



LOYOLA ACADEMY

DEGREE & PG COLLEGE

OLD ALWAL, SECUNDERABAD - 500 010, TELANGANA, INDIA

(An Autonomous Institution Affiliated to Osmania University)

Re-accredited with 'A' Grade (III Cycle) by NAAC

A Catholic Christian Minority Institution (Co-Education)

A "College with Potential for Excellence" by UGC

www.loyolaacademy.edu.in email: info@loyolaacademy.edu.in Ph: 040-040-27862363/27860077

SYLLABUS

of

Master of Computer Applications

For the Academic Year

2025-2026



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Principal

Dean

Chairman, Board of Studies

For the Academic Year 2025-2026 for the Batch 2024 - 2026



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MASTER OF COMPUTER APPLICATIONS

PROGRAMME OUTCOMES

PO1: Engineering knowledge: Apply the knowledge of mathematics, computer science, various programming languages, databases and operating system to develop a software system.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems to reach substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions: Design solutions for complex engineering problems and System components or processes that meet the specified needs of public health and safety.

PO4: Continuous learning: Recognize the needs and improve the ability to engage in independent and life-long learning as trends changes in technology.



DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS (M.C.A)

PROGRAMME SPECIFIC OUTCOMES

PSO1: To consolidate the foundation of mathematics, computer science and problem-solving methodology for effective implementation in the area of software development. To inculcate advanced knowledge about various sub-domains of computer science and applications.

PSO2: To prepare graduates to achieve peer-recognition, as an individual and in a team, through demonstration of good analytical, design and implementation skills.

PSO3: To improve the ability to test and analyze the qualities of various subsystems and to integrate them to evolve a larger and better computing system, that includes the concept of mathematics, computer engineering and related disciplines to meet the user objective.



Consolidated Scheme

Loyola Academy Degree & PG College
M.C.A. (2024-25) of Batch 2024-26 (Choice Based Credit System)

Yr	Sem	Course-1	Course-2	Course-3	Course-4	Course-5	Course-6	Course - 7	Hours	Credits	
I	I	*Soft Skills (1) (SEC-1)	\$ (3) (GE-Interdisciplinary)	Probability and Statistics (3+1+0) (Core-1)	Mathematical Foundations of Computer Science (4+0+0) (Core-2)	Computer Architecture (3+0+0) (Core-3)	Data Structures using C(3+0+2) (Core-4)	Database Management Systems (3+0+2) (Core-5)	Python Lab (0+0+2) (Core-6)	34	27
I	II	*Human Values and Professional Ethics (2) (AECC)	Computer Networks (4+0+0) (Core-7)	Artificial Intelligence (4+0+0) (Core-8)	Design and Analysis of Algorithms (3+0+0) (Core-9)	Operating Systems (3+0+2) (Core-10)	Java Programming (3+0+2) (Core-11)	Machine Learning (3+0+2) (Core-12)		34	26
II	III	Summer Internship (2) (SEC-2)	Internet of Things / Distributed Systems/ Information Security (DSE-1) (3+0+0)	Network Security/ Block Chain Technology /Android Application Development (DSE-2) (3+0+0)	Operation Research (4+0+0) (Core-13)	Software Engineering (3+0+2) (Core-14)	Internet Technologies (3+0+2) (Core-15)	Deep Learning (3+0+2) (Core-16)		33	27
II	IV	Software Testing / Cloud Computing/ Cyber Security (DSE -3) (3+0+0)	Natural Language Processing / Big Data Analytics/ Social Media Analytics (DSE-4) (3+0+0)	Open Elective -1 Environmental Science/ Constitution of India/ Disaster Management (OE-1) (2+0+0)	Project(12)					32	20
										133	100
								Total			

Legend: 1. Ability Enhancement Compulsory Course (AECC) : 01
 2. Interdisciplinary (ID) : 01
 3. Skill Enhancement Course (SEC) : 02
 4. Core : 16
 5. Discipline-Specific Elective (DSE) : 04
 6. Open Elective (OE) : 01

\$ GE-Interdisciplinary: Information Technology Applications for Management and I.T Lab offered to other departments.
 *AECC is excluded for SGPA and CGPA calculation but it is compulsory to pass in the examination
 # Add on course "Campus Recruitment Training" (Non -CGPA) in II-Semester.
 # In the second Semester students will take summer Internship of 2 credits(CGPA)

PROFESSOR
 Department of Computer Science & Engineering
 University College of Engineering (A)
 Osmania University
 Hyderabad-500 007.

P.V. Sankar



First Semester Scheme

Year-wise and Semester-wise Distribution of Courses Department of Master of Computer Applications First Year First Semester Academic Year 2024-2025 of 2024 - 2026 Batch (CBCS)									
Sl. No	Part	Course Code	Title of the Course	Hours /Week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	I	MB20109	Managerial Economics and Accountancy (GE)	3	3	40	60	100	3
CORE									
2	II	MCA24101	Probability and Statistics(Core-1)	4	3	40	60	100	4
3	II	MCA20102	Mathematical Foundations of Computer Science (Core-2)	4	3	40	60	100	4
4	II	MCA20103	Computer Architecture (Core-3)	3	3	40	60	100	3
5	II	MCA20104	Data Structures Using C (Core-4)	3	3	40	60	100	3
6	II	MCA20105	Database Management Systems (Core-5)	3	3	40	60	100	3
PRACTICALS									
7	II	MCA20106	Programming Lab-I (Data structures using C Lab)	4	3	40	60	100	2
8	II	MCA20107	Programming Lab-II (Database Management Systems Lab)	4	3	40	60	100	2
9	II	MCA22108	Programming Lab-III (Python Lab) (Core 6)	4	3	40	60	100	2
10	I	MCA24109	Soft Skills(SEC - I)	2	3	20	30	50	1
Total				34	-	380	570	950	27
CIA components for Internal marks of theory paper: i) First Mid : 12.5M ii) Second Mid:12.5M iii)Assignment: 3M iv) Case Study/GD/MCQ:5M v) Viva/Seminar: 3M vi) Attendance: 4M									
CIA components for Practical Internal marks: i)Attendance: 5M ii) Observation/ Record Book: 5M iii)Practical skill acquired: 10M iv)Pre final Practical: 20M									
For Library/Mentoring/MOOCs/Remedial classes extra 3 hrs are given in a week.									



MANAGERIAL ECONOMICS AND ACCOUNTANCY

Credits: 3

Semester: I

Course Code: MB20109

No of Lecture Hours: 45

Course Objective:

- To understand various parameters that determines the consumers' behavior.
- To evaluate the factors that affect production
- To understand the concepts of capital budgeting and payback period.
- To study the concepts of various book-keeping methods.

Course Outcome:

CO1: Apply the fundamental concepts of managerial economics to evaluate business decisions

CO2: Identify different types of Demand and determine Demand Forecasting and equilibrium

CO3: Identify different types of markets and determine price –output under perfect competition.

CO4: Determine working capital requirement and payback

CO5: Analyze and interpret financial statements through ratios

Course Content	Hours Allotted	Pedagogy
Module I: Meaning and Nature of Managerial Economics: <ul style="list-style-type: none">• Managerial Economics and its usefulness to Engineers• Fundamental Concepts of Managerial Economics-Scarcity• Marginalism, Equimarginalism, Opportunity costs• Discounting, Time Perspective, Risk and Uncertainty, Profits• Case study method.	(9) 2 2 3 1 1	Lecture + Case Studies
Module II: Law of Demand and Supply: <ul style="list-style-type: none">• Law of Demand, Determinants• Types of Demand, Elasticity of Demand (Price, Income and Cross-Elasticity• Demand Forecasting, Law of Supply• Concept of Equilibrium.	(9) 2 3 2 2	Problem-Based + Charts/Graphs



<p>Module III: Theory of Production and Markets:</p> <ul style="list-style-type: none"> • Production Function, Law of Variable Proportion, ISO quants • Economics of Scale, Cost of Production (Types and their measurement) • Concept of Opportunity Cost, Concept of Revenue • Cost-Output relationship, Break-Even Analysis, • Price - Output determination under Perfect Competition and • Monopoly (Problems on Break-Even Analysis) 	<p>(9) 2 2 2 1 1 1</p>	<p>Interactive Discussion + Problem Solving</p>
<p>Module IV: Capital Management:</p> <ul style="list-style-type: none"> • Significance and its determination • Estimation of fixed and working capital requirements • Sources of capital, Introduction to capital budgeting • Methods of payback and discounted cash flow methods with problems. 	<p>(9) 3 2 2 2</p>	<p>Activity-Based + Simulated Accounting Tools</p>
<p>Module V:Accounting:</p> <ul style="list-style-type: none"> • Principles and significance of double entry book keeping • Journal, Subsidiary books, Ledger accounts • Trial Balance, concept • preparation of Final Accounts with simple adjustments • Analysis and interpretation of Financial Statements through Ratios 	<p>(9) 2 2 1 2 2</p>	<p>Hands-on Analysis + Case Studies</p>

Learning Resources	
1.	<p>Textbook:</p> <ul style="list-style-type: none"> • Managerial Economics & Analysis, Mehta P.L, 2011, Sulthan Chand & Sons • Introduction to Accountancy ,Maheswari S.N, 2005, Vikas Publishing House
2.	<p>Reference books:</p> <ul style="list-style-type: none"> • Financial Management, Pandey I.M2009, Vikas Publishing House.



PROBABILITY AND STATISTICS

Credits: 4

Semester: I

Course Code: MCA24101

No of Lecture Hours: 45L +15T

Course Objective:

- Grasping basic statistics
- Basic concepts of probability and concepts of various discrete and continuous probability distributions.
- Learning sampling procedure and various kinds of estimate techniques.
- Learning hypotheses testing and acquiring knowledge of basic statistical Inference and its applications.
- The concept of association between two variables and forecast future values by regression equations.

Course Outcome:

CO1: Understanding of basic statistics will boost the ability to understand and apply data organization and presentation through graphs

CO2: Calculate probabilities by applying probability laws and theoretical results, knowledge of important discrete and continuous distributions, their inter relations with real time applications.

CO3: Understanding the use of sample statistics to estimate unknown parameters.

CO4: Evaluating the proficiency in learning to interpret outcomes

CO5: Application of Correlation Analysis, regression lines and multiple regression analysis

Course Content	Hours Allotted	Pedagogy
Module I: Introduction: <ul style="list-style-type: none">• Data Collection, presenting the data in tables, graphing• Measures of central tendency• Measures of dispersion.	(9) 3 3 3	Lecture + Real-Life Applications



<p>Module II: Probability</p> <ul style="list-style-type: none"> • Basic terminology, Three types of probability, Probability rules • Statistical independence, Statistical dependency • Bayes’ theorem. <p>Probability Distributions:</p> <ul style="list-style-type: none"> • Binomial distribution • Poisson distribution, • Normal distribution • Choosing correct distribution 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p> <p>1</p>	<p>Problem-Based Learning + Visualization</p>
<p>Module III: Sampling and sampling distributions</p> <ul style="list-style-type: none"> • Random sampling • Sampling distributions. • Operational considerations in sampling <p>Estimation:</p> <ul style="list-style-type: none"> • Point estimates, interval estimates, confidence intervals, • Calculating interval estimates of the mean and proportion • t-distribution, determination of sample size in estimation 	<p>(9)</p> <p>2</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p>	<p>Hands-on Examples + Group Activities</p>
<p>Module IV: Hypotheses</p> <ul style="list-style-type: none"> • Hypotheses testing of mean when the population standard deviation is known • Powers of hypotheses test • Hypotheses testing of proportions. • Hypotheses testing of means when standard deviation is not known <p>Testing Hypotheses - Two sample tests</p> <ul style="list-style-type: none"> • Tests for difference between means – large sample, small sample • Dependent samples • Testing for difference between proportions – Large sample 	<p>(8)</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p>	<p>Example Problems Discussion, Chalk & Talk</p>



Module V: Title Chi-square and analysis of variance:		(10)	
• chi-square as test of independence	chi-square as a test of goodness of fit	1	
• Analysis of variance		1	
• Inferences about a population variance		1	
• Inferences about two population variances		1	
Regression and Correlation			
• Simple Regression - Estimation using regression line, correlation analysis		1	Chalk & Talk, Inquiry-Based
• Making inferences about population parameters		1	
• Limitations, Errors and caveats in regression and correlation analysis		1	
• Multiple Regression and correlation analysis.		1	
• Finding multiple regression equations		1	
• Making inferences about population parameters		1	

Learning Resources	
	Textbook:
1.	• Statistics for Management Richard I Levin, David S Rubin, 1997, Seventh Edition, PHI
	Reference books:
2.	• Applied Statistics and Probability for Engineers Douglas C. Montgomery, Douglas Montgomery, and George C. Runger ,2009, Fifth Edition Wiley Publishers.



MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Credits: 4

Semester: I

Course Code: MCA20102

No of Lecture Hours: 60L + 0T

Course Objective:

- To learn logic theory and Boolean algebra related to computer science
- To understand relations and functions
- To comprehend algebraic structure
- To gain insights into recurrence relation
- To study graph theory and concepts of trees

Course Outcome:

CO1: Define Statements, connectives, how to apply connectives, working with sets, subsets and represent them in Venn diagrams

CO2: Explains about relations, ordering, functions, illustrating with examples

CO3: Explains about algebraic structures and groups by applying various theorems and solving for an appropriate result.

CO4: Compare the Homogeneous Recurrence Relations and Non-Homogeneous Recurrence Relations along with examples

CO5: Constructs graphs, trees and planar graphs

Course Content	Hours Allotted	Pedagogy
Module I: Mathematical Logic	(12)	
• Module Statements and notations	1	
• Connectives	1	
• Well-formed formulas, Truth Tables	1	Concept
• Tautology, equivalence implication	1	Mapping +
• Normal forms	1	Truth Table
	2	Activities
Set Theory:		
• Sets and subsets, Set Operation	1	
• Laws of Set Theory and Venn diagrams	1	



<p>properties of the Integers:</p> <ul style="list-style-type: none"> • The well – ordering principle • Recursive Definitions • Division Algorithms • Fundamental theorem of Arithmetic 	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	
<p>Module II: Functions:</p> <ul style="list-style-type: none"> • Cartesian Product • Functions onto Functions • Special Functions • Pigeonhole Principle • Composition and Inverse Functions <p>Relations:</p> <ul style="list-style-type: none"> • Partial Orders • Equivalence Relations and Partitions <p>Principle of Inclusion and Exclusion:</p> <ul style="list-style-type: none"> • Principles of Inclusion and Exclusion • Generalization of Principle 	<p>(12)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p> <p>1</p>	<p>Problem-Based + Interactive Lecture</p>
<p>Module III: Algebraic structures:</p> <ul style="list-style-type: none"> • Algebraic System – General Properties • Semi Groups • Monoids, Homomorphism • Groups • Residue Arithmetic 	<p>(12)</p> <p>2</p> <p>2</p> <p>4</p> <p>2</p> <p>2</p>	<p>Practice Worksheets</p>
<p>Module IV: Generating Functions:</p> <ul style="list-style-type: none"> • Introductory Examples • Definition and Examples • Partitions of Integers <p>Recurrence Relations</p> <ul style="list-style-type: none"> • First-order linear recurrence relation. • Second-order linear Homogeneous • Recurrence relations with constant coefficients • Non-homogeneous recurrence relations 	<p>(12)</p> <p>1</p> <p>1</p> <p>1</p> <p>3</p> <p>2</p> <p>2</p> <p>2</p>	<p>Puzzles Oriented Learning + Case-Based Learning</p>



<p>Module V:Graph theory:</p> <ul style="list-style-type: none"> • Definitions and examples, Sub graphs, Complements • Graph Isomorphism, Vertex Degree • Planar Graphs: Euler’s formula Euler graphs Hamiltonian graphs • Graph Coloring <p>Trees</p> <ul style="list-style-type: none"> • Definitions and their properties and Examples • Rooted trees, Spanning Trees and Minimum Spanning Trees (Kruskal’s Algorithm and Prim’s Algorithm) 	<p>(12)</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p> <p>2</p> <p>5</p>	<p>Problem-Based + Interactive Lecture + Examples in CS Context</p>
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Learning Resources	
1.	<p>Textbook:</p> <ul style="list-style-type: none"> • Discrete Mathematics for Computer Scientists & Mathematicians, Mott Joe L Mott, Abraham Kandel, and Theodore P Baker, , 2015, Prentice Hall NJ, 2nd Edition • Discrete Mathematical Structures with Applications to Computer Science Jr. P. Tremblay and R Manohar ,1987, McGraw Hill
2.	<p>Reference books:</p> <ul style="list-style-type: none"> • Discrete Mathematics R.K.Bisht and H.S.Dhami, 2015, Oxford Higher Education • Mathematical Foundation of Computer Science, Bhavanari Satyanarayana, Tumurukota Venkata Pradeep Kumar and Shaik Mohiddin Shaw, 2016, , BSP. • Discrete and Combinatorial Mathematics, Ralph P. Grimaldi, 2004, 5th Edition, Pearson



COMPUTER ARCHITECTURE

Credits: 3

Semester: I

Course Code: MCA20103

No of Lecture Hours: 45L+OT

Course Objective:

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the different ways of communicating with I/O devices and to study the hierarchical memory system including cache memories and virtual memory.

Course Outcomes:

CO1: Demonstrate knowledge of digital logic circuits and organization of a basic computer system.

CO2: Explain machine language of a basic computer system.

CO3: Analyse in-depth understanding of control unit organization and micro programmed control.

CO4: Apply various algorithms to perform arithmetic operations and propose suitable hardware for them

CO5: Analyze and emphasize various communication media in the basic computer system using design of various memory structures.

Course Content	Hours Allotted	Pedagogy
Module I: Digital Logic Circuits	(11)	
• Digital computers & Logic gates	1	
• Boolean Algebra & Map Simplification	1	
• Combinational Circuits	1	
• Sequential Circuits- Flip Flops	1	
Digital Components	1	Power point presentations
• Integrated Circuits & Decoders	1	
• Multiplexers	1	
• Registers, Shift Registers	1	
• Binary counter & Memory unit	1	



<p>Data Representation</p> <ul style="list-style-type: none"> • Data types & Complements • Fixed and floating point Representation • Other binary codes & Error detection codes 	<p>1</p> <p>1</p> <p>1</p>	
<p>Module II: Register Transfer and Micro operations:</p> <ul style="list-style-type: none"> • Register Transfer language & Register transfer • Bus and Memory Transfer • Arithmetic Micro operations • Logic Micro operations • Shift Micro operations & Arithmetic logic shift unit <p>Basic Computer organization and Design:</p> <ul style="list-style-type: none"> • Instruction codes & Computer Registers • Computer Instructions & Timing and Control • Instruction Cycle • Memory Reference Instructions, Input & output & Interrupt • Design of Accumulator logic. 	<p>(10)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Chalk & Talk</p>
<p>Module III: Programming the Basic Computer:</p> <ul style="list-style-type: none"> • Introduction, Machine Language & Assembly Language • The Assembler. • Programming Arithmetic and Logic Operations. • Subroutines, Input-output Programming, <p>Micro programmed Control</p> <ul style="list-style-type: none"> • Control Memory & Address Sequencing • Micro program Example • Design of Control Unit 	<p>(8)</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p>	<p>Assignments, Chalk & Talk</p>
<p>Module IV: Central Processing Unit:</p> <ul style="list-style-type: none"> • Introduction, General Register Organization & Stack Organization • Instruction Formats & Addressing Modes • Data Transfer and Manipulation & Program Control • RISC. 	<p>(8)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Concept- Based Learning + Block Diagrams</p>



Computer Arithmetic: <ul style="list-style-type: none"> Addition and Subtraction Multiplication algorithms, Division Algorithms Floating point arithmetic operations Decimal arithmetic unit, Decimal arithmetic operation 	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	
Module V: Input-Output: <ul style="list-style-type: none"> Peripheral Devices & I/O output interface Asynchronous data transfer Modes of transfer, Priority Interrupt DMA, Input output Processor & Serial Communication Memory Organization: <ul style="list-style-type: none"> Memory Hierarchy Main Memory, Cache Memory 	<p>(8)</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p>	<p>Case Studies + Discussion- Based</p>

Learning Resources	
1.	Textbook: <ul style="list-style-type: none"> Computer System Architecture, M.Morris Mano, 1993, Pearson Education Asia, third Edition
2.	Reference books: <ul style="list-style-type: none"> Computer Architecture and Organization, Miles Murdocca, Vincent Heuring , 2007, John Wileyandson's. Fundamentals of Computer Organization and Design, ShivaRama P dandanudi, , 2003, Wiley Dream Tech publisher. Computer Organization and Architecture, William Stalling's, 2003, Education, Sixth Edition, Computer Architecture and Organization, Miles Murdocca, Vincent Heuring, 2007, John Wileyand son's.



DATA STRUCTURES USING C

Credits: 3

Semester: I

Course Code: MCA20104

No of Lecture Hours:45L + 0T

Course Objective:

- To learn the features of C
- To learn the linear and non-linear data structures
- To explore the applications of linear and non-linear data structures
- To learn to represent data using graph data structure
- To learn the basic sorting and searching algorithms

Course Outcomes:

CO1: Implement linear and non-linear data structure operations using C

CO2: Suggest appropriate linear / non-linear data structure for any given data set.

CO3: Apply hashing concepts for a given problem

CO4: Modify or suggest new data structure for an application

CO5: Implementing sorting algorithm for an application

Course Content	Hours Allotted	Pedagogy
Module I: C PROGRAMMING BASICS:		
• Structure of a C program, compilation and linking processes	(9)	Hands-on Coding + Whiteboard Explanation
• Constants, Variables, Data Types	1	
• Expressions using operators in C.	1	
• Managing Input and Output operations	1	
• Decision Making and Branching, Looping statements	1	
• Arrays –Initialization, Declaration	1	
• One dimensional and Two-dimensional arrays.	1	
• Strings- String operations, String Arrays. Simple programs- sorting	1	
• Searching – matrix operations	1	



Module II: <ul style="list-style-type: none"> • Functions, pointers, structures and unions. • Functions – Pass by value, Pass by reference • Recursion – Pointers – Definition – Initialization • Pointers arithmetic. Structures and unions, definition • Structure within a structure • Union – Programs using structures and Unions • Storage classes, Pre-processor directives 	(9) 2 1 2 1 1 1 1	Pair Programming + Problem Solving
Module III: Linear data structures: <ul style="list-style-type: none"> • Arrays and its representations Stacks and Queues – Applications • Linked lists – Single, circular and doubly Linked list-Application 	(9) 4 5	Experiential learning
Module IV: Non-linear data structures: <ul style="list-style-type: none"> • Trees – Binary Trees – Binary tree representation • Traversals, – Applications of trees • Binary Search Trees, AVL trees • Graph and its representations – Graph Traversals. 	(9) 3 2 2 2	Concept Mapping
Module V: SEARCHING AND SORTING ALGORITHMS: <ul style="list-style-type: none"> • Linear Search – Binary Search • Sorting: Selection Sort, Bubble Sort • Insertion sort, Merge sort, Quick Sort • Hashing, Types of Hashing, Collision resolution techniques 	(9) 2 2 2 3	Performance Analysis

Learning Resources	
1.	Textbook: <ul style="list-style-type: none"> • The C Programming Language Brian W. Kernighan / Dennis Ritchie, 2015, Second Edition , Pearson • Fundamentals of Data Structures in C, Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, 2008, Second Edition, University Press



Reference books:

- **Programming in C**, Pradip Dey and Manas Ghosh , , 2011, Second Edition, Oxford University Press
2. • **Structures and Algorithm Analysis in C**, Mark Allen Weiss, 1996, Second Edition, Pearson Education.
- **Data Structures and Algorithms**, Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, 1983, Pearson Education



DATABASE MANAGEMENT SYSTEMS

Credits: 3

Semester: I

Course Code: MCA20105

No of Lecture Hours: 45L + 0T

Course Objective:

- To understand the different issues involved in the design and implementation of a database System
- To study the physical and logical database designs, database modeling, managing a database using queries
- To provide facilities for data access, enforcing data integrity, managing concurrency, database security and restoring data from backups

Course Outcome:

CO1: Explain logical database using Entity Relationship

CO2: Construct database using relational algebra and relational calculus &SQL

CO3 Classify the storage and file structure, storage access, indexing and hashing techniques of the database.

CO4: Defines client server architecture, Parallel databases, and distributed databases

CO5: Create NOSQL Databases.

Course Content	Hours Allotted	Pedagogy
Module I:	(11)	
• Database System Applications, Purpose of Database Systems	1	Interactive Lecture + Examples + Activity- Based
• View of Data – Data Abstraction, Instances and Schemas.	1	
• Data Models – the ER Model, Relational Model, Database Languages	1	
• Database Access from Applications Programs	1	
• Transaction Management, Data Storage and Querying	1	
• Database Architecture, Database Users and Administrators, ER diagrams	1	



<p>Relational Model</p> <ul style="list-style-type: none"> • Introduction to the Relational Model • Integrity Constraints over Relations, Enforcing Integrity constraints • Querying relational data, Logical data base Design • Introduction to Views –Altering Tables and Views, Relational Algebra • Basic SQL Queries, Nested Queries, Complex Integrity Constraints in SQL, Triggers 	<p>1 1 1 1 1</p>	
<p>Module II: Introduction to Schema Refinement</p> <ul style="list-style-type: none"> • Problems Caused by redundancy • Decompositions – Problem related to decomposition • Functional Dependencies - Reasoning about FDS. • Normal Forms- BCNF • Properties of Decompositions,-Loss less- join Decomposition • Dependency preserving Decomposition, Schema Refinement in Data base Design • Other kinds of Dependencies-Multi valued Dependencies, Join Dependencies, FIFTH Normal form. 	<p>(9) 1 1 1 2 1 2</p>	<p>Problem-Based + Quiz Competitions</p>
<p>Module III: Indexing and Hashing:</p> <ul style="list-style-type: none"> • Basic Concepts, Ordered Indices, B+-tree Index Files • B-tree Index Files, Multiple-Key Access • Static Hashing, Dynamic Hashing, Comparison of Hashing 	<p>(8) 2 3 3</p>	<p>Assignments</p>
<p>Module IV: Transaction Management:</p> <ul style="list-style-type: none"> • The ACID Properties, Transactions and Schedules • Concurrent Execution of Transactions – Lock Based Concurrency Control • Deadlocks – Performance of Locking – Transaction Support in SQL. • Concurrency Control: Serializability, and recoverability • Introduction to Lock Management – Lock Conversions • Dealing with Deadlocks 	<p>(8) 2 2 1 1 1 1</p>	<p>Case-Based + Simulations</p>



<p>Module V: Crash Recovery</p> <ul style="list-style-type: none"> • Introduction to ARIES, The Log • Other Recovery Related Structures, The WALCheck pointing • Recovering from a System Crash, media Recovery <p>Security and Authorization</p> <ul style="list-style-type: none"> • Introduction to Database Security, Access Control • Discretionary Access Control, Mandatory Access Control <p>NOSQL</p> <ul style="list-style-type: none"> • Need for No-SQL, Aggregate data models, more details on data models • Distribution models, consistency, version stamps, map-reduce • Key-value databases, document databases, column-family stores • Graph databases, Schema Migrations 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Hands-on SQL Lab + Peer Learning</p>
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Learning Resources	
1.	<p>Textbook:</p> <ul style="list-style-type: none"> • Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, 2009, TMH, 3rd Edition • Data base System Concepts A.Silberschatz, H.F. Korth, S.Sudarshan, McGraw hill, VI edition • NoSQL Distilled, Pramod J Sadalage, Martin Fowler, , 2012, Addison-Wesley Professional; 1 st edition.



Reference books:

- 2.
- **Database Systems implementation** Hector Garcia-Molina, Jeffrey Ullman, Jennifer Widom
 - Date, C. J. **Introduction to Database Systems**, Pearson Education.
 - Silberschatz, A., Korth, H. F., & Sudarshan, S. **Database System Concepts**, 6th Edition, McGraw-Hill Education.
 - Elmasri, R., & Navathe, S. B. **Fundamentals of Database Systems**, Pearson Education.
 - Das Gupta, P. K. **Database Management System: Oracle SQL and PL/SQL**, PHI Learning.
 - Rob, P., & Coronel, C. **Database System Concepts**, Cengage Learning, 2008.
 - Connolly, T., & Begg, C. **Database Systems: A Practical Approach to Design, Implementation and Management**, 4th Edition, Pearson Education.
 - O'Neil, P., & O'Neil, E. **Database: Principles, Programming, and Performance**, 2nd Edition, Elsevier.



PROGRAMMING LAB-I
DATA STRUCTURES USING C LAB

Credits: 2

Semester: I

Subject code: MCA20106

No. of practical hours: 60

Objectives:

- To understand and implement basic data structures using C
- To apply linear and non-linear data structures in problem solving.
- To learn to implement functions and recursive functions by means of data structures
- To implement searching and sorting algorithms

Course Outcomes:

- Upon completion of the course, the students will be able to:
- Write basic and advanced programs in C
- Implement functions and recursive functions in C
- Implement data structures using C
- Choose appropriate sorting algorithm for an application and implement it in a modularized way

List of Programs:

1. Basic C Programs – looping, arrays
2. Programs using strings – string function implementation
3. Programs using structures and pointers
4. Programs involving dynamic memory allocations
5. Array implementation of stacks and queues
6. Linked list implementation of stacks and queues
7. Application of Stacks and Queues
8. Implementation of Trees, Tree Traversals
9. Implementation of Binary Search trees
10. Implementation of Linear search and binary search
11. Implementation Insertion sort, Bubble sort, Quick sort and Merge Sort
12. Implementation Hash functions, collision resolution techniques



PROGRAMMING LAB-II
DATABASE MANAGEMENT SYSTEMS LAB

Credits: 2

Semester: I

Subject code: MCA20107

No. of practical hours: 60

Objectives:

- To study the physical and logical database designs, database modeling, managing a Database using queries.
- To provide facilities for data access, enforcing data integrity, managing concurrency, database security and restoring data from backups.

Course Outcomes:

Upon completion of this course, the student is able to:

- Utilize the techniques used to create, insert, update and delete data/documents.
- Utilize various techniques used to query the database.
- Utilize techniques to optimize querying using indexing.
- Apply methods to analyze data using aggregation techniques.
- Adopt knowledge about the role of NoSQL in business.

a. Relational Databases:

1. Implement DDL Statements.
2. Implement DML Statements.
3. Write the queries for implementing Built-In Functions.
4. Design a Database and create required tables. Apply the constraints like Primary Key, Foreign Key, Not Null, and other constraints to the tables.

Perform SQL Queries.

5. Set operations
6. Join concept
7. View Intro
8. Write the queries to implement the Joins.
9. Write the queries to implement sub queries and correlated queries.



b. PL/SQL:

1. Introduction of PL/SQL Advantages of PL/SQL Support of SQL Executing PL/SQL
2. PL/SQL character set & Data Types Character, row, rowed, Boolean, binary integer, number Variable, constant
3. PL/SQL blocks Attribute % type, %rowtype, operators, function comparison numeric, character, date Control structure Condition - if Interactive- loop, for, while Sequential – goto
4. Composite data types Record- declaration, refer, record assignment Table- Declaration, table attributes (Count, delete, exists, first, last, next, prior)
5. Database Triggers Definition, syntax, parts of triggers Types of triggers, enabling & disabling triggers
6. Sub programs Definition Features Cursors
7. Procedures Definition, creating, Parameter
8. Function Definition & implementation



PROGRAMMING LAB-III

PYTHON LAB

Credits: 2

Semester: I

Subject code: MCA22108

No. of practical hours: 60

Objectives:

- To understand why Python useful for developers/data analysts.
- To learn how to design and program Python applications.

Course Outcomes:

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

- Understand basic types of Python Programming.
- Demonstrate the conditional and loop statements in Python Programming.
- Experiment with functions and recursive functions.
- Elaborate various operations on Strings, Lists, Tuples, Dictionaries.
- Understand and experiment with libraries like Numpy, Pandas, matplotlib.
- Demonstrating the Data Pre-Processing techniques.

List of Programs:

1. Demonstrate Python Data types, Variables.
2. Demonstrate the use of if and if-else statements.
3. Demonstrate the use of for and while loop statements.
4. Print the prime numbers up to 'n'.
5. Find sum of n natural numbers using recursion function.
6. Demonstrate Strings in Python.
7. Perform operations on Lists.
8. Perform operations on Tuple.
9. Perform operations on Dictionaries.
10. Find the factorial of a given number using functions.
11. Find the GCD of given two numbers using functions.
12. Find the factorial of given two numbers using recursive functions.
13. Find the GCD of given two numbers using recursive functions.
14. Display Fibonacci series using recursion and non-recursion functions with modules.



15. Create, access, rename and delete files.
16. Demonstrate Packages, Libraries of Python (Numpy, Pandas, Statistics, matplotlib etc)
17. Demonstrate application on feature scaling using MinMaxScaler with pandas.
18. Demonstrate application on feature scaling using StandardScaler with pandas.
19. Demonstrate application on feature scaling using Binarizer with pandas.
20. Demonstrate application on feature scaling using Normalizer with pandas.

Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• ReemaThareja,“Python Programming”, Oxford Press, 2017.• Jake VanderPlas, “Python Data Science Handbook”, O’Really Publications, 2017.• Dr. Charles R. Severance, “Python for Everybody-Exploring Data in Python 3”.



SOFT SKILLS

Credits: 1

Semester: I

Subject code: MCA24109

No. of practical hours: 30

Objectives:

- Learn conversational skills
- Learn reading strategies
- Learn time management
- Learn stress management
- Learn career planning

Course Outcomes:

CO1: Express conversational skills

CO2: Specify reading strategies

CO3: Perform time management

CO4: Perform stress management

CO5: Explore career planning

Activities:

1. Conversation skills, Listening dialogues from TV/radio/Ted talk/Podcast
2. Group discussion
3. Interview skills, Making presentation
4. Listening to Lectures and News Programmes, Listening to Talk show
5. Watching videos on interesting events on Youtube,
6. Reading different genres of texts ranging from newspapers to philosophical treatises
7. Etiquette and Attitude, Combating common fears while speaking
8. Corporate communication and Public speaking.
9. Cover letter, Resume,
10. Writing for publications, Letters, Memos, Emails and blogs
11. Civil Service (Language related), Verbal ability
12. Motivation, Self image
13. Goal setting, Managing changes
14. Time management, Stress management



15. Leadership traits
16. Team work
17. Career and life planning.
18. Multiple intelligences
19. Emotional intelligence
20. Spiritual quotient (ethics)
21. Intercultural communication
22. Creative and critical thinking
23. Learning styles and strategies

Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• International English Language Testing System Practice Tests, Cambridge University Press.• Interactive Multimedia Programs on Managing Time and Stress.• Personality Development (CD-ROM), Times Multimedia, Mumbai• Robert M Sherfield “Developing Soft Skills” 4th Edition, Pearson Education, 2009.
2.	Reference books: <ul style="list-style-type: none">• Business English Certificate Materials, Cambridge University Press.• Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London.



Second Semester Scheme
Year-wise and Semester-wise Distribution of Courses
Department of Master of Computer Applications
First Year Second Semester
Academic Year 2024-25 of 2024 - 2026 Batch (CBCS)

Sl. No	Part	Course Code	Title of the Course	Hours /Week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
1	I	*MCA24201	*Human Values and Professional Ethics (AECC)	2	2	20	30	50	*2
CORE									
2	II	MCA20202	Computer Networks (Core-7)	4	3	40	60	100	4
3	II	MCA20203	Artificial Intelligence (Core-8)	4	3	40	60	100	4
4	II	MCA20204	Design and Analysis of Algorithms (Core-9)	3	3	40	60	100	3
5	II	MCA20205	Operating Systems (Core-10)	3	3	40	60	100	3
6	II	MCA20206	Java Programming (Core-11)	3	3	40	60	100	3
7	II	MCA24207	Machine Learning (Core-12)	3	3	40	60	100	3
PRACTICALS									
8	II	MCA20208	Programming Lab-IV Operating Systems Lab	4	3	40	60	100	2
9	II	MCA20209	Programming Lab-V Java Programming Lab	4	3	40	60	100	2
10	II	MCA24210	Programming Lab-VI Machine Learning Lab	4	3	40	60	100	2
11			*PLANET Community work	-	-	-	-	-	*1
Total				34	-	360	540	900	26

- *PLANET (Programme of Loyola Academy for Neighborhood Empowerment & Transformation) Credits are not part of CGPA
- Ability Enhancement Compulsory Course (AECC) is excluded from SGPA and CGPA calculation, but it is compulsory to pass the examination
- CIA components for Internal marks of theory paper: i) First Mid: 12.5M ii) Second Mid:12.5M iii) Assignment M iv) Case Study/GD/MCQ:5M v) Viva/Seminar: 3M vi) Attendance: 4M
- CIA components for Practical Internal marks: i) Attendance: 5M ii) Observation/ Record book: 5M iii) Practical skill acquired: 10M iv) Pre-final Practical: 20M
- For Library/Mentoring/MOOCs/Remedial classes extra 3 hours are given in a week.



HUMAN VALUES AND PROFESSIONAL ETHICS

Credits: 02

Semester: II

Course Code: MCA24201

No of Lecture Hours: 30L

Course Objective:

- Develop a deep understanding of human and interpersonal values.
- Cultivate critical thinking skills to analyze situations, make informed decisions, and solve problems creatively.
- Analyze Ethical Theories and develop Ethical Decision-Making Skills.
- Develop organizational skills to maintain order and efficiency in both personal and professional life.
- Foster resilience to overcome challenges and setbacks, building a positive mindset in the face of adversity and promote a sense of global citizenship by understanding interconnectedness and global issues.

Course Outcome:

CO1: Students will be able to understand the concept of Universal Human Values

CO2: Students will be able to analyze Ethical Theories and develop Ethical Decision-Making Skills

CO3: Students will be able to cultivate Interpersonal Skills and Communication

CO4: Students will be able to examine Ethical Issues in Various Professions

CO5: Students will be able to promote Social Responsibility and reflect on Personal and Professional Values

Course Content	Hours Allotted	Pedagogy
Module I: Human Values <ul style="list-style-type: none">• Positive affirmations, Assertiveness, Constructive Criticism• Human Relationship – formal and informal• Boundaries in relationships• Guilt and grudges• Forgiveness – accepting self & others.	(6)	Lecture, Role Play, Group Discussions



<p>Module II: Professional Values</p> <ul style="list-style-type: none"> • Dealing with changes, adaptability skills • Transition from College to career • Work-life balance • Leader and manager • Integrity, Accountability, sustainability and Social responsibility 	(6)	Case Study, Scenario-Based Learning
<p>Module III: Ethical Theories</p> <ul style="list-style-type: none"> • Distinction between ethics and morality • Common Ethical Dilemmas in the Profession • Ethical theories: Utilitarianism, Deontology, Virtue Ethics, Ethical Relativism, Consequentialism and Rights-based Ethics • Application of ethical theories in real-life dilemmas. 	(6)	Assignments, Compare & Contrast, Presentations
<p>Module IV: Ethical Decision-making</p> <ul style="list-style-type: none"> • Steps involved in Ethical decision-making • Case studies to analyze and resolve ethical dilemmas • Problem-solving skills – Process, approaches, and their components • Lateral thinking, Tools and techniques, application of SMART analysis 	(6)	Case Analysis, SMART Method
<p>Module V: Ethics in Profession</p> <ul style="list-style-type: none"> • Interpersonal skills for ethical collaboration in a diverse workplace • Ethical issues and challenges in business, healthcare, technology, and academia • Case studies to understand the ethical dimensions of professional practices • Addressing biases and promoting inclusivity in professional interactions 	(6)	- Panel Discussion, Guest Talks, Reflection Tasks

Learning Resources	
1.	Textbook: Handout on Human Values and Professional Ethics – Loyola



COMPUTER NETWORKS

Credits: 04

Semester: II

Course Code: MCA20202

No of Lecture Hours: 60L+0T

Course Objective:

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry into advanced courses in computer networking.
- Allow the student to gain expertise in some specific areas of networking, such as the design and maintenance of individual networks.

Course Outcome:

CO1: Defines Data Communication, components of networks, explains the type of transmission media and describes the functions of each layer in OSI and TCP/IP model.

CO2: Describes the functions of each layer and explains the various protocols

CO3: Classify the routing protocols and analyze how to assign the IP addresses for the given network.

CO4: Describe the Transport layer header format and services.

CO5: Explain the functions of Presentation layer and Application Layer.

Course Content	Hours Allotted	Pedagogy
Module I: DATA COMMUNICATIONS	(12)	
• Components of Networks – Direction of data flow	1	
• Networks – Components and categories – Types of connections	2	Lecture + Visual
• Topologies	1	Diagrams +
• Protocols and Standards – ISO/OSI model, TCP/IP	4	Concept
• Transmission media – Coaxial cable – Fibre Optics	2	Mapping
• Transmission impairments	1	
• Line coding schemes.	1	



Module II: DATA LINK LAYER <ul style="list-style-type: none"> Error detection and correction, CRC, Hamming code Flow Control and Error Control – stop and wait Go back NARQ –selective repeat ARQ sliding window HDLC 		(12) 3 2 2 1	Lecture + Visual Diagrams + Concept Mapping
MAC LAYER <ul style="list-style-type: none"> LANs Ethernet-Wired ALOHA CSMA, CSMA/CD, CSMA/CA 		1 1 2	
Module III: NETWORK LAYER <ul style="list-style-type: none"> Internet works – virtual Circuit and Datagram approach Connecting Devices IP addressing, Address Space, Notations, Classful Addressing Classless Addressing, NAT Routing – Distance Vector Routing, Link State Routing OSPF and BGP 		(12) 2 1 3 2 2 2	Problem-Based Learning + Routing Simulations
Module IV: TRANSPORT LAYER <ul style="list-style-type: none"> Services of transport layer, Multiplexing Transmission Control Protocol (TCP) Congestion Control, Timer management Quality of services (QOS) User Datagram Protocol (UDP) 		(12) 3 2 3 2 2	
Module V: APPLICATION LAYER <ul style="list-style-type: none"> Domain Name Space (DNS) SMTP FTP HTTP WWW SNMP 		(12) 2 2 2 2 2 2	Real-World Protocol Examples (e.g., DNS, HTTP)
Learning Resources			
1	Textbook: <ul style="list-style-type: none"> Andrew S, Tanenbaum. 2008. Computer Networks. (4th Ed.) Pearson Education Behrouz A, Forouzan. 2009. Data communication and Networking. Tata McGraw-Hill. 		



ARTIFICIAL INTELLIGENCE

Credits: 04

Semester: II

Course Code: MCA20203

No of Lecture Hours: 60L+0T

Course Objective:

- To have a basic understanding of some of the more advanced topics of AI, such as learning, natural language processing, expert systems and planning.

Course Outcomes:

CO1: Defines Artificial Intelligence, Problem Solving, Heuristic Search Techniques.

CO2: Explains about Knowledge Representation using Predicate Logic.

CO3: Explains about Expert Systems and Probability Theory.

CO4: Compares the various Artificial Neural Networks.

CO5: Constructs the various advanced knowledge Representation Techniques.

Course Content	Hours Allotted	Pedagogy
Module I:	(12)	
• Introduction, History	1	Lectures
• Intelligent Systems, Foundations of AI, Sub-areas of AI, Applications	1	
• Problem Solving – State-Space Search and Control Strategies	1	
• Introduction, General Problem Solving	1	
• Characteristics of Problem, Exhaustive Searches	1	
• Heuristic Search Techniques	1	
• Iterative-Deepening A*	1	
• Constraint Satisfaction	1	
• Game Playing,	1	
• Bounded Look-ahead Strategy and Use of Evaluation Functions	1	
• Alpha-Beta Pruning	1	
• Case Study: Playing Chess and Manufacturing Scheduling.	1	



<p>Module II: Logic Concepts and Logic Programming:</p> <ul style="list-style-type: none"> • Introduction, Propositional Calculus • Propositional Logic, Natural Deduction System • Axiomatic System, Semantic Tableau System in Propositional Logic • Resolution Refutation in Propositional Logic • Predicate Logic, Logic Programming. <p>Knowledge Representation:</p> <ul style="list-style-type: none"> • Introduction: Approaches to Knowledge Representation • Knowledge Representation using Semantic Network • Extended Semantic Networks for KR • Knowledge Representation using Frames • Case Study: Medical Diagnosis 	<p>(12)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p>	<p>Interactive Lectures ,Concept-Based Teaching + Flowchart Activities</p>
<p>Module III: Expert System and Applications:</p> <ul style="list-style-type: none"> • Introduction, Phases in Building Expert Systems • Expert System Architecture • Expert Systems Vs Traditional Systems • Truth Maintenance Systems, Application of Expert Systems • List of Shells and Tools. <p>Uncertainty Measure – Probability Theory:</p> <ul style="list-style-type: none"> • Introduction, Probability Theory • Bayesian Belief Networks, Certainty Factor Theory • Dempster-Shafer Theory • Case Study: A Course Advisory Expert System. 	<p>(12)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p> <p>1</p>	<p>Case Study Discussions in groups - Concept-Based Lectures with Flow Diagrams</p>
<p>Module IV: Artificial Neural Networks:</p> <ul style="list-style-type: none"> • Introduction, Artificial Neural Networks • Single-Layer Feed-Forward Networks • Multi-Layer Feed-Forward Networks • Radial-Basis Function Networks • Design Issues of Artificial Neural Networks, Recurrent Networks • Case Study: Bank Failure Prediction, Public Health Outcome Cluster. 	<p>(12)</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p>	<p>Lectures</p>



Module V: Advanced Knowledge Representation Techniques: <ul style="list-style-type: none">• Case Grammars	(12) 3	Lecture + Case Studies
Semantic Web Natural Language Processing:		
• Introduction, Sentence Analysis Phases	2	
• Grammars and Parsers, Types of Parsers, Semantic Analysis	2	
• Universal Networking Knowledge	3	
• Case Study: Machine Translation	2	

Learning Resources	
1	Textbook: <ul style="list-style-type: none">• Artificial Intelligence by Saroj Kaushik, Cengage Learning,2011.• Artificial Intelligence, A Modern Approach by Russell, Norvig, Pearson Education,2nd Edition, 2004.
2	Reference books: <ul style="list-style-type: none">• Artificial Intelligence by Rich, Knight, Nair, Tata McGraw-Hill



DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 03

Semester: II

Course Code: MCA20204

No of Lecture Hours: 45L+0T

Course Objective:

- To understand data structures and emphasize the design and analysis of algorithms.

Course Outcomes:

CO1: Define Elementary data structures

CO2: Explaining divide and conquer, greedy methods with examples

CO3: Explaining divide and conquer greedy methods with examples

CO4: Explaining backtracking and branch and bound

CO5: Analysis of NP-Hard and NP-Complete problems

Course Content	Hours Allotted	Pedagogy
Module I: Introduction	(9)	
<ul style="list-style-type: none">Definition of an algorithm	1	
<ul style="list-style-type: none">Algorithm Specification	1	
<ul style="list-style-type: none">Performance Analysis	1	Chalk-Talk,
<ul style="list-style-type: none">Randomized Algorithms	1	Dry Run
Elementary Data Structures		Exercises,
<ul style="list-style-type: none">Stacks and Queues, Trees	1	Complexity
<ul style="list-style-type: none">Dictionaries	1	Comparisons
<ul style="list-style-type: none">Priority Queues	1	
<ul style="list-style-type: none">Sets and Disjoint Set Union	1	
<ul style="list-style-type: none">Graphs	1	
Module II: Divide and Conquer	(9)	
<ul style="list-style-type: none">Binary Search, Finding the Maximum and Minimum	1	Problem
<ul style="list-style-type: none">Merge Sort, Quick Sort	1	Solving in
<ul style="list-style-type: none">Selection, Stassen's Matrix Multiplication	1	Groups, Case
<ul style="list-style-type: none">Convex Hull	1	Solving +
The Greedy Method		Algorithm
<ul style="list-style-type: none">Knapsack problem, Tree Vertex Splitting	1	



<ul style="list-style-type: none"> • Job Sequencing with Deadlines • Minimum-Cost Spanning Trees • Optimal Storage on Tapes • Optimal Merge Patterns, Single Source Shortest Paths 	<p>1</p> <p>1</p> <p>1</p> <p>1</p>	
<p>Module III: Dynamic Programming</p> <ul style="list-style-type: none"> • General Method, Multistage Graphs • All-Pairs Shortest Paths, Single-Source Shortest Paths • Optimal Binary Search Trees, 0/1 Knapsack, Reliability Design • The Travelling Salesperson Problem <p>Basic Traversal and Search Techniques</p> <ul style="list-style-type: none"> • Techniques for Binary Trees • Techniques for Graphs • Connected Components and Spanning Trees • Bi-connected Components and DFS 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Step-by-Step Execution + Interactive Examples</p>
<p>Module IV: Back Tracking</p> <ul style="list-style-type: none"> • General Method, 8-Queens Problem • Sum of Subsets, Graph Coloring • Hamiltonian Cycles • Knapsack Problem <p>Branch-Bound</p> <ul style="list-style-type: none"> • The Method, 0/1 Knapsack Problem • Travelling Salesperson 	<p>(9)</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p>	<p>Discussion + Flowchart Mapping</p>
<p>Module V:</p> <ul style="list-style-type: none"> • NP Hard and NP-Complete Problems • Basic Concepts • Cook's Theorem • NP-Hard Graph Problems • NP-Hard Scheduling Problems, NP-Hard Code Generation • Some Simplified NP-Hard Problems 	<p>(9)</p> <p>2</p> <p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p>	<p>Discussion + Flowchart Mapping+ Lectures</p>



Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• Horowitz, E., Sahni, S., & Rajasekaran, S. (2007). Fundamentals of Computer Algorithms (2nd ed.). Hyderabad: University Press.
2.	Reference books: <ul style="list-style-type: none">• Pannerselvam, R. (2007). Design and Analysis of Algorithms. New Delhi: PHI Learning.• Pandey, H. M. (2009). Design and Analysis of Algorithms. India: University Science Press.• Cormen, T. H., Leiserson, C. E., Rivest, R. L., & Stein, C. (2010). Introduction to Algorithms (3rd ed.). New Delhi: PHI Learning.• Dave, P. H., & Dave, H. B. (2008). Design and Analysis of Algorithms. New Delhi: Pearson Education.



OPERATING SYSTEMS

Credits: 03

Semester: II

Course Code: MCA20205

No of Lecture Hours: 45L+0T

Course Objective:

- This course aims to explain the UNIX operating system. Students will be able to perform the following: user administration, access control, auditing, etc.

Course Outcomes:

CO1: Understand fundamental operating system abstractions, Analyzing the algorithms

CO2: Describe the list of resources involved in process creation and management

CO3: Explain the use of paging and segmentation

CO4: Explain the function and structure of the I/O system.

CO5: Describe path names and directory structure visible to end users

Course Content	Hours Allotted	Pedagogy
Module I: Introduction <ul style="list-style-type: none">• Operating System structure and Operating System operations• Operating system services, System calls and System Programs Process Management: <ul style="list-style-type: none">• Process concept, Process Scheduling, Operations on Processes.• Inter-process communication, Threads, and Multithreading Models. CPU Scheduling: <ul style="list-style-type: none">• Scheduling Criteria• Scheduling Algorithms, Multi-Processor Scheduling	(9) 1 1 2 2 1 2	Lecture with Diagrams & Layered Architecture Charts +Activity
Module II: Process synchronization <ul style="list-style-type: none">• Critical Section problem, Semaphores, monitors	(9) 3	Problem-Based Learning - Coding Practice with Semaphores (C)



<p>Deadlocks:</p> <ul style="list-style-type: none"> Necessary conditions, resource allocation graph Methods for handling deadlocks, prevention Avoidance, detection and recovery Protection Goal Domain of protection, access matrix. 	<p>1 2 2 1</p>	<p>- Case Study Analysis on Deadlocks</p>
<p>Module III: Memory Management</p> <ul style="list-style-type: none"> Swapping, contiguous allocation, and paging Static and Dynamic partition, demand paging Page replacement Algorithms, thrashing Segmentation, segmentation with Paging <p>File System Interface:</p> <ul style="list-style-type: none"> File Concept, Access Methods Directory Structure, File System Mounting, File Sharing, Protection. <p>File System Implementation:</p> <ul style="list-style-type: none"> File-System Structure, Implementation Directory Implementation, Allocation Methods Free Space management, Efficiency and Performance, Recovery 	<p>(9) 1 1 1 1 1 1 1 1 1</p>	<p>Whiteboard Problem Solving (Paging & Page Replacement), Lab Tasks on Memory Allocation Techniques, File System Structure Mapping (using Linux)</p>
<p>Module IV: Mass Storage Structure</p> <ul style="list-style-type: none"> Disk Structure, Disk Attachment, Disk Scheduling Disk Management, Swap Space Management RAID structure, Stable storage Implementation <p>I/O System:</p> <ul style="list-style-type: none"> I/O hardware, Application I/O Interface Kernel I/O Subsystem Transforming an I/O request to a hardware operation STREAMS. 	<p>(9) 1 1 1 1 1 2 2</p>	<p>Demo for Disk Scheduling (FCFS, SCAN, C-SCAN), Hands-on Activity: Disk Scheduling Comparisons</p>
<p>Module V: Case Studies Linux System</p> <ul style="list-style-type: none"> Design Principles, Kernel Modules Process Management, Scheduling, Memory Management File Systems, Input and Output, Inter-Process Communication Network Structure, Security 	<p>(9) 2 2 1 1</p>	<p>Case-Based Learning, Group Presentation</p>



Influential Operating Systems: <ul style="list-style-type: none">• Early Systems, MULTICS, IBM OS/360, Mach	1	
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Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• Abraham, Silberschatz. Peter, B Galvin. Greg, Gagne, 2012. Operating System Concepts, Ninth Edition. Wiley India.
2.	Reference books: <ul style="list-style-type: none">• Andrew S, Tanenbaum. 2009. Modern Operating Systems. (3rd Ed). PHI.• Robert, Love. 2004. Linux Kernel Developmen. Pearson Education.• William, Stallings. Operating Systems. (6thEd). PHP



JAVA PROGRAMMING

Credits: 03

Semester: II

Course Code: MCA20206

No of Lecture Hours: 45L+0T

Course Objective:

- To state the advantages of an object-oriented approach to software development.
- To understand the fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- To be able to use the Java SDK environment to create, debug and run Java programs.
- To enable students to learn to produce well-designed, dynamic Web applications.

Course Outcomes:

CO1: Explain the benefits of Java compared to other Programming languages. The student will be able to identify classes, objects, and Interfaces and will be able to demonstrate the concepts of polymorphism and inheritance

CO2: Create Java programs to implement error handling techniques using exception handling and multi-threading concepts

CO3: Identify the usage of the collection framework.

CO4: Distinguish between different Byte Streams and Character Streams and construct applets.

CO5: Describe different AWT and Swing classes. Students can design GUI-based applications.

Course Content	Hours Allotted	Pedagogy
Module I:	(9)	
• Understanding object-oriented development and concepts	1	
• Benefits of object-oriented development	1	
• Java Programming Fundamentals	1	Interactive
Introduction		Lecture + Code
• Overview of Java	1	Walkthroughs
• Data types, variables	1	
• Arrays, Operators, Control statements, Overloading and Overriding	1	



<ul style="list-style-type: none"> Classes, Methods, Inheritance Packages and Interfaces, Inner Classes 	1	
	2	
Module II:	(9)	
<ul style="list-style-type: none"> Exceptional Handling Multithreaded programming String handling 	3	Problem-Based Learning
	3	
	3	
Module III: Java Collections	(9)	
<ul style="list-style-type: none"> Collections overview Collection classes ArrayList, LinkedList, HashSet, HashMap Collection Interfaces – Collection, Set, List, Map Iterators, Random access interface 	2	Hands-On Lab: CRUD Operations using Collections
	2	
	3	
	2	
Module IV: Java Files	9	
<ul style="list-style-type: none"> Java I/O classes and interfaces Files, streams and byte classes Character streams Serialization 	2	Hands-On Labs, Lectures
	2	
	2	
	1	
Applet		
<ul style="list-style-type: none"> Applet Basics, Applet Architecture Applet tag, passing Parameters to Applet 	1	
	1	
Module V: Event Handling	9	
<ul style="list-style-type: none"> The delegation event model, Events, Event classes Event Listener Interfaces. Using the Delegation event model, Adapter classes, and LayoutManager 	1	Tool-Based Learning
	1	
	1	
Swings		
<ul style="list-style-type: none"> JComboBox, JLabel, JMenuBar, JOptionPane, JPanel, JPopupMenu JScrollPane, TabbedPane, JTable, JTree, JTextArea, JTextField JPasswordField, JButton, JMenuItem, JCheckBox-MenuItem, JRadioButton-MenuItem, JCheckBox, JRadioButton, JMenu, JToggleButton 	2	
	2	
	2	



Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• Herbert Schildt. Java Complete Reference. 9th Edition. New Delhi: TGH.• Jim Keogh. The Complete Reference J2EE. 7th Edition. New Delhi: Tata McGraw-Hill.
2.	Reference books: <ul style="list-style-type: none">• Richard A. Johnson. 2009. Java Programming and Object Oriented Application Development. India: Cengage Learning.• John Dean and Raymond Dean. 2008. Introducing to Programming with JAVA A Problem-Solving Approach. New Delhi: Tata McGraw-Hill.



MACHINE LEARNING

Credits: 03

Semester: II

Course Code: MCA24207

No of Lecture Hours: 45L+0T

Course Objective:

- Understand the fundamentals of Machine Learning.
- Acquire theoretical knowledge on various ML algorithms.
- Learn Probabilistic Learning Algorithms for applying in real world applications.
- Understand the concepts of Reinforcement Learning and to evaluate hypothesis.
- Understand the working of Genetic Algorithms.

Course Outcomes:

CO1: Analyze the characteristics of Machine Learning techniques that enable to solve real world problems

CO2: Implement machine learning strategies.

CO3: Apply various supervised and unsupervised learning methods to appropriate problems.

CO4: Identify and integrate more than one technique to enhance the performance of learning.

CO5: Create probabilistic learning models for handling unknown pattern

Course Content	Hours Allotted	Pedagogy
Module I: Introduction to Machine Learning <ul style="list-style-type: none">• Introduction, Components of Learning, Learning Models• Geometric Models, Probabilistic Models• Logic Models, Grouping and Grading• Designing a Learning System• Types of Learning, Supervised, Unsupervised• Reinforcement, Perspectives and Issues	(9) 1 1 2 1 2 2	ecture + Visual Diagrams
Module II: Supervised and Unsupervised Learning <ul style="list-style-type: none">• Decision Trees: ID3,• Classification and Regression Trees,• Regression: Linear Regression,	(9) 1 1 1	Hands-On Labs, Coding Assignments



<ul style="list-style-type: none"> • Multiple Linear Regression, Logistic Regression, • Neural Networks: Introduction, Perception, Multilayer Perception, • Support Vector Machines: Linear and Non-Linear, • Kernel Functions, K Nearest Neighbors • Introduction to clustering, K-means clustering 	1 2 1 1 1	
<p>Module III: Ensemble and Probabilistic Learning</p> <ul style="list-style-type: none"> • Model Combination Schemes, Voting, • Error-Correcting Output Codes, • Bagging: Random Forest Trees, • Boosting: Adaboost, Stacking • Gaussian mixture models - The Expectation-Maximization (EM)Algorithm2 • Information Criteria, Nearest neighbor methods – • Nearest Neighbor Smoothing, Efficient Distance • Computations: the KD-Tree, Distance Measures 	(9) 1 1 1 1 2 1 1 1	Interactive Demonstration, Hands-On Labs
<p>Module IV: Reinforcement Learning and Evaluating Hypotheses</p> <ul style="list-style-type: none"> • Introduction, Learning Task • Q Learning: the Q Function, • An Algorithm for Learning Q, An Illustrative • Example, Convergence, Experimentation Strategies, • Updating Sequence • Motivation, Estimation Hypothesis Accuracy, • Version Spaces, Finite and Infinite Hypothesis Spaces, • PAC Learning, VC Dimension 	(9) 1 1 1 1 1 2 1	Step-by-Step Breakdown of Q- Algorithm, MCQ + Case Scenarios: Hypothesis Evaluation
<p>Module V: Genetic Algorithms</p> <ul style="list-style-type: none"> • Motivation, • Genetic Algorithms: Representing Hypotheses, • Genetic Operator, • Fitness Function and Selection, • An Illustrative Example • Hypothesis Space Search, Genetic Programming, 	(9) 1 2 1 2 1 2	Hands-On Coding



Learning Resources	
1.	<p>Textbook:</p> <ul style="list-style-type: none">• Tom Mitchell, “Machine Learning”, McGraw Hill, 3rd Edition, 1997.• Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Prentice Hall of India, 3rd Edition 2014.• Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar “Foundations of Machine Learning”, MIT Press, 2012.
2.	<p>Reference books:</p> <ul style="list-style-type: none">• Charu C. Aggarwal, “Data Classification Algorithms and Applications”, CRC Press, 2014.• Charu C. Aggarwal, “DATA CLUSTERING Algorithms and Applications”, CRC Press, 2014.• Kevin P. Murphy “Machine Learning: A Probabilistic Perspective”, The MIT Press, 2012• Jiawei Han and Micheline Kamber and Jian Pei, “Data Mining Concepts and Techniques”, 3rd edition, Morgan Kaufman Publications, 2012.



PROGRAMMING LAB – IV
OPERATING SYSTEMS LAB

Credits: 02

Course Code: MCA20208

Semester: II

No of Practical Hours: 60

Course Objective:

- To learn Unix commands.
- To know about various Process scheduling algorithms
- To realize the differences between OS and Distributed OS
- To learn Socket programming.

Course Outcomes:

- The student will be able to apply UNIX operating system commands, perform basic shell control of the utilities and understand different UNIX/LINUX shell scripts and execute various shell programs.

1. Unix Shell Commands

- File handling commands
- Directory handling commands
- General-purpose commands

2. Unix Shell Scripts

- Print the Multiplication table of a given no. using all loops
- Perform all arithmetic operations
- Print the type of a file
- Rename all files whose names end with .c as .old
- Display the no. of lines in each of text file in a givendir

3. Simulate the following CPU scheduling algorithms.

- FCFS
- SJF
- Round Robin
- Priority.



4. Write a C program to simulate producer-consumer problem using Semaphores
5. Write a C program to simulate the concept of Dining-philosophers problem.
6. Simulate MVT and MFT.
7. Write a C program to simulate the following contiguous memory allocation techniques
 - Worst fit
 - Best fit
 - First fit.
8. Simulate following page replacement algorithms
 - FIFO
 - LRU
 - OPTIMAL
9. Simulate following File Organization Techniques
 - Single level directory
 - Two level directory
10. Simulate following file allocation strategies
 - Sequential
 - Indexed
 - Linked.
11. Simulate Bankers Algorithm for Dead Lock Avoidance.
12. Simulate Bankers Algorithm for Dead Lock Prevention.
13. Write a C program to simulate disk scheduling algorithms.
 - FCFS
 - SCAN
 - C-SCAN



PROGRAMMING LAB – V
JAVA PROGRAMMING LAB

Credits: 02

Course Code: MCA20209

Semester: II

No of Practical Hours: 60

Course Objective:

- To practice fundamentals of object-oriented programming in Java, including defining Classes, invoking methods, using class libraries, etc.
- To be able to use the Java SDK environment to create, debug and run Java programs.

Course Outcome:

- The student will be able to create Java programs that solve simple business problems, work with Java I/O streams and implement database connectivity.

List of Programs

1. Programs using the concept of class with constructors, methods and overloading.
2. Programs using the concept of inheritance, dynamic polymorphism, and abstract classes.
3. Programs using the concept of multithreading, synchronization, and Exceptional Handling
4. Programs using the concept of Packages, collections
5. Programs using the concept of ArrayList, LinkedList, HashSet, HashMap, Set, List, Map, Iterator interface, ListIterator
6. Program using the concept of Byte Streams, Character Streams and Serialization.
7. Programs using the concept of Applet and passing parameters to the applet.
8. Programs using the concept of Swings.



**PROGRAMMING LAB VI
MACHINE LEARNING LAB**

Credits: 02

Course Code: MCA24210

Semester: II

No of Practical Hours: 60

Course Objective:

- Learn machine learning algorithms in python
- Learn supervised algorithm programming
- Learn unsupervised algorithm programming
- Learn neural network programming

Course Outcome:

- Write machine learning algorithms in python
- Write supervised algorithm programming
- Write unsupervised algorithm programming
- Write neural network programming

1 Machine Learning

- Types of Machine Learning (ML)
- Most Common Machine Learning Algorithms

2 Data Preparation

- Preprocessing the Data
- Techniques for Data Preprocessing
- Labeling the Data

3 Supervised Learning: Classification

- Steps for Building a Classifier in Python
- Building Classifier in Python
- Logistic Regression
- Decision Tree Classifier
- Random Forest Classifier

4 Supervised Learning: Regression

- Building Regressors in Python



5 Unsupervised Learning: Clustering

- Concept of Clustering
- Algorithms for Clustering the Data
- Measuring the Clustering Performance
- Calculating Silhouette Score
- Finding Nearest Neighbors
- K-Nearest Neighbors Classifier

CASE STUDIES:

Case Study 1: Titanic Disaster Analysis

Problem Definition: The Titanic Machine Learning Case Study is a classic example in the field of data science and machine learning. The study is based on the dataset of passengers aboard the Titanic when it sank in 1912. The study's goal is to predict whether a passenger survived or not based on their demographic and other information.

Dataset: The dataset contains information on 891 passengers, including their age, gender, ticket class, fare paid, as well as whether or not they survived the disaster. Titanic-Machine Learning from Disaster dataset

Procedure: The first step in the analysis is to explore the dataset and identify any missing values or outliers. Once this is done, the data is pre-processed to prepare it for modeling.

To build a predictive model using various machine learning algorithms, such as logistic regression, decision trees, and random forests. These models are trained on a subset of the data and evaluated on another subset to ensure they can generalize well to new data.

Finally, the model is used to make predictions on a test dataset, and the model performance is measured using various metrics such as accuracy, precision, and recall. The study results can be used to improve safety protocols and inform future disaster response efforts.

Case Study 2: Loan Application Classification

Problem Definition: Financial institutions receive tons of requests for lending money by borrowers and making decisions for each request is a crucial task. Manually processing these requests can be a time-consuming and error-prone process, so there is an increasing demand for machine learning to improve this process by automation



Dataset: Loan data from Kaggle

Procedure: Follow the below-mentioned steps to get started on this case study.

- a. Analyze the dataset and explore how various factors such as gender, marital status, and employment affect the loan amount and status of the loan application.
- b. Select the features to automate the process of classification of loan applications.
- c. Apply machine learning models such as logistic regression, decision trees, and random forests to the features and compare their performance using statistical metrics.

This case study falls under the umbrella of supervised learning problems in machine learning and demonstrates how ML models are used to automate tasks in the financial industry.

Case Study 3: Market Basket Analysis

Problem Definition: Market basket analysis is a common application of machine learning in retail and e-commerce, where it is used to identify patterns and relationships between products that are frequently purchased together. By leveraging this information, businesses can make informed decisions about product placement, promotions, and pricing strategies.

Dataset: Market Basket dataset in this case study, you will utilize the EDA methods to carefully analyze the relationships among different variables in the data. And study how to use the Apriori algorithm to identify frequent item sets and association rules, which describe the likelihood of a product being purchased given the presence of another product. These rules can generate recommendations, optimize product placement, and increase sales, and they can also be used for customer segmentation.

Procedure: Using machine learning for market basket analysis allows businesses to understand customer behavior better, identify cross-selling opportunities, and increase customer satisfaction. It has the potential to result in increased revenue, improved customer loyalty, and a better understanding of customer needs and preferences.

Case Study 4: Predicting Prices for Airbnb

Problem Definition: Airbnb is a tech company that enables hosts to rent out their homes, apartments, or rooms to guests interested in temporary lodging. One of the key challenges hosts face is optimizing the rent prices for the customers. With the help of machine learning, hosts can have rough estimates of the rental costs based on various factors such as location, property type, amenities, and availability.

Dataset: Airbnb price prediction dataset



Procedure: Step 1, in this case study, is to clean the dataset to handle missing values, duplicates, and outliers. In the same step, the data is transformed, and the data is prepared for modeling with the help of feature engineering methods.

Step 2: to perform EDA to understand how the rental listings are spread across different cities in the US. Next, you will learn how to visualize how prices change over time, looking at trends for different seasons, months, days of the week, and times of the day.

Step 3: involves implementing ML models like linear regression (ridge and lasso), Naive Bayes, and Random Forests to produce price estimates for listings. You will learn how to compare the outcomes of these models and evaluate their performance.

Case Study 5: Customer Churn Prediction

Problem Definition: Predicting customer churn is essential for businesses interested in retaining customers and maximizing their profits. By leveraging historical customer data, machine learning algorithms can identify patterns and factors that are correlated with churn, enabling businesses to take proactive steps to prevent it.

Description: In this case study, how a telecom company uses machine learning for customer churn prediction. The available data contains information about the services each customer signed up for, their contact information, monthly charges, and their demographics. The goal is to first analyze the data at hand with the help of methods used in Exploratory Data Analysis. It will assist in picking a suitable machine-learning algorithm. The five machine learning models used in this case study are AdaBoost, Gradient Boost, Random Forest, Support Vector Machines, and K-Nearest Neighbors. These models are used to determine which customers are at risk of churn.

By using machine learning for churn prediction, businesses can better understand customer behavior, identify areas for improvement, and implement targeted retention strategies. It can result in increased customer loyalty, higher revenue, and a better understanding of customer needs and preferences. This case study example will help you understand how machine learning is a valuable tool for any business looking to improve customer retention and stay ahead of the competition.



References:

GitHub Repository: <https://github.com/ashishpatel26/Titanic-Machine-Learning-from-Disaster>

GitHub Repository: <https://github.com/samuelklam/airbnb-pricing-prediction>

GitHub Repository: <https://github.com/kkrusere/Market-Basket-Analysis-on-the-Online-Retail-Data>

GitHub Repository: <https://www.kaggle.com/datasets/burak3ergun/loan-data-set>

GitHub Repository: <https://github.com/Pradnya1208/Telecom-Customer-Churn-prediction>



YEAR-WISE AND SEMESTER-WISE DISTRIBUTION OF SUBJECTS
MASTER OF COMPUTER APPLICATIONS
THIRD SEMESTER
ACADEMIC YEAR 2025-26 OF 2024-26 BATCH (CBCS)

Sl. No.	Subject Code	Title of the Subject	Hours/ week			Duration of Exam (hrs.)	Marks			Credits
			L	T	P		Internal	External	Total	
1	MCA21301	Summer Internship (SEC – 2)	2			3	25	25	50	2
DSE – I										
2	MCA21302A	Internet of Things	3	-	-	3	40	60	100	3
	MCA21302B	Distributed Systems								
	MCA21302C	Information Security								
DSE-II										
3	MCA21303A	Network Security	3	-	-	3	40	60	100	3
	MCA23303B	Block Chain Technology								
	MCA23303C	Android Application Development								
CORE										
4	MCA21304	Operation Research (Core- 13)	4	-	-	3	40	60	100	4
5	MCA21305	Software Engineering (Core-14)	3	-	-	3	40	60	100	3
6	MCA25306	Internet Technologies (Core-15)	3	-	-	3	40	60	100	3
7	MCA23307	Deep Learning (Core-16)	3	-	-	3	40	60	100	3
PRACTICALS										
8	MCA21308	Programming Lab-I (Software Engineering Lab)	-	-	4	3	40	60	100	2
9	MCA25309	Programming Lab- II (Internet Technologies Lab)	-	-	4	3	40	60	100	2
10	MCA23310	Programming Lab- III (Deep Learning Lab)	-	-	4	3	40	60	100	2
Total			33				360	540	900	27
*SEC Skill Enhancement Course)										
* DSE (Discipline Specific Elective)										
* Core										

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SUMMER INTERNSHIP (SEC-2)

Credits: 2

Semester: III

Course Code: MCA21301

No of Lecture Hours: 30

Course Objective:

- The objective of the MCA mini project work is to develop quality software solution. The primary emphasis of the project work is to understand and gain the knowledge of the principles of software engineering practices.

Course Outcome:

- The Master of Computer Applications (MCA) programme prepares the students to take up positions as Systems Analysts, Systems Designers, Software Engineers, Programmers and Project Managers in any field related to Information Technology.

CO1: Communicate a practical understanding of how a technology actually operates

CO2: Demonstrate the ability to integrate and apply theoretical knowledge and skills developed in various courses to real-world situations in a business organization

CO3: Exhibit the ability to effectively work in a professional environment and demonstrate work ethic and commitment in a work-based environment

CO4: Demonstrate the ability to successfully complete internship assignments.

CO5: Reflect on personal and professional development needs and set strategic goals for advancing along an intended career path

CO6: Communicate effectively in a professional environment in both English and regional language, orally and in writing.



INTERNET OF THINGS

Credits: 3

Semester: III

Course Code: MCA21302A

No of Lecture Hours: 3L + 0T

Course Objective:

- To introduce the terminology, technology and its applications
- To introduce the concept of M2M (machine to machine) with necessary protocols
- To introduce the Python Scripting Language which is used in many IoT devices
- To introduce the Raspberry PI platform, that is widely used in IoT applications
- To introduce the implementation of web-based services on IoT devices

Course Outcome:

CO1: Understand the concepts of IoT and IoT enabling technologies

CO2: Explain IOT and system management.

CO3: To develop an understanding Programming Raspberry Pi with Python

CO4: To understand IoT Physical Servers and Cloud Offerings

CO5: Gain knowledge on IoT programming and able to develop IoT applications

Course Content	Hours Allotted	Pedagogy
Module I:	(9)	
• Introduction to Internet of Things –Definition and Characteristics of IoT	1	
• Physical Design of IoT – IoT Protocols, IoT communication models	1	
• IoT Communication APIs	1	Interactive
• IoT enabled Technologies – Wireless Sensor Networks, Cloud Computing	1	Lecture + Diagrams
• Big data analytics, Communication protocols, Embedded Systems	2	
• IoT Levels and Templates, Domain Specific IoTs – Home, City, Environment	2	
• Agriculture, Industry, health and Lifestyle	1	



<p>Module II:</p> <ul style="list-style-type: none"> • IoT and M2M- Introduction to M2M, Difference between IoT and M2M • SDN and NFV for IoT, IoT System Management with NETCONF-YANG • Need for IoT Systems Management, SNMP • Network Operator requirements, NETCONF, YANG • IoT Platforms Design Methodology: Introduction, IoT Design Methodology 	<p>(9)</p> <p>2</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p>	<p>Lectures</p>
<p>Module III :</p> <ul style="list-style-type: none"> • Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib • IoT Physical Devices and Endpoints – IoT device • Raspberry Pi, About the Board, Linux on Raspberry Pi, Raspberry Pi Interfaces • Programming Raspberry Pi with Python • Program with Raspberry PI with focus of interfacing external gadgets • Controlling output, reading input from pins. 	<p>(9)</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p> <p>1</p>	<p>Hands-On Lab: Write code on Raspberry Pi</p>
<p>Module IV :</p> <ul style="list-style-type: none"> • IoT Physical Servers and Cloud Offerings • Cloud Storage models and communication • Wamp, Xively • Django, Restful, Amazon • FOG computing, Protocol based applications 	<p>(9)</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p> <p>3</p>	<p>Lectures, Discussion</p>
<p>Module V : Case studies Illustrating IOT Design</p> <ul style="list-style-type: none"> • Introduction • Home Automation • Cities • Environment • Agriculture • Productivity Applications 	<p>(9)</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p>	<p>Case Studies</p>



Learning Resources	
1.	Textbook: <ul style="list-style-type: none">Richardson, Matt and Wallace, Shawn. 2014. Getting Started with Raspberry Pi. O'Reilly (SPD). ISBN: 9789350239759
2.	Reference books: <ul style="list-style-type: none">Bahga, ArshdeepandMadiseti, Vijay. 2015.Internet of Things - A Hands-on ApproachUniversities Press ISBN: 9788173719547



DISTRIBUTED SYSTEMS

Credits: 3

Semester: III

Course Code: MCA21302B

No of Lecture Hours: 3L + 0T

Course Objective:

- To describe important characteristics of Distributed Systems and features of such systems.

Course Outcome:

CO1: Defines Distributed systems, goals, processes and identifies the advantages and challenges in designing distributed algorithms for different primitives like mutual exclusion, deadlock detection, agreement, etc.

CO2: Explains about Name entities and illustrates the various synchronization algorithms

CO3: Differentiate between different types of faults and fault handling techniques in order to implement fault tolerant systems.

CO4: Compares the various Distributed Object Systems along with their related Case studies.

CO5: Constructs the algorithms related to Distributed Shared memory and Distributed Scheduling.

Course Content	Hours Allotted	Pedagogy
Module I: Introduction to Distributed Systems	(9)	
• Definition, Goals	1	
• Types of Distributed Systems	1	
Architectures		
• Architectural Styles	1	
• System Architecture	1	
• Architectures Versus Middleware	1	Interactive Lecture + Architecture Diagrams
• Self-Management	1	
Process		
• Threads	1	
• Virtualization	1	
• Clients, Servers	1	
• Code Migration	1	



<p>Module II:</p> <p>Naming</p> <ul style="list-style-type: none"> • Names, Identifiers and Addresses • Flat Naming • Structured Naming • Attribute-Based Naming <p>Synchronization</p> <ul style="list-style-type: none"> • Clock Synchronization • Logical Clocks, 2 Mutual exclusion • Global Positioning of Nodes • Election Algorithms 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p>	<p>Whiteboard Problem Solving for Mutual Exclusion</p>
<p>Module III :</p> <p>Consistency and Replication</p> <ul style="list-style-type: none"> • Introduction • Data-Centric, Client-Centric Consistency Models • Replica Management • Consistency Protocols <p>Fault Tolerance</p> <ul style="list-style-type: none"> • Introduction, Process resilience • Reliable client-server and Group Communication • Distributed Commit and Recovery 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p>	<p>Case Studies</p>
<p>Module IV : Distributed Object based Systems</p> <ul style="list-style-type: none"> • Architecture • Processes • Communication • Naming • Synchronization • Consistency and Replication • Fault Tolerance • Security 	<p>(9)</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Group Discussions, Lectures</p>



Module V :	(9)	
Distributed shared memory		
• Implementation algorithms	1	
• Memory coherence	1	Discussion,
• Design issues	1	Assignments
Distributed Scheduling		+ Lectures
• Issues in Load Distributing	2	
• Components of Load Distributing Algorithms	2	
• Load Distributing Algorithms	2	

Learning Resources	
1.	<ul style="list-style-type: none">• Andrew S, Tanenbaum, Van, Steen.2002. Distributed Systems, Second Edition. New Delhi:Pearson- Education.• M, Singhal. N.G, Shivaratri. 2001.Advanced concepts in operating Systems.NewDelhi:Tata McGraw Hill.



INFORMATION SECURITY

Credits: 3

Semester: III

Course Code: MCA21302C

No of Lecture Hours: 3L + 0T

Course Objective:

- To develop an understanding of cryptography, security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.

Course Outcome:

CO1: Defines the History, Characteristics and SDLC of the Information Security.

CO2: Understand the Legal Ethical and Professional Issues and Overview of the Risk Management.

CO3: Analyze the Planning of the Security and how the Security Technologies are used.

CO4: Explain how the detection, Access Control and Cryptography of the Security Technologies.

CO5: Apply the Implementation of the Information Security and Personnel.

Course Content	Hours Allotted	Pedagogy
Module I: History, Critical characteristics of information, NSTISSC security model <ul style="list-style-type: none">• Components of an information system, Securing the components• Balancing security and access• The SDLC, The security SDLC• Need for Security: Business needs, Teats, Attacks- secure software development	(9) 1 2 3 3	Conceptual Lectures + Security Lifecycle Diagrams, Interactive Discussion
Module II: Legal Ethical and professional Issues <ul style="list-style-type: none">• Law and ethics in information security• Relevant U.S laws- international laws and legal bodies• Ethics and information security Risk Management <ul style="list-style-type: none">• Overview, Risk identification, Risk assessment	(9) 2 2 1 1	Case Studies / Review of research articles



<ul style="list-style-type: none"> • Risk control strategies, selecting a risk control strategy • Quantitative versus qualitative risk control practices • Risk management discussion points, recommended risk control practices 	<p>1</p> <p>1</p> <p>1</p>	
<p>Module III :</p> <p>Planning for Security</p> <ul style="list-style-type: none"> • Security policy, Standards and practices • Security blue print, Security education, Continuity strategies <p>Security Technology</p> <ul style="list-style-type: none"> • Firewalls and VPNs: Physical design, Firewalls • Remote connections 	<p>(9)</p> <p>1</p> <p>2</p> <p>3</p> <p>3</p>	<p>Discussion, Assignments</p>
<p>Module IV :</p> <p>Security Technology</p> <ul style="list-style-type: none"> • Intrusion detection, access control and other security tolls • Intrusion detection and prevention systems • Scanning and analysis tools, Access control devices <p>Cryptography</p> <ul style="list-style-type: none"> • Foundations of cryptology, Cipher methods • Cryptographic Algorithms, Cryptographic tools • Protocols for secure communications, Attacks on cryptosystems 	<p>(9)</p> <p>2</p> <p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p>	<p>Whiteboard Demo, Lectures</p>
<p>Module V :</p> <p>Implementing Information Security</p> <ul style="list-style-type: none"> • Information security project management • Technical topics of implementation, Non-technical aspects of implementation • Security certification and accreditation <p>Security and Personnel</p> <ul style="list-style-type: none"> • Positioning and staffing security function • Employment policies and practices • Internal control strategies, Information security maintenance • Security management models, The maintenance model, Digital forensics 	<p>(9)</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p>	<p>Case Study</p>



Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• Detmar W Straub, Seymour Goodman, Richard L Baskerville, Information Security, Policy, Processes and Practices, PHI , 2008• Mark Merkow and Jim Breithaupt, Information Security Principles and Practices, Pearson Education, 2007
2.	Reference books: <ul style="list-style-type: none">• Michel E Withman and Herbert J Mattord, Principles and Practices of Information Security, Cengage Learning,2009• Thomas R Peltier, Justin Peltier, John Blackley, Information Security Fundamentals, Auerbach Publications, 2010



NETWORK SECURITY

Credits: 3

Course Code: MCA21303A

Semester: III

No of Lecture Hours: 3L + 0T

Course Objective:

- Understand the significant aspects of network security
- Comprehend secret and public key cryptography
- Learn hash functions and digital signatures
- Study the digital signatures and smart cards
- Comprehend the applications of network applications

Course Outcome:

CO1: Explain the fundamentals of network security

CO2: Elaborate the concepts secret and public key cryptography

CO3: Elucidate the hash functions digital signatures

CO4: Describe the digital signatures and smart cards

CO5: Explain the applications of network security

Course Content	Hours Allotted	Pedagogy
Module I: Introduction <ul style="list-style-type: none">• Attributes of Security• Integrity, Authenticity• Non-repudiation, Confidentiality Authorization• Anonymity, Types of Attacks, DoS• IP Spoofing, Replay, Man-in-the-Middle attacks• General Threats to Computer Network• Worms, Viruses, -Trojans	(9) 1 2 1 2 1 1 1	Group discussion on real-life hacking cases , Diagram-based lecture
Module II: Secret Key Cryptography <ul style="list-style-type: none">• DES, Triple DES• AES, Key distribution, Attacks	(9) 2 2	Flowcharts & Board Walkthrough, Discussion



Public Key Cryptography <ul style="list-style-type: none"> • RSA, ECC, Key Exchange (Diffie - Hellman) • Java Cryptography Extensions, Attacks 	3 2	
Module III : Integrity, Authentication and Non-Repudiation <ul style="list-style-type: none"> • Hash Function (MD5, SHA5) • Message Authentication Code (MAC) • Digital Signature (RSA, DSA Signatures), Biometric Authentication. 	(9) 2 2 5	Lectures
Module IV : PKI Interface <ul style="list-style-type: none"> • Digital Certificates, Certifying Authorities • POP Key Interface • System Security using Firewalls and VPN's. Smart Cards <ul style="list-style-type: none"> • Application Security using Smart Cards • Zero Knowledge Protocols and their use in Smart Cards • Attacks on Smart Cards 	(9) 1 2 1 1 2 2	Lectures, Assignments
Module V : Applications <ul style="list-style-type: none"> • Kerberos, Web Security Protocols (SSL), IPSec • Electronic Payments, E-cash, Secure Electronic Transaction (SET) • Micro Payments, Case Studies of Enterprise Security (.NET and J2EE) 	(9) 3 3 3	Case Study Presentation

Learning Resources	
1.	Textbook: <ul style="list-style-type: none"> • Joseph MiggaKizza, A Guide to Computer Network Security, Springer, 2010 • Dario Cataiano, Contemporary Cryptology, Springer, 2010
2.	Reference books: <ul style="list-style-type: none"> • William Stallings, Cryptography and Network Security, 4th Edition. Pearson,. 2009 • Behrouz A Forouzan, Cryptography and Network Security, TMH, 2009



BLOCK CHAIN TECHNOLOGY

Credits: 3

Semester: III

Course Code: MCA23303B

No of Lecture Hours: 3L + 0T

Course Objective:

- Learn the basic concept of Cryptographic Hash Functions, Hash Pointers
- Study Elliptic Curve Digital Signature Algorithm.
- A technical overview of decentralized digital currencies like Bitcoin, as well as their broader economic, legal and financial context.
- To get an insight into the working of the Bitcoin network Wallet
- Comprehend Bitcoin mining and distributed consensus for reliability.

Course Outcome:

CO1: Learn the basics of hash functions

CO2: Learn the importance of digital signature

CO3: Understand the structure of a block chain.

CO4: Learn different ways of storing Bitcoin keys, security measures.

CO5: Learn how Bitcoin relies on mining.

Course Content	Hours Allotted	Pedagogy
Module I: Introduction to Cryptography <ul style="list-style-type: none">• Cryptographic Hash Functions• SHA256, Hash Pointers and Data Structures• Merkle tree.	(9) 3 3 3	Power point presentations
Module II: Digital Signatures <ul style="list-style-type: none">• Elliptic Curve Digital Signature Algorithm (ECDSA)• Public Keys as identities• A Simple Crypto currency.	(9) 3 3 3	Lectures



<p>Module III :</p> <ul style="list-style-type: none"> • Centralization vs Decentralization • Distributed consensus, Consensus without identity using a block chain • Incentives and proof of work. <p>Mechanics of Bitcoin</p> <ul style="list-style-type: none"> • Bitcoin Transactions, Bitcoin Scripts • Applications of Bitcoin Scripts • Bitcoin Blocks, The Bitcoin Network. 	<p>(9) 2 2 2 1 1 1</p>	<p>Assignments</p>
<p>Module IV :Storage and Usage of Bitcoins</p> <ul style="list-style-type: none"> • Simple Local Storage, Hot and Cold Storage • Splitting and Sharing Keys • Online Wallets and Exchanges • Payment Services • Transaction Fees • Currency, Exchange Markets 	<p>(9) 1 1 2 1 2 2</p>	<p>Lectures</p>
<p>Module V :</p> <p>Bitcoin Mining</p> <ul style="list-style-type: none"> • The Task of Bitcoin miners • Mining Hardware, Mining pools • Mining incentives and strategies. <p>Bitcoin and Anonymity</p> <ul style="list-style-type: none"> • Anonymity Basics, Mixing • Zero coin and Zero cash • Applications of Block Chain Technologies 	<p>(9) 2 1 1 2 2 1</p>	<p>Discussions</p>



Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton Press, 2016.
2.	Reference books: <ul style="list-style-type: none">• Mastering Bitcoin: Programming the Open Blockchain by Andreas M. Antonopoulos Shroff, O'Reilly; 2nd Edition, 2017.



ANDROID APPLICATION DEVELOPMENT

Credits: 3

Semester: III

Course Code: MCA23303C

No of Lecture Hours: 3L + 0T

Course Objective:

- To understand the fundamentals of Android Operating Systems.
- To demonstrate the Android software development tools.
- To develop software with reasonable complexity on mobile platform.
- To deploy software to mobile devices.
- To debug programs running on mobile devices.

Course Outcome:

CO1: Compare different mobile application models/architectures and patterns

CO2: Apply a mobile development framework to the development of a mobile application.

CO3: Explain components and structure of a mobile development framework.

CO4: Develop advanced Java programming competency.

CO5: manage persistent data using files, shared preferences, SQLite, and content providers.

Course Content	Hours Allotted	Pedagogy
Module I: Overview of Android	(9)	
Introduction to Android		
● History of Android Platform Android APIs	1	
● Android Architecture, Application Framework	1	
● Features of Android, Android Components, Manifest File	1	
Downloading and Installing Android		Hands-on
● Android SDK, Android Virtual Device	2	Presentation
● Android Physical Device, Development Environment	1	
Developing and executing the First Android Application		
● Using Eclipse IDE to create an application, Running the Application	2	
● Exploring the Application, Using command-line tools	1	



<p>Module II:</p> <p>Working with Activities</p> <ul style="list-style-type: none"> • Creating an Activity, Starting an Activity, Lifecycle of an activity • Applying themes and styles to the activity • Displaying dialogs in the activity, Hiding the title of the activity <p>Intents</p> <ul style="list-style-type: none"> • Exploring Intent objects, Intent resolution, Intent Filters • Linking the Activities using Intent, Obtaining results from an Intent • Passing data Using an Intent Object <p>Fragments</p> <ul style="list-style-type: none"> • Life cycle of a fragment, Implementation • Using the Intent Object to Invoke Built-in-Application 	<p>(9)</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Use flowcharts to explain activity & fragment lifecycle</p>
<p>Module III : User Interface using Views and View Groups</p> <p>Working with view groups</p> <ul style="list-style-type: none"> • Linear layout, Relative layout, Scroll layout • Table layout, Frame layout, Tab layout <p>Working with views</p> <ul style="list-style-type: none"> • Text , Edit text, Button, Radio button, Checkbox • Image Button, Toggle button, Rating bar <p>Binding Data with the Adapter View Class</p> <ul style="list-style-type: none"> • List view, Spinner, Gallery view. <p>Implementing Screen Orientation, Handling UI Events</p> <ul style="list-style-type: none"> • With Activities, With Views 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>3</p> <p>2</p>	<p>Drag-and-drop layout in Android Studio</p>
<p>Module IV : Handling Pictures and Menus with Views</p> <p>Working with Image views</p> <ul style="list-style-type: none"> • Displaying image in gallery view and grid view • Designing context menu, Analog and Digital clock views • Embedding web browser in the Activity. • Notifications – Creating and Displaying notifications, Displaying Toasts 	<p>(9)</p> <p>2</p> <p>1</p> <p>3</p> <p>3</p>	<p>Assignment</p>



Module V :		
Persistent Storage	(9)	
<ul style="list-style-type: none">Using application specific folders and files, creating files, reading data from files	1	
<ul style="list-style-type: none">Listing contents of a directory shared preferences – creating shared preferences	2	
<ul style="list-style-type: none">Saving and retrieving data using shared preference	1	
Database		Lectures
<ul style="list-style-type: none">Introduction to SQLite database, creating and opening a database	1	
<ul style="list-style-type: none">creating and opening a database, creating tables	1	
<ul style="list-style-type: none">Inserting retrieving and deleting data	1	
<ul style="list-style-type: none">Registering Content Providers, using content providers – insert, retrieve and update	2	

Learning Resources	
1.	Textbook: <ul style="list-style-type: none">Pradeep Kothari. Android Application Development- Black Book. DreamTech press



OPERATIONS RESEARCH

Credits: 4

Semester: III

Course Code: MCA21304

No of Lecture Hours: 4L+0T

Course Objective:

To introduce general problem solving, learn skills needed for reading, analyzing and reviewing research papers.

Course Outcome:

CO1: Identifying the methods to solve LPP.

CO2: Applying OR to transportation problems.

CO3: Applying OR to Assignment problems and IPP.

CO4: Creating the network diagrams for Project management problems.

CO5: Analysing the game theory problems.

Course Content	Hours Allotted	Pedagogy
Module I: Linear Programming <ul style="list-style-type: none">• Introduction and Concept of Linear Programming Model• Development of LP models• Graphical Method• Linear Programming Methods• Special cases of Linear Programming• Duality• Sensitivity Analysis	(12) 1 1 1 3 2 1 3	Lecture + Graphical Solvers
Module II: Transportation Problem <ul style="list-style-type: none">• Introduction• Mathematical Model for Transportation Problem• Types of Transportation Problem• Methods to solve Transportation Problem• Transshipment Model	(12) 1 1 2 4 4	Step-by-step Whiteboard Solving + Worksheet Activities



<p>Module III : Assignment Problem</p> <ul style="list-style-type: none"> • Introduction and Zero-One Programming Model • Types of Assignment Problem and Hungarian Method • Branch-and-Bound Technique for Assignment Problem <p>Integer Programming</p> <ul style="list-style-type: none"> • Introduction, Integer Programming Formulations • The Cutting-Plane Algorithm • Branch-and-Bound Technique • Zero-One Implicit Enumeration Algorithm 	<p>(12)</p> <p>1</p> <p>2</p> <p>3</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p>	<p>Problem Solving in Groups</p>
<p>Module IV : Dynamic Programming</p> <ul style="list-style-type: none"> • Introduction • Applications of Dynamic Programming- Cargo Loading &Capital budgeting • Solution of Linear Programming Problem through Dynamic Programming <p>Project Management</p> <ul style="list-style-type: none"> • PERT and CPM-Introduction, difference between PERT and CPM • Significance of using PERT/CPM and Phases of Project management • PERT/CPM network components and Precedence relationships • Critical Path Analysis 	<p>(12)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>4</p> <p>3</p>	<p>Game Simulation + Payoff Matrix Design</p>
<p>Module V : Game Theory</p> <ul style="list-style-type: none"> • Introduction • Game with Pure Strategies, game with Mixed Strategies • Dominance Property • Graphical Method for 2 x n or m x2 Games • Linear Programming Approach for Game Theory 	<p>(12)</p> <p>1</p> <p>1</p> <p>2</p> <p>4</p> <p>4</p>	<p>Case-Based Learning + Excel Modelling</p>



Learning Resources	
1.	Textbook: <ul style="list-style-type: none">● Pannarselvam. 2006. Operations Research. (2nd Ed).India:PHI● Prem Kumar, Gupta. DS, Hira. 2010. Operations Research. S. Chand
2.	Reference books: <ul style="list-style-type: none">● Rathindra P, Sen. 2010. Operations Research-Algorithm and Application. India: PHI.● JK, Sharma. 2009. Operations Research. (4th Ed). India: Macmillan.



SOFTWARE ENGINEERING

Credits: 3

Semester: III

Course Code: MCA21305

No of Lecture Hours: 3L + 0T

Course Objective:

The basic objective of this course is to enlighten students and make them understand software engineering principles and train them on developing methods and procedures for software development.

Course Outcome:

CO1: Define Software Engineering and to know which model is suited according to the user specifications.

CO2: Explains about Software Requirement and Specifications (SRS) and to know the concepts of designing a project and what are the models used for designing.

CO3: To understand the places or parts of the project where design is to be conducted and the types of designs and how to identify and overcome the risks in a software project.

CO4: To know the importance of testing and to understand the importance of testing and understand various testing procedures and measurements used for testing the productivity of a software project.

CO5: To understand the importance of maintenance, reengineering and software process improvement in a software project.

Course Content	Hours Allotted	Pedagogy
Module I: Software and Software Engineering	(9)	
• The Nature of software, The Unique nature of Web Apps	1	
• Software Engineering, The Software Process	1	
• Software Engineering Practice	1	
The Software Process : Process Models		Power point presentations
• A Generic Process Model		
• Process Assessment and Improvement	1	
• Prescriptive Process Models, Specialized Process Models	1	
• The Unified Process, Process Technology, Product and Process	1	
	1	



<p>Agile Development</p> <ul style="list-style-type: none"> • Agile Process, Agile Development • Extreme Programming. 	<p>1 1</p>	
<p>Module II:</p> <p>Understanding Requirements</p> <ul style="list-style-type: none"> • Requirements Engineering • Eliciting Requirements • Developing Use Cases • Building the Requirements Model, Negotiating • Validating Requirements. <p>Requirements Modeling</p> <ul style="list-style-type: none"> • Requirement Analysis • Scenario Based Modeling • UML Models, Data Modeling Concepts, Class Based Modeling • Requirement Modeling Strategies, Flow-Oriented • Modeling, Behavioral Model, Patterns Requirements <p>Design Concepts</p> <ul style="list-style-type: none"> • Design Process, Concepts, Model <p>Architectural Design</p> <ul style="list-style-type: none"> • Architectural Styles, Architectural Design 	<p>(9) 1 1 1 1 1 1 1 1 1</p>	<p>Diagram-based explanation of architectural styles</p>
<p>Module III :</p> <p>Component Level Design</p> <ul style="list-style-type: none"> • Definition, Designing Class Based Components • Conducting Component Level Design • Designing Traditional Components, Component Based Development <p>Pattern Based Design</p> <ul style="list-style-type: none"> • Design Patterns, Pattern Based Software Design <p>Project Management Concepts</p> <ul style="list-style-type: none"> • The Management Spectrum, People, Product, Process, The Project • The W⁵HH Principle 	<p>(9) 1 1 1 1 1 1</p>	<p>Tool-Based Learning</p>



<p>Estimation for Software Projects</p> <ul style="list-style-type: none"> • Software Project Estimation • Empirical Estimation Models, The Make/Buy Decision • Project scheduling, Scheduling <p>Risk Management</p> <ul style="list-style-type: none"> • Reactive versus Proactive Risks, Software Risks, Risk Identification • Projection, Refinement, Risk Mitigation, Monitoring and Management • The RMMM Plan 	<p>1</p> <p>1</p> <p>1</p>	
<p>Module IV :</p> <p>Testing Strategies</p> <ul style="list-style-type: none"> • A strategic approach to software testing • Test strategies for conventional software, Validation testing, System testing • The Art of Debugging • Software Testing Fundamentals • White-Box testing, Basis Path Testing, Control Structure Testing • Black-Box Testing <p>Product metrics</p> <ul style="list-style-type: none"> • Framework for Product metrics, Metrics for Requirements Model • Metrics for Design Model • Metrics for source code, Metrics for testing, Metrics for maintenance <p>Process and Project Metrics</p> <ul style="list-style-type: none"> • Software Measurement, Metrics for software quality 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Practice task: Use a test case template</p>
<p>Module V : Maintenance and Reengineering</p> <ul style="list-style-type: none"> • Software Maintenance • Reengineering, Business Process Reengineering • Software Reengineering, Reverse Engineering • Restructuring, Forward Engineering • The Economics of Reengineering 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Case study</p>



Software Process Improvement	1	
• SPI, SPI Process	2	
• The CMMI, The People CMM	1	
• Other SPI Frameworks, SPI Return on Investment, SPI Trends		

Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• Software Engineering A Practitioner's Approach, Roger S Pressman, seventh edition. McGraw Hill International Edition.• Software Engineering, Ian Sommerville, eighth edition, Pearson education.
2.	Reference books: <ul style="list-style-type: none">• Software Engineering, A Precise Approach, PankajJalote, Wiley India, 2010.• Software Engineering: A Primer, Waman S Jawadekar, Tata McGraw-Hill, 2008• Fundamentals of Software Engineering, Rajib Mall, PHI, 2005• Software Engineering, Principles and Practices, Deepak Jain, Oxford University Press.

Loyola Academy, Alwal, Secunderabad 500 010



INTERNET TECHNOLOGIES

Credits: 3

Semester: III

Subject Code: MCA25306

No. of lecture hours: 3L+0T

Objectives:

- To enable students to learn to produce well designed, dynamic web applications
- To introduce tools, technologies and framework hence node.js, angular, react.js introduced to enhance web development skills.
- To develop full-stack web applications using MERN/MEAN

Frontend Development (Client-Side)

- HTML, CSS, JavaScript/typescript (fundamentals for building UI).
- React.js: A JavaScript library for building user interfaces.
- Angular: A TypeScript-based framework for building web applications.
- Frameworks:
- Node.js: JavaScript runtime for building scalable server-side applications.
- Express.js: Minimal Node.js framework for building APIs.

Backend Development (Server-Side)

Languages:

- JavaScript/TypeScript: Used with Node.js for backend development.

Course Outcomes:

CO1: Explain basics of HTML , CSS, JavaScript, and oops concepts

CO2: Explain the basics of TypeScript

CO3: Create Express with nodejs

CO4: Basics of react.js to build dynamic SPAs

CO5: Create dynamic web pages using angular and data integration using express

Unit-I

- HTML
- CSS
- Basics of Java Script
- Objects, oops

9Hrs

1
1
1
1

Master of Computer Applications 24 W.e.f. Academic Year 2025-26(CBCS)

P.V. Subbarao

PROFESSOR
Department of Computer Science & Engineering
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- Operators and expressions 1
- Control statements 1
- Arrays and functions 1
- Constructors
- Pattern Matching using RegExpressions 1

Unit-II

9Hrs

Basics of TypeScript

- Static Typing 1
- Interfaces 1
- Classes
- Modules and Namespaces 1
- Generics
- Decorators
- Type assertions 2
- Union and Intersection Types
- Enums
- Type Guards 2
- Async/Await with typescript
- Utility Types
- Advanced Types 2
- Strict Null Checking
- Integration with frameworks (angular, react)

Unit -III

9Hrs

Introduction to Node.js

- Saving time with express 1
- Tidying Up 1
- The Request and Response Objects 1
- Form Handling -Restful methods 2
- Routing 1
- Database Integration 1
- Implementing MVC in express 1

Unit-IV

9 Hrs

React.js

Master of Computer Applications 25 W.e.f. Academic Year 2025-26(CBCS)

P.V. Sushra

PROFESSOR

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• Components	1
• JavaScript XML	1
• Properties	
• State	1
• Lifecycle Methods	
• Context API	1
• Routing	
• Higher-order Components (HOCs)	2
• React Fragments	1
• Performance Optimization	1
• Testing	1

Unit -V

9Hrs

Angular

• Overview, environment setup	1
• Project Setup	1
• Components, Modules	2
• Data binding, Event Binding	1
• Templates	1
• Directives, Pipes	2
• Routing, forms	1

ESSENTIAL READING

1. Learning TypeScript 2.x - Second Edition: Develop and maintain captivating web applications with ease by Remo H Jansen, Packt Publishing
2. Learn React with TypeScript 3: Beginner's guide to modern React web development with TypeScript 3 by Carl Rippon, Packt Publishing
3. Web Technologies, Uttam K Roy, Oxford University Press,2010.
4. ng-book The Complete Book on Angular,Nate Murray,Felipe Coury,Ari Lerner,Carlos Taborda,2021 Edition.
5. Web Development with Node & Express, Ethan Brown, O'reilly Publication,July 2014WEB
6. Learning React: Functional Web Development with React and Redux (Greyscale Indian Edition) Paperback – 1 January 2017 by Alex Banks (Author), Eve Porcello (Author),O'Reilly
7. React: Up & Running - Building Web Applications, Second Edition (Grayscale Indian Edition), by Stoyan Stefanov O'Reilly

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W of Academic Year 2025-26(CBCS)

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Loyola Academy, Alwal, Secunderabad 500 010



SUGGESTED READING

1. Programming world wide web, R.W. Sebesta, Fourth edition, Pearson.
2. Dieterl, Deitel & NIETO, "Internet & World Wide Web- How to Program", Pearson Education, Third Edition, 2004.
3. Steven Holzner, "HTML Black Book – Comprehensive Problem Server", Dream Tech Press, 2000
4. B Sosinsky, V Hilley, "Programming the Web – An Introduction ", MGH, 2004
5. Fullstack React: The Complete Guide to ReactJS and Friends" by Accomazzo, Murray, and Lerner, Fullstack.io
6. Mastering TypeScript" by Nathan Rozentals, Packt Publishing

WEB REFERENCES:

1. <https://www.tutorialsteacher.com/angularjs/angularjs-validation-css-classes>.
2. <https://docs.angularjs.org/tutorial>
3. <https://reactjs.org/docs/thinking-in-react.html>

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DEEP LEARNING

Credits: 3

Semester: III

Course Code: MCA23307

No of Lecture Hours: 3L+0T

Course Objective:

- Learn deep learning basics and optimization algorithms.
- Understand deep learning computation, CNNs and moderns CNNs.
- Study recurrent neural networks and its modern versions.
- Learn computer vision.
- Comprehend GANs

Course Outcome:

CO1: Learn deep learning basics and optimization algorithms.

CO2: Understand deep learning computation, CNNs and moderns CNNs.

CO3: Study recurrent neural networks and its modern versions.

CO4: Learn computer vision.

CO5: Comprehend GANs.

Course Content	Hours Allotted	Pedagogy
Module I: Introduction	(9)	
• A motivating example, the key components, Data, models, and algorithms	1	Graphical explanation, Assignment
• Kinds of machine learning, the road to deep learning, success stories	1	
• Linear regression, multilayer perceptron's, model selection	1	
• Underfitting and overfitting, weight decay, dropout, forward propagation	1	
• Backward propagation and computational graphs	1	
• Numerical stability and initialization	1	
• Considering the environment, predicting house prices on Kaggle	1	



<p>Optimization algorithms</p> <ul style="list-style-type: none"> • Optimization and deep learning, convexity, gradient descent • Momentum, adagrad, rmsprop, adadelata, adam, learning rate scheduling 	<p>1</p> <p>1</p>	
<p>Module II: Deep learning computation</p> <ul style="list-style-type: none"> • Layers and blocks, parameter management • Deferred initialization, custom layers, file i/o, gpus <p>Convolutional neural networks</p> <ul style="list-style-type: none"> • From dense layers to convolutions, convolutions for images • Padding and stride, multiple input and output channels • Pooling, convolutional neural networks(lenet) <p>Modern Convolutional neural networks</p> <ul style="list-style-type: none"> • Deep Convolutional neural networks(alexnet), Networks using blocks (VGG) • Networks with parallel concatenations(googlenet) • Batch normalization, residual networks(resnet) • Densely connected networks(densenet) 	<p>(9)</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p>	<p>Hands-on lab, Live demo: Using GPUs on Google Colab</p>
<p>Module III : Recurrent neural networks</p> <ul style="list-style-type: none"> • Sequence models, text processing • Language models and the dataset, recurrent neural networks • Back propagation through time <p>Modern Recurrent neural networks</p> <ul style="list-style-type: none"> • Gated recurrent units (GRU), long short-term memory (LSTM) • Deep recurrent neural networks, bidirectional recurrent neural networks • Machine translation and the dataset • encoder-decoder architecture, sequence to sequence <p>Attention mechanism</p> <ul style="list-style-type: none"> • Attention mechanism • Sequence to sequence with attention mechanism, transformer 	<p>(9)</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p>	<p>Code demo, Group activity</p>



<p>Module IV : Computer vision</p> <ul style="list-style-type: none"> • Image augmentation fine tuning • Object detection and bounding boxes, anchor boxes • Multi-scale object detection, the object detection dataset • Single shot multiboxdetection(SSD), region based cnns(R-cnns) • Semantic segmentation and the dataset, transposed convolution • Fully convolutional networks(FCN), neural style transfer • Image classification(CIFAR-10) on kaggle • Dog breed identification (Imagenet dogs) on kaggle 	<p>(9)</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p>	<p>Hands-on Labs, Guide students through Kaggle challenges</p>
<p>Module V :</p> <p>Generative adversarial networks</p> <ul style="list-style-type: none"> • Generative adversarial networks • Deep convolutional generative adversarial networks <p>Tools for deep learning</p> <ul style="list-style-type: none"> • Using jupyter, using amazon sagemaker • Using aws ec2 instances • Using googlecolab, selecting servers and gpus 	<p>(9)</p> <p>2</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p>	<p>Code Demo, Practice Lab</p>

Learning Resources	
1.	<p>Textbook:</p> <ul style="list-style-type: none"> • Deep Learning: An MIT Press Book By Ian Goodfellow and YoshuaBengioand Aaron Courville • Neural Networks and Learning Machines, Simon Haykin, 3rd Edition, Pearson Prentice Hall.
2.	<p>Web Sorces:</p> <ul style="list-style-type: none"> • Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016. Link: https://www.deeplearningbook.org • Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola, Dive into Deep Learning, 2020 Link: Dive into Deep Learning- Dive into Deep Learning 0.16.6 documentation (https://d2l.ai/)



(Programming Lab VII)

SOFTWARE ENGINEERING LAB

Credits: 2

Semester: III

Course Code: MCA21308

No of Practical Hours: 60

Project Description: Develop Software Requirement Specification Sheet (SRS) for any one of the below listed projects. Please check below for more details on exercises involved as part of this project work, most importantly this project should be done using Agile (Scrum) mythologies. You can refer to Agile Scrum Guide and Methodologies supplied as part of references.

Software Engineering Lab Tool Required: Rational Rose Enterprise Edition

Scrum: The Scrum Guide by Ken Schwaber and Jeff Sutherland 2020

List of exercises / experiments:

1. Write down the problem statement for a suggested system of relevance.
2. Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
3. To perform the Function-Oriented diagram: Data Flow Diagram (DFD) and Structured chart
4. To perform the User 's view analysis for the suggested system: Use case diagram.
5. To draw the Structural view diagram for the system: Class diagram, object diagram.
6. To draw the Behavioral view diagram: State-chart diagram, Activity diagram
7. To perform the Behavioral view diagram for the suggested system: Sequence diagram, Collaboration diagram
8. To perform the Implementation view diagram: Component diagram for the system.
9. To perform the Environmental view diagram: Deployment diagram for the system.
10. To perform various testing using the testing tool unit testing, integration testing for a sample code of the suggested system.



Choose any one project and perform above exercises

- a. Student Result Management System
- b. Library management system
- c. Fast food billing system
- d. Railway reservation system
- e. Automatic teller machine
- f. Hotel management system

Learning Resources

Textbook:

1.
 - K.K. Aggarwal & YogeshSingh, —**Software Engineering**, New Age International, 2005
 - Pankaj Jalote, —**An Integrated Approach to Software Engineering**, Second Edition, Springer.
 - **The Unified Modeling language user guide** Grady Booch, James Rumbaugh, Ivar Jacobson, Pearson Education

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(Programming Lab II)

INTERNET TECHNOLOGIES LAB

Credits: 2

Semester: III

Subject Code: MCA25309

No. of practical hours: 60

Objectives:

- To enable students to practice well designed, dynamic Web applications
- To practice tools, technologies and framework hence Angular, Java script, type Script, Node.js, React.js and express are introduced to enhance web development skills

Outcome:

- The student will be able to design and develop applications using advanced frameworks like Angular, Node.js, React.js
1. Write a Java Script program on operators and expressions
 2. Write Script program on functions
 3. Write java script program on arrays
 4. Write java script program on pattern Matching
 5. Write java script program on control Statements
 6. Write program on type script
 7. Write programs on css, scss, sass
 8. Write angular program on Data binding, event binding, templates
 9. Write angular program on directives, Pipes, Routing, Forms
 10. Write Express program on Form Handling
 11. Write Express program on Routing
 12. Write a program for implementing MVC in express
 13. Write node.js program on Request and Response objects
 14. Write node.js/express program for Database Integration
 15. Write a code to design a web page for sign-in and register using React (UI)
 16. Write the code to design a web page for sign-in and register using angular(UI)
 17. Building a user Register/login web application.
 18. Building a products management application insert product, update product, view products using both angular and react.
 19. Build Restful API using MERN/MEAN

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(Programming Lab IX)
DEEP LEARNING LAB

Credits: 2

Course Code: MCA23310

Semester: III

No of Practical Hours: 60

Course Objective:

- To Build the Foundation of Deep Learning.
- To Understand How to Build the Neural Network.
- To enable students to develop successful machine learning concepts.

Course Outcome:

- Implement deep neural networks to solve real world problems.
- Choose appropriate pre-trained model to solve real time problem.
- Interpret the results of two different deep learning models.

Software Packages required:

- Keras
- Tensorflow
- PyTorch

List of Experiments:

1. Implement multilayer perceptron algorithm for MNIST Hand written Digit Classification.
2. Design a neural network for classifying movie reviews (Binary Classification) using IMDB dataset.
3. Design a neural Network for classifying news wires (Multi class classification) using Reuters dataset.
4. Design a neural network for predicting house prices using Boston Housing Price dataset.
5. Build a Convolution Neural Network for MNIST Hand written Digit Classification.
6. Build a Convolution Neural Network for simple image (dogs and Cats) Classification
7. Use a pre-trained convolution neural network (VGG16) for image classification.
8. Implement one hot encoding of words or characters.
9. Implement word embedding for IMDB dataset.
10. Implement a Recurrent Neural Network for IMDB movie review classification problem.



Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• Reza Zadeh and BharathRamsundar, “Tensorflow for Deep Learning”, O’Reilly publishers, 2018• Francois Chollet. Deep Learning with python. Manning Publications,2018.
2.	Reference books: <ul style="list-style-type: none">• AurelienGeron. Hands on Machine Learning with SciKit-Learn, Keras and Tensor Flow. O’Reilly publishers, 2019
3	WEB REFERENCES: <ul style="list-style-type: none">• https://github.com/fchollet/deep-learning-with-python-notebooks



Fourth Semester Scheme

Year-wise and Semester-Wise Distribution of Courses Department of Master of Computer applications Second Year Second Semester Academic Year 2025-26 of 2024 – 2026 Batch (CBCS)									
Sl. No.	Part	Course Code	Title of the Course	Hours / Week	Duration of Exam (hrs.)	Marks			Credits
						Internal	External	Total	
DSE – I									
1	II	MCA21401A	Software Testing	3	3	40	60	100	3
	II	MCA23401B	Cloud Computing						
	II	MCA21401C	Cyber Security						
DSE – II									
2	II	MCA23402A	Natural Language Processing	3	3	40	60	100	3
	II	MCA23402B	Big Data Analytics						
	II	MCA23402C	Social Media Analytics						
OE									
3	I	OE21401A	Environmental Science	2	3	40	60	100	2
	I	OE21401B	Constitution of India						
	I	OE21401C	Disaster Management						
PRACTICALS									
4	II	MCA21403	Project Work	24	3	50	100	150	12
Total				32		170	280	450	20
DSE (Discipline Specific Elective) *OE (Open Elective)									



SOFTWARE TESTING

Credits: 3

Semester: IV

Course Code: MCA21401A

No of Lecture Hours: 3L

Course Objective:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing.

Course Outcome:

CO1: Express importance of testing in software development process, glass-box testing, black-box testing, and how to report and analyse bugs.

CO2: Design different types of test case.

CO3: Organize how to build testing strategy, establishing software testing methodology and software testing techniques.

CO4: Identify the definition of quality, metrics for software quality and inspection techniques.

CO5: Identify the definition of quality, metrics for software quality and inspection techniques.

Course Content	Hours Allotted	Pedagogy
Module I: A Mathematical Context <ul style="list-style-type: none">• A Perspective on Testing, Examples Functional Testing• Boundary Value Testing, Equivalence Class Testing• Decision Table-Based Testing• Retrospective on Functional Testing	(9) 2 3 2 2	Power point presentations+ Lectures
Module II: Structural Testing: <ul style="list-style-type: none">• Path Testing, Dataflow Testing• Retrospective on Structural Testing	(9) 4 5	Power point presentations +Diagrams



Module III: Integration and System Testing: <ul style="list-style-type: none"> • Levels of Testing • Integration Testing • System Testing • Interaction Testing. 	(9) 3 2 2 2	Lecture + case study
Module IV: Object-Oriented Testing: <ul style="list-style-type: none"> • Issues in Object-Oriented Testing, Class Testing • Object-Oriented Integration Testing • GUI Testing, Object-Oriented System Testing 	(9) 3 3 3	UML Diagrams, Discussion
Module V: Millennium Testing: <ul style="list-style-type: none"> • Exploratory Testing, Model-Based Testing • Test-Driven Development, All Pairs Testing • Software Testing Excellence • Test adequacy assessment using: control flow, data flow, and program mutations 	(9) 3 2 2 2	Interactive Task, Group activity

Learning Resources	
1.	Textbook: <ul style="list-style-type: none"> • Paul C. Jorgensen, Software Testing: A Craftsman’s Approach, 3rd Edition, CRC Press, 2007. • William E. Perry. Effective Methods for Software Testing: Includes Complete Guidelines, Checklists, and Templates 3rd Edition. Wiley Publishers, 3rd Edition, USA
2.	Reference books: <ul style="list-style-type: none"> • Boris Beizer, Software Testing Techniques, Dreamtech, 2009.



CLOUD COMPUTING

Credits: 3

Semester : IV

Course Code: MCA23401B

No of Lecture Hours: 3L

Course Objective:

To introduce the fundamental information of cloud computing, what cloud computing is about, available services and key players, cloud computing benefits

Course Outcome:

CO1: Illustrate the main concepts, features, challenges and risks in cloud computing.

CO2: Describe virtualization of clusters and Data centres, virtual clusters and resource management.

CO3: Identify the architectures over virtualized data centres.

CO4: Explain the core issues of cloud computing such as cloud security and trust management.

CO5: Compare various cloud programming and software environments.

Course Content	Hours Allotted	Pedagogy
Module I: Introduction to Cloud Computing <ul style="list-style-type: none">• Cloud Computing in a Nutshell• System Models for Distributed and Cloud Computing• Roots of Cloud Computing• Grid and Cloud• Layers and Types of Clouds• Desired Features of a Cloud• Basic Principles, Challenges and Risks• Service Models	(9) 1 2 1 1 1 1 1	Power point presentations +Lectures
Module II: Virtualization and Resource Management <ul style="list-style-type: none">• Virtual Machines and Virtualization of Clusters and Data Centers• Levels, Tools, and Structures of Virtualization• CPU, Memory, I/O Virtualization	(9) 1 2 1 1	Case Studies



<ul style="list-style-type: none"> • Virtual Clusters, Resource Management • Case Study: Xen VM Monitors & API • VMware: Products and Features • Microsoft Virtual Server: Features 	<p>2</p> <p>1</p> <p>1</p>	
<p>Module III: Cloud Architectures Over Virtualized Data Centers</p> <ul style="list-style-type: none"> • Data Center Design, Interconnection Networks • Architectural Design of Compute and Storage Clouds • Public Cloud Platforms: GAE, AWS, Azure • Inter-cloud Resource Management 	<p>(9)</p> <p>2</p> <p>2</p> <p>1</p> <p>4</p>	<p>Mini research task</p>
<p>Module IV: Cloud Security and Trust Management</p> <ul style="list-style-type: none"> • Introduction to Data Security • Current State of Cloud Data Security • Homo Sapiens and Digital Information • Cloud Computing and Data Security Risks • Identity in the Cloud • Digital Identity and Data Security • Content Level Security – Pros and Cons 	<p>(9)</p> <p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Lectures + Case Studies</p>
<p>Module V: End-User Access to Cloud Computing</p> <ul style="list-style-type: none"> • YouTube, YouTube API Overview, widgets, YouTube Player APIs • The YouTube Custom Player, YouTube Data API • Zimbra, Zimbra Collaboration Suite (ZCS) • Facebook, Facebook Development • Zoho, ZohoCloud SQL,Dim Dim Collaboration <p>Cloud Programming and Software Environments</p> <ul style="list-style-type: none"> • Features of Cloud and Grid Platforms • Parallel and Distributed Programming Paradigms • Programming Support of Google App Engine • Programming on Amazon AWS and Microsoft Azure Emerging Cloud Software Environments 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Assignments / Lectures</p>



Learning Resources	
1.	<p>Textbook:</p> <ul style="list-style-type: none">• Rajkumar Buyya, James Broberg and Andrzej M. Goscinski. Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing). Wiley Publishing. 2011 (unit-I,IV some part)• John W. Rittinghouse, James F. Ransome. Cloud Computing: Implementation, Management, and Security. CRC Press. 2009 (unit-V)• Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, Distributed and Cloud Computing From Parallel Processing to the Internet of Things. 2012. Elsevier. (unit-II, unit-III, unit-V)
2.	<p>Referencebooks:</p> <ul style="list-style-type: none">• Raluca Ada Popa, Catherine M.S. Redfield, NikolaiZeldovich, and HariBalakrishnan. Crypt DB: Protecting Confidentiality with encrypted Query Processing.23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal.• Craig Gentry. September A Fully Homomorphic Encryption Scheme. 2009.• David Marshall, Wade A. Reynolds. Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center. Auerbach Publications. 2006.
3.	<p>Other Electronic resources:</p> <ul style="list-style-type: none">• https://aws.amazon.com/• https://code.google.com/appsengine• http://www.buyya.com/



CYBER SECURITY

Credits: 3

Semester: IV

Course Code: MCA21401C

No of Lecture Hours: 3L

Course Objective:

- To learn about cybercrimes and how they are planned. To learn the vulnerabilities of mobile and wireless devices. To learn about the crimes in mobile and wireless devices

Course Outcome:

CO1: Ability to understand about cybercrimes, cyber offenses, and attacks.

CO2: Analyze and evaluate the cyber security needs of an organization.

CO3: Explain cyber laws and its implications.

CO4: Understand the concepts of computer forensics.

CO5: Understand cyber security concepts and social media marketing.

Course Content	Hours Allotted	Pedagogy
Module I: Introduction to Cybercrime	(9)	
<ul style="list-style-type: none">• Introduction, Cybercrime and Information Security• Who are cybercriminals? Classifications of Cybercrimes	1 1	
Cybercrime		
<ul style="list-style-type: none">• The Legal Perspectives and Indian Perspective• Cybercrime and the Indian ITA 2000• A Global Perspective on Cybercrimes	1 1 1	Power point presentations, Lectures
Cyber Offenses		
<ul style="list-style-type: none">• How Criminals Plan Them: Introduction• How Criminals Plan the Attacks, Social Engineering• Cyber Stalking, Cyber Café and Cybercrimes	1 1 1	



<p>Botnets</p> <ul style="list-style-type: none"> • The Fuel for Cybercrime, Attack Vector • Cloud Computing 	<p>1</p>	
<p>Module II: Cybercrime Involving Mobile and Wireless Devices</p> <ul style="list-style-type: none"> • Mobile and Wireless Devices: Introduction • Proliferation of Mobile and Wireless Devices, Trends in Mobility • Credit Card Frauds in the Mobile and Wireless Computing Era, • Security Challenges Posed by Mobile Devices • Registry Settings for Mobile Devices, Authentication Service Security • Attacks on Mobile/Cell Phones, Mobile devices • Security Implications for Organizations Organizational Measures for Handling Mobile • Organizational Security Policies and Measures in the Mobile Computing Era, Laptops 	<p>(9)</p> <p>1 2 1 1 1 2 1</p>	<p>Lectures, Infographics,Case Studies</p>
<p>Module III: Cybercrimes and Cyber Security</p> <ul style="list-style-type: none"> • Legal Perspectives: Cybercrime and Legal Landscape Around the World <p>Why Do We Need Cyber Laws</p> <ul style="list-style-type: none"> • The Indian Context, The Indian IT Act • Challenges to Indian Law and Cybercrime Scenario in India • Digital Signatures and the Indian IT Act, Amendments to the Indian IT Act • Cybercrime and Punishment, Cyber Law 	<p>(9)</p> <p>2 1 2 2 1</p>	<p>Lecture, Legal Framework Chart</p>



<p>Technology and Students</p> <ul style="list-style-type: none"> • Indian Scenario 	<p>1</p>	
<p>Module IV: Understanding Computer Forensics</p> <ul style="list-style-type: none"> • Introduction, Historical Background of Cyber Forensics • Digital Forensics Science, The Need for Computer Forensics • Cyber Forensics and Digital Evidence • Forensics Analysis of Email • Digital Forensics Lifecycle, Chain of Custody Concept • Network Forensics, Approaching a Computer Forensics Investigation • Challenges in Computer Forensics • Special Tools and Techniques • Forensics Auditing 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Flowchart, Case Analysis</p>
<p>Module V: Cyber Security</p> <ul style="list-style-type: none"> • Organizational Implications: Introduction • Cost of Cybercrimes and IPR Issues • Web Threats for Organizations • Security and Privacy Implications <p>Social Media Marketing</p> <ul style="list-style-type: none"> • Security Risks and Perils for Organizations • Social Computing and the Associated Challenges for Organizations 	<p>(9)</p> <p>1</p> <p>2</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p>	<p>PPT, Case Studies</p>



Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA, 1 edition (January 1, 2011).• Introduction to Cyber Security, Chwan-Hwa(john) Wu,J.DavidIrwin.CRC Press T&F Group, 1 edition.
2.	Reference books: <ul style="list-style-type: none">• Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.



NATURAL LANGUAGE PROCESSING

Credits: 3

Semester: IV

Course Code: MCA23402A

No of Lecture Hours: 3L

Course Objective:

- The goal is to make familiar with the concepts of the study of human language from a computational perspective.
- It covers syntactic, semantic and discourse processing models, emphasizing machine learning concepts.

Course Outcome:

CO1: Understand about Background of NLP, NLP applications and NLTK.

CO2: Understand various approaches on parsing and syntax.

CO3: Describe n-gram models, pos tagging, semantic analysis and discourse processing.

CO4: Analyze various methodologies used in Machine Translation; know about natural language generations with translation systems.

CO5: Understand about Information Retrieval and Lexical resources.

Course Content	Hours Allotted	Pedagogy
Module I: Introduction to NLP <ul style="list-style-type: none">• Introduction to NLP, Background, and Overview• NLP Applications – NLP Hard Problems, Ambiguity, Algorithms and Models• Knowledge Bottlenecks in NLP, Introduction to NLTK, Case Study	(9) 3 3 3	Power point presentations, Lectures
Module II: Parsing and Syntax <ul style="list-style-type: none">• Word Level Analysis: Regular Expressions, Text Normalization• Edit Distance, Parsing and Syntax, Spelling, Error	(9) 2 3	Case Studies



<p>Detection and Correction</p> <ul style="list-style-type: none"> • Words and Word Classes, Part-of-Speech Tagging • Naive Bayes and Sentiment Classification: Case Study 	<p>2</p> <p>2</p>	
<p>Module III: Smoothed Estimation and Language Modelling</p> <ul style="list-style-type: none"> • N-gram Language Models: N-Grams • Evaluating Language Models, The Language Modelling Problem <p>Semantic Analysis and Discourse Processing</p> <ul style="list-style-type: none"> • Semantic Analysis: Meaning Representation, Lexical Semantics • Ambiguity, Word Sense Disambiguation 	<p>(9)</p> <p>3</p> <p>2</p> <p>2</p> <p>2</p>	<p>Lectures, Whiteboard</p>
<p>Module IV: Natural Language Generation and Machine Translation</p> <ul style="list-style-type: none"> • Natural Language Generation: Architecture of NLG Systems, Applications • Machine Translation: Problems in Machine Translation • Machine Translation Approaches, Evaluation of Machine Translation Systems • Case Study: Characteristics of Indian Languages 	<p>(9)</p> <p>3</p> <p>2</p> <p>2</p> <p>2</p>	<p>Case Study Presentation, Assignment</p>
<p>Module V: Information Retrieval and Lexical Resources</p> <ul style="list-style-type: none"> • Information Retrieval: Design Features of Information Retrieval Systems • Classical, Non-Classical, Alternative Models of Information Retrieval • Evaluation of Lexical Resources: Word Embeddings – Word2Vec – GloVe 	<p>(9)</p> <p>2</p> <p>2</p> <p>2</p>	<p>Lectures, Case Studies</p>



<ul style="list-style-type: none">• Recommender Systems, Long Short-Term Memory (LSTM)	2	
<ul style="list-style-type: none">• Linear Discriminant Analysis (LDA)	1	

Learning Resources

1.	Textbook: <ul style="list-style-type: none">• Speech and Language Processing, Daniel Jurafsky and James H., 2nd Edition, Martin Prentice Hall, 2013.• Foundations of Statistical Natural Language Processing. Cambridge, MA: MIT Press, 1999.
2.	Reference books: <ul style="list-style-type: none">• Foundations of Computational Linguistics: Human-computer Communication in Natural Language, Roland R. Hausser, Springer, 2014.• Steven Bird, Ewan Klein and Edward Loper Natural Language Processing with Python, O'Reilly Media; 1 edition, 2009.



BIG DATA ANALYTICS

Credits: 3

Semester: IV

Course Code: MCA23402B

No of Lecture Hours: 3L

Course Objective:

- To optimize business decisions and create competitive advantage with Big Data analytics.
- To derive business benefit from unstructured data
- To impart the architectural concepts of Hadoop and introducing map reduce paradigm.
- To introduce programming tools PIG & HIVE in Hadoop ecosystem.

Course Outcome:

CO1: Understand Big Data fundamentals, tools, and career opportunities.

CO2: Explain the components of the Hadoop ecosystem and apply the Map Reduce framework for data processing.

CO3: Analyze and implement resource management using YARN architecture.

CO4: Perform data operations and construct queries using Hive for efficient data handling.

CO5: Explore data analysis with Pig and differentiate various NoSQL database models.

Course Content	Hours Allotted	Pedagogy
Module I:	(9)	
• What is Big Data? History of Data Management, Evolution of Big Data	1	
• Structuring Big Data, Elements of Big Data	2	
• Big Data Analytics, Careers and Future of Big Data	1	Power point presentations,
• Importance and Scope of Big Data Jobs, Opportunities	1	Lectures
• Skill Assessment, Roles, and Responsibilities in Big Data Jobs	1	
• Basic Educational and Technological Requirements for Big Data Jobs	2	



<ul style="list-style-type: none"> Tools Supporting Big Data 	1	
<p>Module II: Understanding Hadoop Ecosystem</p> <ul style="list-style-type: none"> Introducing Hadoop Hadoop Ecosystem Difference Between Client Server and Distributed OS Hadoop Distributed File System MapReduce, Hadoop Yarn, Introducing HBase, Combining HBase and HDFS Hive, Pig and Pig Latin, Sqoop, Zookeeper, Flume and Oozie <p>Understanding MapReduce Fundamentals and HBase</p> <ul style="list-style-type: none"> The MapReduce Framework Techniques to Optimize MapReduce Jobs Uses of MapReduce, Characteristics of HBase 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Classroom Discussion, Tutorial</p>
<p>Module III: Understanding Hadoop YARN Architecture</p> <ul style="list-style-type: none"> Background and Advantages of YARN YARN Architecture Working of YARN, YARN Schedulers YARN Configurations YARN Commands YARN Containers 	<p>(9)</p> <p>1</p> <p>1</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p>	<p>Whiteboard Explanation, Assignments</p>
<p>Module IV: Exploring HIVE</p> <ul style="list-style-type: none"> Introducing Hive Getting Started with Hive Data Types and Built-in Functions in Hive Hive DDL Data Manipulation in Hive Data Retrieval Queries Using Joins in Hive 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p>	<p>Class Exercise</p>



<p>Module V: Analysing Data with Pig</p> <ul style="list-style-type: none"> • Introducing Pig, Running Pig • Getting Started with Pig Latin • Working with Operators in Pig • Working with Functions in Pig • Debugging Pig, Error Handling in Pig <p>NoSQL Data Management</p> <ul style="list-style-type: none"> • Introduction to NoSQL • Types of NoSQL Data Models • Schema-Less Databases, Materialized Views • Distribution Models, Sharding 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Interactive Quiz, Assignments</p>
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Learning Resources

1.	<p>Textbook:</p> <ul style="list-style-type: none"> • DT Editorial Services. 2016. Big Data Black Book. Dreamtech Press • Tom White ,Hadoop: The Definitive Guide, 3rd Edition, O’reilly
2.	<p>Reference books:</p> <ul style="list-style-type: none"> • Chuck Lam, Hadoop in Action, MANNING Publication ,2010. • Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss,Hadoop for Dummies,Wiley Publication, 2014.



SOCIAL MEDIA ANALYTICS

Credits: 3

Semester: IV

Course Code: MCA23402C

No of Lecture Hours: 3L

Course Objective:

The objective of this course is to enhance skills of the student in the area of social media, to extract data from social media platforms and transform them into actions resulting in improved business values.

Course Outcome:

CO1: Identify various platforms in social media.

CO2: Understand processing of social media.

CO3: Compare differences between twitter and other social media networks.

CO4: Analyze Face book information and write business cases.

CO5: Differentiate social media networks Instagram (i.e., usage of Instagram and data Processing techniques also they will get idea)

Course Content	Hours Allotted	Pedagogy
Module I: <ul style="list-style-type: none">• Social Media and Its Importance• Various Social Media Platforms• Social Media Mining• Challenges for Social Media Mining• Social Media Mining Techniques	(9) 2 2 1 2 2	Power point presentations, Lectures
Module II: <ul style="list-style-type: none">• Types of Social Media Networks• Generic Process of Social Media Mining• Preprocessing and Cleaning in R• Data Modeling Steps• Sentiment Analysis• Steps in Sentiment Analysis• Business Case	(9) 1 2 1 1 2 1 1	Case Studies, Assignments



<p>Module III: Twitter</p> <ul style="list-style-type: none"> • Twitter and Its Importance • Understanding Twitter APIs • Collecting Twitter User Features from APIs • Twitter Vocabulary • Twitter Sentiment Analysis: Business Case 	<p>(9)</p> <p>2</p> <p>1</p> <p>2</p> <p>2</p> <p>2</p>	<p>Presentations</p>
<p>Module IV: Face book</p> <ul style="list-style-type: none"> • Social Network Analysis and Visualization • Getting Face book Page Data • Trend Analysis, • Spam Detection • Business Case <p>Instagram</p> <ul style="list-style-type: none"> • Access Data from R, • Building a Dataset • Popular Personalities • Finding Most Popular Destination • Clustering the Pictures • Recommendations to the Users, Business Case 	<p>(9)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Assignments</p>
<p>Module V:More Social Media Websites</p> <ul style="list-style-type: none"> • Searching on Social Media, Accessing Product Reviews from Sites • Retrieving Data from Wikipedia, Accessing Data from Quora • Mapping Solutions from Google Maps • Professional Network Data from LinkedIn • Getting Blogger Data 	<p>(9)</p> <p>2</p> <p>2</p> <p>2</p> <p>1</p> <p>2</p>	<p>Lectures, Group Activity</p>



Learning Resources

1.

Textbook:

- Ravindran, Sharan Kumar. Garg, Vikram. 2015. **Mastering Social Media Mining with R.**
- **Social Media Data Mining and Analytics**, Gabor Szabo, Gungor Polatkan, P. Oscar Boykin · 2018 Wiley publishers



ENVIRONMENTAL SCIENCE

Credits: 2

Semester: IV

Course Code: OE21401A

No of Lecture Hours: 2L

Course Objective:

- Learn the scope and importance of environmental studies.
- Study about the environment and natural resources
- Understand the environmental pollution.
- Comprehend the regional and sectoral issues concerning environment.
- Gain insights into social issues and the environment.

Course Outcome:

CO1: Explain the scope and importance of environmental studies.

CO2: Elaborate the environment and natural resources.

CO3: Describe the environmental pollution.

CO4: Discuss the regional and sectoral issues concerning environment.

CO5: Explain the social issues and the environment.

Course Content	Hours Allotted	Pedagogy
Module I: Environmental Education: Introduction	(6)	
<ul style="list-style-type: none">• Definition, Objective, and Importance, Basic principle of ecosystem functioning, Concept of ecosystem, structure and functioning of ecosystem	1	Lectures, Case Study
<ul style="list-style-type: none">• Introduction and characteristic features, Structures and functions, different ecosystems	1	
Biodiversity and its conservation		
<ul style="list-style-type: none">• Introduction - Bio-geographical classification of India• Value of biodiversity - consumptive and predictive use, social, ethical and optional values	1 1	



<ul style="list-style-type: none"> • Biodiversity - Global, National, and local levels, Hot spots of biodiversity - Threats to biodiversity • Endangered and endemic species of India, Conservation of biodiversity - In-situ and Ex-situ conservation 	<p>1</p> <p>1</p>	
<p>Module II: Environmental and Natural Resources</p> <ul style="list-style-type: none"> • Energy resources – Renewable and Non- Renewable Resources • Water resources - Use and over-utilization of surface and ground water, floods • Food resources - World food problems - change caused by agricultural and overgrazing • Effects of modern agricultural fertilizer pesticide problems, water logging and salinity 	<p>(6)</p> <p>1</p> <p>2</p> <p>1</p> <p>2</p>	<p>Group Discussion</p>
<p>Module III: Environmental Pollution</p> <ul style="list-style-type: none"> • Causes, effects and control measures of air pollution • Water pollution, soil pollution, marine pollution • Noise pollution, Nuclear Pollution <p>Environmental Problems in India</p> <ul style="list-style-type: none"> • Effects of human activities on the quality of life, Water and River, Ground water • Wasteland reclamation, Solid Waste Management • Characteristics of solid Waste, E-Waste 	<p>(6)</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>Assignments</p>
<p>Module IV: Regional and Sectoral Issues</p> <ul style="list-style-type: none"> • Urbanization, Agro-forestry, Dry lands, Goods and services • Mountain development, River basin water resources management • Sustainable tourism, and Coastal zone management 	<p>(6)</p> <p>1</p> <p>2</p>	<p>Lectures</p>



<p>Sustainability</p> <ul style="list-style-type: none"> • Equitable use of resources for sustainable lifestyles • Role of an individual in prevention of pollution 	<p>1 1 1</p>	
<p>Module V:</p> <ul style="list-style-type: none"> • Consumerism and waste products • Public awareness. Sustainable resources management • Design of Environmental Policy • Direct regulation by Government - Command and control instrumentation • Energy Problems Related to Urban 	<p>(6) 1 1 1 2 1</p>	<p>Case Analysis</p>

<p>Learning Resources</p>	
<p>1.</p>	<p>Textbook:</p> <ul style="list-style-type: none"> • B. Sudhakara Reddy, T. Sivaji Rao, U. Tataji & K. Purushottam Reddy, An Introduction to Environmental Studies, Maruti Publications. • C. Manohar Chary and P. Jayaram Reddy, Principles of Environmental Studies, B.S. Publications, Hyderabad.
<p>2.</p>	<p>Reference books:</p> <ul style="list-style-type: none"> • Y. Anjaneyulu, Introduction to Environmental Science, B.S. Publications, Hyderabad. • P.D. Sharma, Fundamentals of Environmental Studies, Sitech Publications.



CONSTITUTION OF INDIA

Credits: 2

Course Code: OE21401B

Semester: IV

No of Lecture Hours: 3L

Course Objective:

- Learn the basics of the constitution.
- Understand the structure of the union government.
- Comprehend the state government structure.
- Gain insights into local administration.
- Study about the election commission

Course Outcome:

CO1: Explain the basics of the constitution.

CO2: Elucidate the structure of the union government.

CO3: Elaborate the state government structure.

CO4: Describe the local administration.

CO5: Discuss the election commission.

Course Content	Hours Allotted	Pedagogy
Module I: The Constitution – Introduction <ul style="list-style-type: none">• The History of the Making of the Indian Constitution• Preamble and the Basic Structure, and its interpretation• Fundamental Rights and Duties and their interpretation• Directive Principles of State Policy	(6) 1 2 2 1	Storytelling Method, Class Discussion
Module II: Union Government <ul style="list-style-type: none">• Structure of the Indian Union• President – Role and Power• Prime Minister and Council of Ministers• Lok Sabha and Rajya Sabha	(6) 1 2 1 2	Visual Charts, Worksheet



Module III: State Government <ul style="list-style-type: none">• Governor – Role and Power• Chief Minister and Council of Ministers• State Secretariat	(6) 2 2 2	Case Study, Flow Chart
Module IV: Local Administration <ul style="list-style-type: none">• District Administration• Municipal Corporation• Zilla Parishad and Panchayat	(6) 2 2 2	Assignments
Module V: Election Commission <ul style="list-style-type: none">• Role and Functioning• Chief Election Commissioner• State Election Commission	(6) 2 2 2	Presentation

Learning Resources	
1.	Textbook: <ul style="list-style-type: none">• Ethics and Politics of the Indian Constitution Rajeev Bhargava, Oxford University Press, New Delhi, 2008• The Constitution of India B.L. Fadia Sahitya Bhawan; New edition (2017)
2.	Reference books: <ul style="list-style-type: none">• Introduction to the Constitution of India DD Basu Lexis Nexis; Twenty-Third 2018 edition
3.	Other Electronic resources: <ul style="list-style-type: none">• https://constitution.org/1-Constitution/cons/india/const.html• http://www.legislative.gov.in/constitution-of-india• https://www.sci.gov.in/constitution• https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india



DISASTER MANAGEMENT

Credits:2

Semester: IV

Course Code: OE21401C

No of Lecture Hours: 3L

Course Objective:

- To learn about various types of natural and man-made disasters.
- To know pre- and post-disaster management for some of the disasters.
- To know about various information and organizations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

Course Outcome:

CO1: Acquainted with basic information on various types of disasters.

CO2: Knowing the precautions and awareness regarding various disasters.

CO3: Decide first action to be taken under various disasters.

CO4: Familiarized with organization in India which are dealing with disasters.

CO5: Able to select IT tools to help in disaster management.

Course Content	Hours Allotted	Pedagogy
Module I: Understanding Disaster <ul style="list-style-type: none">• Understanding the Concepts and definitions of Disaster• Hazard, Vulnerability, Risk Capacity• Disaster and Development, and disaster management	(6) 2 2 2	Case Study Analysis, Discussion
Module II: Types, Trends, Causes, Consequences and Control of Disasters <ul style="list-style-type: none">• Geological Disasters (earthquakes, landslides, tsunami, mining)• Hydro-Meteorological Disasters (floods, cyclones, lightning, thunderstorms, hailstorms, avalanches, droughts, cold and heat waves)• Biological Disasters (epidemics, pest attacks, forest fire)	(6) 1 1 1	Documentary Sessions



<ul style="list-style-type: none"> • Technological Disasters (chemical, industrial, radiological, nuclear) • Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemical and biological disasters) 	1 2	
Module III: Disaster Management Cycle and Framework <ul style="list-style-type: none"> • Disaster Management Cycle • During Disaster – Evacuation – Disaster Communication – Search and Rescue • Emergency Operation Centre – Incident Command System – Relief and Rehabilitation • Post-disaster – Damage and Needs Assessment 	(6) 1 1 2 2	Flow Charts, Interactive Model
Module IV: Disaster Management in India <ul style="list-style-type: none"> • Disaster Profile of India – Mega Disasters of India and Lessons Learnt • Disaster Management Act 2005 – Institutional and Financial Mechanism • National Policy on Disaster Management, National Guidelines 	(6) 2 2 2	Group Discussion
Module V: Applications of Science and Technology for Disaster Management <ul style="list-style-type: none"> • Geo-informatics in Disaster Management (RS, GIS, GPS and RS) • Land Use Planning and Development Regulations • Disaster Safe Designs and Constructions • Structural and Non-Structural Mitigation of Disasters 	(6) 2 2 1 1	Seminar Presentations



Learning Resources

Textbook:

- Publications of **National Disaster Management Authority (NDMA)** on Various Templates and Guidelines for Disaster Management
- Bhandani, R. K., **An overview on natural & man-made disasters and their reduction**, CSIR, New Delhi
- Srivastava, H. N., and Gupta G. D., **Management of Natural Disasters in developing countries**, Daya Publishers, Delhi

Reference books:

- Alexander, David, **Natural Disasters**, Kluwer Academic London
- Ghosh, G. K., **Disaster Management**, A P H Publishing Corporation
- Murthy, D. B. N., **Disaster Management: Text & Case Studies**, Deep & Deep Pvt. Ltd.



PROJECT WORK

Credits: 12

Semester: IV

Course Code: MCA21403

No of Lecture Hours: 24

Project has to be carried out by each student individually in a period of 15 weeks of duration. Students should submit a synopsis at the end of 2nd week in consultation with the Project Guide. The synopsis should consist of definition of the problem, scope of the problem and plan of action. After completion of eight weeks students are required to present a Project Seminar on the topic covering the aspects of analysis, design and implementation of the project work.

At the end of the semester the students are required to present themselves for a University Viva-voce examination. Evaluation guidelines for the award of SEE marks are mentioned in the Rules and Regulations book.

A committee consisting of two faculty members of the respective college along with a guide will evaluate the project and award CIE marks.

Each student will be required to:

1. Submit one page of synopsis on the project work for display on notice board.
2. Give a 20 minutes presentation followed by 10 minutes discussion.
3. Submit a technical write-up on the project.

At least two teachers will be associated with the Project Seminar to evaluate students for the award of CIE marks which will be on the basis of performance in all the 3 items stated above.

The project seminar presentation should include the following components of the project:

- Problem definition and specification
- Literature survey, familiarity with research journals
- Broad knowledge of available techniques to solve a particular problem
- Planning of the work, preparation of bar (activity) charts, Presentation both oral and written.