PERIODS

Mapping of COs with POs and PSOs														
COs/POs & PSOs	PO 1	PO 2	PO 3	PO 4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1		√		√		√						√		
CO2			√	√								√		
CO3				√	√							√		
CO4			√		√							√		
CO5	√	√	√	√	√				√		√	√	√	√

MC4005

INFORMATION RETRIEVAL TECHNIQUES

L T P C
3 0 0 3

OBJECTIVES:

- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing
- To get an understanding of machine learning techniques for text classification and clustering.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search
- To understand the concepts of digital libraries

UNIT I MOTIVATION

9

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – Retrieval Evaluation – Open Source IR Systems–History of Web Search – Web Characteristics– The impact of the web on IR —IR Versus Web Search–Components of a Search engine

UNIT II MODELING

9

Taxonomy and Characterization of IR Models – Boolean Model – Vector Model - Term Weighting – Scoring and Ranking –Language Models – Set Theoretic Models - Probabilistic Models – Algebraic Models – Structured Text Retrieval Models – Models for Browsing

UNIT III INDEXING

9

Static and Dynamic Inverted Indices – Index Construction and Index Compression. Searching-Sequential Searching and Pattern Matching. Query Operations -Query Languages – Query Processing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis – Measuring Effectiveness and Efficiency

UNIT IV CLASSIFICATION AND CLUSTERING

9

Text Classification and Naïve Bayes – Vector Space Classification – Support vector machines and Machine learning on documents. Flat Clustering – Hierarchical Clustering – Matrix decompositions and latent semantic indexing – Fusion and Meta learning

UNIT V SEARCHING THE WEB AND RETRIEVAL

9

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking – Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models and Languages – Indexing and Searching Parallel and Distributed IR – Digital Libraries

SUGGESTED ACTIVITIES:

1. Compare the features of any three search engines
2. Compare and contrast the IR models
3. List out features of the various IR Query languages
4. List out the applications of classification and clustering in Machine Learning
5. A Study on web crawler used by any Search Engine for indexing the sites
(For eg., Google, Mozilla, Internet Explorer,...)

OUTCOMES:

Upon completion of this course, the students should be able to:

- Build an Information Retrieval system using the available tools.
- Identify and design the various components of an Information Retrieval system.
- Model an information retrieval system
- Apply machine learning techniques to text classification and clustering which is used for efficient Information Retrieval.
- Design an efficient search engine and analyze the Web content structure.

TOTAL PERIODS: 45

REFERENCES

1. Implementing and Evaluating Search Engines, The MIT Press, Cambridge, Massachusetts London, England, First Edition 2010.
2. Manning D. Christopher, Raghavan Prabhakar & Schutz Hinrich, "Introduction to Information Retrieval", Cambridge University Press, Online Edition, 2009.
3. David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms and Heuristics", Springer, 2nd Edition, 2004.
4. Bruce Croft, Donald Metzler, Trevor Strohman, "Search Engines: Information Retrieval in Practice", Pearson, 2009.
5. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, —Modern Information Retrieval: The concepts and Technology behind Search (ACM Press Books), Second Edition, 2011.
6. Stefan Buttcher, Charles L. A. Clarke, Gordon V. Cormack, —Information Retrieval: Implementing and Evaluating Search Engines (The MIT Press), Illustrated Edition, 2016.

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	√	√	√	√	√				√			√	√	√	√
CO 2	√	√	√	√	√				√			√	√	√	
CO 3	√	√	√	√	√				√			√	√	√	√
CO 4	√	√	√	√	√		√		√	√	√	√	√	√	√
CO 5	√	√	√	√	√				√	√		√	√	√	√

OBJECTIVES:

- To gain knowledge of soft computing theories and its fundamentals.
- To design a soft computing system required to address a computational task.
- To learn and apply artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms in problem solving and use of heuristics based on human experience.
- To introduce the ideas of fuzzy sets, fuzzy logic and to become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To familiarize with genetic algorithms and other random search procedures while seeking global optimum in self – learning situations

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

Kohonen'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

SUGGESTED ACTIVITIES:

- Prepare a weekly timetable for classes in a college for different groups of students so that there are no clashes between classes. The task is to search for the optimum using GA
- Species identification of a plant using Back propagation Algorithm
- Bandwidth allocation for wireless system using Neural network
- Apply Fuzzy logic for washing machines to determine the correct amount of water and detergent, speed of agitation, and length of the wash cycles.
- Apply Fuzzy logic for breast cancer diagnosis
- Do a Case Study Effect of Road Traffic Noise Pollution on Human Work Efficiency in

Offices/ Organizations/ Commercial Business Centers in cities Using Fuzzy Expert System:

OUTCOMES:

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

- Identify and describe soft computing techniques and their roles in building intelligent machines.
- Recognize the feasibility of applying a soft computing methodology for a particular problem.
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems.
- Apply genetic algorithms to optimization problems.
- Design neural networks to pattern classification and regression problems using a soft computing approach.

TOTAL PERIODS: 45

REFERENCES

1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro – Fuzzy and Soft Computing", Pearson Education, 2004.
2. S. Rajasekaran and G.A. VijayalakshmiPai, "Neural Networks, Fuzzy Systems and Evolutionary Algorithms: Synthesis and Applications", PHI Learning, 2nd Edition, 2017.
3. S. N. Sivanandam, S. N. Deepa, "Principles of Soft Computing", Third Edition, Wiley, 2018.
4. Simon Haykin, "Neural Networks and Learning Machines", Pearson, 3rd Edition, 2009.
5. Timothy Ross, "Fuzzy Logic with Engineering Applications", Wiley Publications, 4th Edition 2016.

Mapping of COs with POs and PSOs

COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	√	√											√	
CO2	√	√	√			√							√	
CO3	√	√				√							√	√
CO4	√	√				√							√	
CO5	√	√			√	√			√				√	√

MC4007

OPERATIONS RESEARCH

L T P C
3 0 0 3

OBJECTIVES:

- To provide the concept and an understanding of basic concepts in Operations Research techniques for Analysis and Modeling in Applications.
- To understand , develop and solve mathematical model of linear programming problems
- To understand , develop and solve mathematical model of Transport and assignment problems
- To Understand network modeling for planning and scheduling the project activities

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- Understand and apply linear programming to solve operational problem with constraints
- Apply transportation and assignment models to find optimal solution
- Prepare project scheduling using PERT and CPM
- Identify and analyze appropriate queuing models to reduce the waiting time in queue.
- Choose the best strategy using decision making methods under game theory.

REFERENCES

1. Taha H.A., "Operations Research: An Introduction", 10th Edition, Prentice Hall of India, New Delhi, 2017
2. KantiSwarup, P.K. Gupta, Man Mohan, "Operations Research", 15th Revised Edition, S. Chand& Sons Education Publications, New Delhi, 2017
3. Ronald L Rardin, Optimization In Operations Research, 2nd Edition, Pearson Education, India, 2018
4. Jatinder Kumar, Optimization Techniques in Operations Research, LAP LAMBERT Academic Publishing, 2015
5. D.S.Hira and P.K.Gupta, Operations Research, 5th Edition, S.Chand& Sons, 2015.

Mapping of COs with POs and PSOs

COs/POs & PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	√	√	√	√					√					
CO2	√	√	√	√	√								√	
CO3	√	√	√	√	√		√	√			√	√	√	
CO4	√	√	√	√	√	√		√					√	
CO5	√	√	√	√	√				√				√	

MC4008**BUSINESS DATA ANALYTICS****L T P C
3 0 0 3****OBJECTIVES:**

- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.

UNIT I OVERVIEW OF BUSINESS ANALYTICS**9**

Introduction – Drivers for Business Analytics – Applications of Business Analytics: Marketing and Sales, Human Resource, Healthcare, Product Design, Service Design, CustomerService and Support – Skills Required for a Business Analyst – Framework for Business Analytics Life Cycle for Business Analytics Process.

UNIT II ESSENTIALS OF BUSINESS ANALYTICS**9**

Descriptive Statistics – Using Data – Types of Data – Data Distribution Metrics: Frequency, Mean, Median, Mode, Range, Variance, Standard Deviation, Percentile, Quartile, z-Score, Covariance, Correlation – Data Visualization: Tables, Charts, Line Charts, Bar and ColumnChart, Bubble Chart, Heat Map – Data Dashboards.

UNIT III MODELING UNCERTAINTY AND STATISTICAL INFERENCE 9

Modeling Uncertainty: Events and Probabilities – Conditional Probability – Random Variables – Discrete Probability Distributions – Continuous Probability Distribution – Statistical Inference: Data Sampling – Selecting a Sample – Point Estimation – Sampling Distributions – Interval Estimation – Hypothesis Testing.

UNIT IV ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK 9

Introducing Hadoop – RDBMS versus Hadoop – Hadoop Overview – HDFS (Hadoop Distributed File System) – Processing Data with Hadoop – Introduction to MapReduce – Features of MapReduce – Algorithms Using Map-Reduce: Matrix-Vector Multiplication, Relational Algebra Operations, Grouping and Aggregation – Extensions to MapReduce

UNIT V OTHER DATA ANALYTICAL FRAMEWORKS 9

Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

SUGGESTED ACTIVITIES:

1. Study on some application of Business analytics in organizations of any domain
2. Study the statistics and data visualization charts of sales data like Amazon using R
3. Study on new strategies derived using data analytic tools on some business data set available and its impact on company progress
4. Prepare a report on the use of Hadoop framework in any two companies
5. Compare and contrast the various Data Analytical Frameworks

OUTCOMES:

On completion of the course, the student will be able to:

- Identify the real world business problems and model with analytical solutions.
- Solve analytical problems with relevant mathematics background knowledge.
- Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
- Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce
- Use open source frameworks for modeling and storing data

TOTAL PERIODS: 45

REFERENCES

1. U. Dinesh Kumar, "Business Analytics: The Science of Data-Driven Decision Making", Wiley, First Edition, 2017.
2. Umesh R Hodeghatta, Umesha Nayak, "Business Analytics Using R – A Practical Approach", Apress, First Edition 2017.
3. Jeffrey D. Camm, James J. Cochran, Michael J. Fry, Jeffrey W. Ohlmann, David R. Anderson, "Essentials of Business Analytics", Cengage Learning, second Edition, 2016.
4. Rui Miguel Forte, "Mastering Predictive Analytics with R", Packt Publication, First Edition 2015.
5. Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing, First Edition 2013.
6. Anand Rajaraman, Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge

University Press,FirstEdition 2012.

7. A. Ohri, "R for Business Analytics", Springer,FirstEdition, 2012

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO 3
CO 1	√	√	√	√	√	√			√	√		√		
CO 2	√	√	√	√	√				√	√		√	√	√
CO 3	√	√	√	√	√				√	√		√	√	√
CO 4	√	√	√	√	√				√	√		√	√	√
CO 5	√	√	√	√	√				√	√	√	√	√	√

Tentative

BRIDGE COURSES

BX4001

DATA STRUCTURES AND ALGORITHMS

L T P C
3 0 2 4

OBJECTIVES:

- Be familiar with basic techniques of algorithm analysis.
- Be exposed to the concept of ADTs.
- Learn linear data structures-List, Stack and Queue.
- Learn nonlinear data structures-Tree and Graphs.
- Be exposed to sorting, searching and hashing algorithms

UNIT I INTRODUCTION

9 +6

Introduction - Abstract Data Types (ADT) – Arrays and its representation – Structures – Fundamentals of algorithmic problem solving – Important problem types – Fundamentals of the analysis of algorithm – analysis framework – Asymptotic notations, Properties, Recurrence Relation.

Lab Experiments:

1. Develop a program to perform various array operations
2. Write a program to find running time complexity by considering each statement in the program for a given set of numbers.

UNIT II LINEAR DATA STRUCTURES - STACK, QUEUE

9 +6

Stack ADT – Operations on Stack - Applications of stack – Infix to postfix conversion – evaluation of expression - Queue ADT – Operations on Queue - Circular Queue - Applications of Queue.

Lab Experiments:

1. Write a program to convert infix to postfix using stack data structure
2. Develop a program to perform circular queue operations

UNIT III LINEAR DATA STRUCTURES – LIST

9+6

List ADT - Array-based Implementation - Linked list implementation - Singly Linked Lists – Circularly linked lists – Doubly Linked Lists - Applications of linked list – Polynomial Addition.

Lab Experiments:

1. Perform Polynomial Manipulation using Single Linked List.
2. Implement the various operations in double linked list.

UNIT IV SEARCHING, SORTING AND HASH TECHNIQUES

9 +6

Searching: Linear search – Binary Search- comparison of linear search and binary search, Sorting algorithms: Insertion sort - Bubble sort – selection sort - Hashing: Hash Functions – Separate Chaining – Open Addressing – Rehashing.

Lab Experiments:

1. Write a program to perform binary search
2. Write a program to sort a given set of numbers and compare among Bubble Sort, Selection Sort and Insertion Sort with respect to computational complexity.

UNIT V NON LINEAR DATA STRUCTURES - TREES AND GRAPHS

9 +6

Trees and its representation – left child right sibling data structures for general trees- Binary Tree – Binary tree traversals – Binary Search Tree - Graphs and its representation - Graph Traversals - Depth-first

traversal – breadth-first traversal-Application of graphs.

Lab Experiments:

1. Write a program to delete a node from a given Binary search tree
2. Write a program to perform Graph Traversals

TOTAL : 75 PERIODS

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

- analyze algorithms and determines their time complexity.
- understand the concepts of data types, data structures and linear structures
- apply data structures to solve various problems
- apply different Sorting, Searching and Hashing algorithms.
- understand non-linear data structures

REFERENCES

1. Anany Levitin "Introduction to the Design and Analysis of Algorithms" 3rd Edition, Pearson Education
2. A.K. Sharma, "Data Structures using C", 2nd Edition, Pearson Education Asia, 2013
3. E. Horowitz, Anderson-Freed and S.Sahni, "Fundamentals of Data structures in C", 2nd Edition, University Press, 2007
4. E.Balagursamy, "Data Structures using C", Tata McGraw Hill 2015 Reprint
5. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, India, 2016
6. Jean Paul Tremblay and Paul G. Sorensen, "An Introduction to Data Structures with Applications", 2nd Edition, Tata McGraw Hill, New Delhi, 2017.

BX4002

PROBLEM SOLVING AND PROGRAMMING IN C

L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand the basic concepts of problem solving approaches and to develop the algorithms
- Apply the techniques of structured (functional) decomposition to break a program into smaller pieces and describe the mechanics of parameter passing.
- To design, implements, test, and apply the basic C programming concepts

UNIT I

INTRODUCTION TO COMPUTER PROBLEM SOLVING

9

Introduction – The Problem Solving aspect – Top down design – Implementation of algorithm – Program Verification – The efficiency of algorithms – The analysis of algorithms – Fundamental Algorithms

UNIT II

PROGRAMMING AND ALGORITHMS

9

Programs and Programming – building blocks for simple programs -pseudo code representation – flow charts - Programming Languages - compiler –Interpreter, Loader and Linker - Program execution – Classification of Programming Language - Structured Programming Concept – Illustrated Problems: Algorithm to check whether a given number is Armstrong number or not- Find factorial of a number

UNIT III BASICS OF 'C', INPUT / OUTPUT & CONTROL STATEMENTS 9 +10

Introduction- Identifier – Keywords - Variables – Constants – I/O Statements - Operators - Initialization – Expressions – Expression Evaluation – Lvalues and Rvalues – Type Conversion in C –Formatted input and output functions - Specifying Test Condition for Selection and Iteration- Conditional Execution - and Selection – Iteration and Repetitive Execution- go to Statement – Nested Loops- Continue and break statements.

Lab Experiments:

1. Write programs to get some input , perform some operation and display the output using I/O statements
2. Write a program to execute some specific statements based on the test condition
3. Write programs to implement nested loop

UNIT IV ARRAYS, STRINGS, FUNCTIONS AND POINTERS 9 +10

Array – One dimensional Character Arrays- Multidimensional Arrays- Arrays of Strings – Two dimensional character array – functions - parameter passing mechanism scope – storage classes – recursion - comparing iteration and recursion- pointers – pointer operators - uses of pointers- arrays and pointers – pointers and strings - pointer indirection pointers to functions - Dynamic memory allocation.

Lab Experiments

1. Write a program in C to get the largest element of an array using the function.
2. Display all prime numbers between two intervals using functions.
3. Reverse a sentence using recursion.
4. Write a C program to concatenate two strings

UNIT V USER-DEFINED DATATYPES & FILES 9 +10

Structures – initialization - nested structures – structures and arrays – structures and pointers - union– type def and enumeration types - bit fields - File Management in C – Files and Streams – File handling functions – Sequential access file- Random access file – Command line arguments.

Lab Experiments:

1. Write a C program to Store Student Information in Structure and Display it.
2. The annual examination is conducted for 10 students for five subjects.
3. Write a program to read the data from a file and determine the following:
Total marks obtained by each student; Topper of the class

COURSE OUTCOMES:

- Able to design a computational solution for a given problem.
- Able to break a problem into logical modules that can be solved (programmed).
- Able to transform a problem solution into programs involving programming constructs.
- To write programs using structures, strings, arrays, pointers and files for solving complex computational problems.
- Able to introduce modularity using functions and pointers which permit ad hoc runtime polymorphism.

TOTAL : 75 PERIODS

REFERENCES:

1. Deitel and Deitel, "C How to Program", Pearson Education. 2013, 7th Edition

2. Byron S Gottfried, —Programming with C, Schaums Outlines, Second Edition, Tata McGraw-Hill, 2006
3. Brian W. Kernighan and Dennis M. Ritchie, “The C programming Language”, Edition? 2nd edition 2015, Pearson Education India
4. How to solve it by Computer, R. G. Dromey, Pearson education, Fifth Edition, 2007
5. Kamthane, A.N., “Programming with ANSI and Turbo C”, Pearson Education, Delhi, 3rd Edition, 2015
6. PradipDey, ManasGhosh, —Computer Fundamentals and Programming in C, Second Edition, Oxford University Press, 2013.

BX4003	INTRODUCTION TO COMPUTER ORGANIZATION AND OPERATING SYSTEM	L T P C 3 0 0 3
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COURSE OBJECTIVES:

- To learn the basic structure and operations of a computer.
- To learn the arithmetic and logic unit and implementation of fixed-point and floating point arithmetic unit.
- To understand the memory hierarchies, cache memories and virtual memories and to learn the different ways of communication with I/O devices.
- To understand the basic concepts and functions of Operating Systems
- To understand Process and various Scheduling Algorithms of OS

UNIT I BASIC STRUCTURE AND ARITHMETIC OPERATIONS 9

.Functional Units – Basic Operational Concepts – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – Decision Making – MIPS Addressing- Arithmetic for Computers

UNIT II PROCESSOR AND CONTROL UNIT 9

A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT III MEMORY & I/O SYSTEMS 9

Memory Hierarchy - Memory technologies – cache memory – measuring and improving cache performance – virtual memory –Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure –Interface circuits – USB

UNIT IV OPERATING SYSTEMS OVERVIEW 9

Operating system overview-objectives and functions, Evolution of Operating System- Operating System Structure - System Calls- Processes – Process Concept, Inter-process Communication

UNIT V PROCESS MANAGEMENT 9

CPU Scheduling – Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Threads Overview– The critical-section problem, Semaphores, Classical problems of synchronization, Critical regions

TOTAL : 45 PERIODS

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

- Understand the basics structure of computers, operations and instructions.
- Design arithmetic and logic unit, control unit.
- Understand the various memory systems and I/O communication.
- Understand operating system functions, types, system calls
- Analyze Process and various scheduling algorithms

REFERENCES:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012
3. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne - Operating System Concepts, 9th Edition, John Wiley and Sons Inc., 2012.
4. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012
5. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.
6. Andrew S. Tanenbaum - Modern Operating Systems, 4th Edition, Pearson Education, 2014.

BX4004

DATABASE MANAGEMENT SYSTEMS

L T P C
3 0 2 4

OBJECTIVES:

- To understand the fundamentals of data models and conceptualize and depict a database system using ER diagram.
- To make a study of SQL and relational database design.
- To know about data storage techniques and query processing.
- To impart knowledge in transaction processing, concurrency control techniques and recovery procedures.

UNIT I INTRODUCTION

9

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

UNIT II RELATIONAL MODEL AND QUERY EVALUATION

9

Relational Model Concepts – Relational Algebra – SQL – Basic Queries – Complex SQL Queries – Views – Constraints

UNIT III DATABASE DESIGN & APPLICATION DEVELOPMENT

9

Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form.

UNIT IV TRANSACTION PROCESSING

9

Query Processing-Transaction Processing – Properties of Transactions - Serializability – Transaction

support in SQL - Locking Techniques –Validation Techniques — Recovery concepts – Shadow paging – Log Based Recovery.

UNIT V FILES AND INDEXING

9

File operations – Hashing Techniques – Indexing – Single level and Multi-level Indexes – B+ tree – Static Hashing

LIST OF EXPERIMENTS:

Data Definition Commands to create, describe, alter, rename, drop and truncate the tables

1. Data Manipulation Commands for inserting, deleting, updating and retrieving in Tables
2. Transaction Control Language Commands like Commit, Rollback and Save Point
3. Illustrate the statements to create index and drop index
4. Perform database querying using simple query, nested query, subquery and join operations
5. Create a PL/SQL block to implement implicit and explicit cursors
6. Create a PL/SQL block to implement procedures and functions
7. Create a PL/SQL block to execute triggers
8. Execute a procedure which handles exception using PL/SQL
9. Create a embedded PL/SQL block to connect with any host language like 'C'

COURSE OUTCOMES:

Upon Completion of the course, the students will be able to

- Understand the basic concepts of the database and data models.
- Design a database using ER diagrams and map ER into Relations and normalize the relations
- Acquire the knowledge of query evaluation to monitor the performance of the DBMS.
- Develop a simple database applications using normalization.
- Acquire the knowledge about different special purpose databases and to critique how they differ from traditional database systems.

TOTAL : 75 PERIODS

REFERENCES:

1. Abraham Silberschatz, Henry F.Korth and S.Sundarshan "Database System Concepts", Seventh Edition, McGraw Hill, 2017.
2. Ramez Elmasri and Shamkant Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education Delhi, 2017
3. RaghuRamakrishnan, —Database Management SystemsII, Fourth Edition, McGrawHill College Publications, 2015.
4. Lee Chao, "Database Development and Management", Auerbach Publications, 1st edition, 2010
5. Carlos Coronel, Peter Rob, and Stephen Morris, "Database Principles Fundamentals of Design, Implementation, and Management –10th Edition", Course Technology, Cengage Learning, 2013
6. C.J. Date, "An Introduction to Database Systems", Eighth Edition, Pearson Education Delhi, 2003

COURSE OBJECTIVES:

- To introduce Mathematical Logic and their rules for validating arguments and programmes.
- To introduce counting principles for solving combinatorial problems.
- To give exposure to Graph models and their utility in connectivity problems.
- To introduce abstract notion of Algebraic structures for studying cryptographic and its related areas.
- To introduce Boolean algebra as a special algebraic structure for understanding logical circuit problems.

UNIT I LOGIC AND PROOFS**9**

Propositional Logic – Propositional Equivalences – Predicates and Quantifiers – Nested Quantifiers – Rules of Inference – Introduction to Proofs – Proof Methods and Strategy.

UNIT II COMBINATORICS**9**

Mathematical Induction – Strong Induction and Well Ordering – The Basics of Counting - The Pigeonhole Principle – Permutations and Combinations – Recurrence Relations Solving Linear Recurrence Relations Using Generating Functions – Inclusion – Exclusion – Principle and Its Applications

UNIT III GRAPHS**9**

Graphs and Graph Models – Graph Terminology and Special Types of Graphs – Matrix Representation of Graphs and Graph Isomorphism – Connectivity – Euler and Hamilton Paths.

UNIT VI ALGEBRAIC STRUCTURES**9**

Groups – Subgroups – Homomorphisms – Normal Subgroup and Coset – Lagrange's Theorem – Definitions and Examples of Rings and Fields.

UNIT V LATTICES AND BOOLEAN ALGEBRA**9**

Partial Ordering – Posets – Lattices as Posets – Properties of Lattices – Lattices as Algebraic Systems – Sub Lattices – Direct Product And Homomorphism – Some Special Lattices – Boolean Algebra

TOTAL : 45 PERIODS**COURSE OUTCOMES:**

CO1: Apply Mathematical Logic to validate logical arguments and programmes.

CO2: Apply combinatorial counting principles to solve application problems.

CO3: Apply graph model and graph techniques for solving network other connectivity related problems.

CO4: Apply algebraic ideas in developing cryptograph techniques for solving network security problems.

CO5: Apply Boolean laws in developing and simplifying logical circuits.

REFERENCES:

1. Kenneth H.Rosen, "Discrete Mathematics and its Applications", Tata McGraw Hill Pub. Co.Ltd., Seventh Edition, Special Indian Edition, New Delhi, 2011.
2. Tremblay J.P. and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, 30th Reprint, New Delhi, 2011.

3. Ralph. P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", Pearson Education, 3rd Edition, New Delhi, 2014.
4. ThomasKoshy, "Discrete Mathematics with Applications", 2nd Edition, Elsevier Publications, Boston, 2006.
5. SeymourLipschutz and Mark Lipson,"Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., Third Edition, New Delhi, 2013

BX4006

BASICS OF COMPUTER NETWORKS

L T P C
3 0 0 3

COURSE OBJECTIVES:

- To understand networking concepts and basic communication model
- To understand network architectures and components required for data communication.
- To analyze the function and design strategy of physical, data link, network layer and transport layer
- To acquire basic knowledge of various application protocol for internet security issues and services

UNIT I NETWORK FUNDAMENTALS 9

Uses of Networks – Categories of Networks -Communication model –Data transmission concepts and terminology – Protocol architecture – Protocols – OSI – TCP/IP – LAN Topology - Transmission media

UNIT II DATA LINK LAYER 9

Data link control - Flow Control – Error Detection and Error Correction - MAC – Ethernet, Token ring, Wireless LAN MAC – Blue Tooth – Bridges.

UNIT III NETWORK LAYER 9

Network layer – Switching concepts – Circuit switching – Packet switching –IP – Datagrams –IP addresses- IPV6– ICMP – Routing Protocols – Distance Vector – Link State- BGP

UNIT IV TRANSPORT LAYER 9

Transport layer –service –Connection establishment – Flow control – Transmission control protocol – Congestion control and avoidance – User datagram protocol

UNIT V APPLICATIONS AND SECURITY 9

Applications - DNS- SMTP – WWW –SNMP- Security –threats and services - DES- RSA.

COURSE OUTCOMES:

On Completion of the course, the students should be able to:

- Able to trace the flow of information from one node to another node in the network
- Able to Identify the components required to build different types of networks
- Able to understand the functionalities needed for data communication into layers
- Able to choose the required functionality at each layer for given application
- Able to understand the working principles of various application protocols and fundamentals of security issues and services available

TOTAL : 45 PERIODS

REFERENCES:

1. Larry L. Peterson & Bruce S. Davie, "Computer Networks – A systems Approach", Fifth Edition, Morgan Kaufmann, 2012.
2. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-down Approach, Pearson Education, Limited, sixth edition, 2012.
3. Andrew S. Tannenbaum, David J. Wetherall, "Computer Networks" Fifth Edition, Pearson Education 2011.
4. Forouzan, "Data Communication and Networking", Fifth Edition, TMH 2012.
5. William Stallings, —Data and Computer Communications II, Tenth Edition, Pearson Education, 2013.
6. Larry L. Peterson & Bruce S. Davie, "Computer Networks – A systems Approach", Fifth Edition, Morgan Kaufmann, 2012.

AUDIT COURSES

AX4091

ENGLISH FOR RESEARCH PAPER WRITING

L T P C
2 0 0 0

COURSE OBJECTIVES:

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I INTRODUCTION TO RESEARCH PAPER WRITING

6

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II PRESENTATION SKILLS

6

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts, Introduction

UNIT III TITLE WRITING SKILLS

6

Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS

6

Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS

6

Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

TOTAL: 30 PERIODS

COURSE OUTCOMES:

- CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

REFERENCES:

1. Adrian Wallwork , English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2011
2. Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2006
3. Goldbort R Writing for Science, Yale University Press (available on Google Books) 2006
4. Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 1998.

AX4092**DISASTER MANAGEMENT****L T P C
2 0 0 0****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 : 30 PERIODS

COURSE OUTCOMES:

CO1: Ability to summarize basics of disaster

CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.

CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.

CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.

CO5: Ability to develop 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. Nishitha Rai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "New Royal book Company, 2007.
3. Sahni, Pardeep Et. Al. , " Disaster Mitigation Experiences And Reflections", Prentice Hall Of India, New Delhi, 2001.

AX4093

CONSTITUTION OF INDIA

L T P C
2 0 0 0

COURSE OBJECTIVES:

Students will be able to:

- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- 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 Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION

History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION

Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES

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

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

District's Administration head: Role and Importance, □Municipalities: Introduction, Mayor and role of Elected Representative, CEO, Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. 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

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

TOTAL: 30 PERIODS

SUGGESTED READING

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.

COURSE OUTCOMES

Students will be able to:

- Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
- Discuss the intellectual origins of the framework of argument that informed the conceptualization
- of social reforms leading to revolution in India.
- Discuss 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.
- Discuss the passage of the Hindu Code Bill of 1956.

AX4094

நற்றமிழ் இலக்கியம்

L T P C

0 0 0 2

UNIT I

சங்க இலக்கியம்

6

1. தமிழின் துவக்க நூல் தொல்காப்பியம்
- எழுத்து, சொல், பொருள்
2. அகநானூறு (82)
- இயற்கை இன்னிசை அரங்கம்
3. குறிஞ்சிப் பாட்டின் மலர்க்காட்சி
4. புறநானூறு (95,195)
- போரை நிறுத்திய ஒளவையார்

UNIT II	அறநெறித் தமிழ்	6
1.	அறநெறி வகுத்த திருவள்ளுவர் - அறம் வலியுறுத்தல், அன்புடைமை, ஒப்புறவு அறிதல், ஈகை, புகழ்	
2.	பிற அறநூல்கள் - இலக்கிய மருந்து - ஏலாதி, சிறுபஞ்சமூலம், திரிகடுகம், ஆசாரக்கோவை (தூய்மையை வலியுறுத்தும் நூல்)	
UNIT III	இரட்டைக் காப்பியங்கள்	6
1.	கண்ணகியின் புரட்சி - சிலப்பதிகார வழக்குரை காதை	
2.	சமுகசேவை இலக்கியம் மணிமேகலை - சிறைக்கோட்டம் அறக்கோட்டமாகிய காதை	
UNIT IV	அருள்நெறித் தமிழ்	6
1.	சிறுபாணாற்றுப்படை - பாரி முல்லைக்குத் தேர் கொடுத்தது, பேகன் மயிலுக்குப் போர்வை கொடுத்தது, அதியமான் ஓளவைக்கு நெல்லிக்கனி கொடுத்தது, அரசர் பண்புகள்	
2.	நற்றிணை - அன்னைக்குரிய புன்னை சிறப்பு	
3.	திருமந்திரம் (617, 618) - இயமம் நியமம் விதிகள்	
4.	தர்மச்சாலையை நிறுவிய வள்ளலார்	
5.	புறநானூறு - சிறுவனே வள்ளலானான்	
6.	அகநானூறு (4) - வண்டு நற்றிணை (11) - நண்டு கலித்தொகை (11) - யானை, புறா ஐந்திணை 50 (27) - மான் ஆகியவை பற்றிய செய்திகள்	
UNIT V	நவீன தமிழ் இலக்கியம்	6
1.	உரைநடைத் தமிழ், - தமிழின் முதல் புதினம், - தமிழின் முதல் சிறுகதை, - கட்டுரை இலக்கியம், - பயண இலக்கியம், - நாடகம்,	
2.	நாட்டு விடுதலை போராட்டமும் தமிழ் இலக்கியமும்,	
3.	சமுதாய விடுதலையும் தமிழ் இலக்கியமும்,	
4.	பெண் விடுதலையும் விளிம்பு நிலையினரின் மேம்பாட்டில் தமிழ் இலக்கியமும்,	

5. அறிவியல் தமிழ்,
6. இணையத்தில் தமிழ்,
7. சுற்றுச்சூழல் மேம்பாட்டில் தமிழ் இலக்கியம்.

TOTAL: 30 PERIODS

தமிழ் இலக்கிய வெளியீடுகள் / புத்தகங்கள்

1. தமிழ் இணைய கல்விக்கழகம் (Tamil Virtual University)
- www.tamilvu.org
2. தமிழ் விக்கிப்பீடியா (Tamil Wikipedia)
- <https://ta.wikipedia.org>
3. தர்மபுர ஆதின வெளியீடு
4. வாழ்வியல் களஞ்சியம்
- தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்
5. தமிழ்கலைக் களஞ்சியம்
- தமிழ் வளர்ச்சித் துறை (thamilvalarchithurai.com)
6. அறிவியல் களஞ்சியம்
- தமிழ்ப் பல்கலைக்கழகம், தஞ்சாவூர்