Department of Computer Science & Engineering

Birla Institute of Technology, Mesra, Ranchi - 835215 (India)

Master of Computer Application

COURSE INFORMATION SHEET

Course code: MA430
Course title: DISCRETE MATHEMATICAL STRUCTURE
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L: 3 T: 0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: I/4
Branch: Master of Computer Applications
Name of Teacher:

Course Objectives

This course enables the students to:

1.	Study methods to solve algebraic, transcendental equations and linear system of equations
2.	Know techniques o find the numerical solution of initial value problems
3.	Apply concepts in discrete mathematics and its properties.
4.	Understand Graph Terminologies and their representation, Connected & Disconnected graphs

Course Outcomes

After the completion of this course, students will be able to:

CO1	Solve algebraic structures and linear system of equations using an appropriate techniques.
CO2	Analyse Recurrence Relations, Classification of Recurrence Relations and their solutions.
CO3	Apply Mathematical logic and Mathematical Reasoning to solve real time problems
CO4	Evaluate Graph Terminologies and their representation, Connected & Disconnected graphs

SYLLABUS

Module I:
Mathematical logic and Mathematical Reasoning, Compound Statements, Propositional Equivalences, Predicates and Quantifiers, Methods of Proof, Mathematical Induction, Well-ordering principle, Recursive Definition and Algorithms.

(8L)

Module II:
Relations, Properties/Classification of Relations, Closure operations on Relations, Matrix representation of Relations, Digraphs, Partial ordered set, Linearly Ordered Set,Hasse Diagram, Isomorphism, Isomorphic Ordered Sets, Supremum, Infimum, Well ordered set.

(8L)

Module III:
Recurrence Relations, Classification of Recurrence Relations and their solutions by Characteristic Root method, Generating function and their various aspects, Utility of Generating function in solving Recurrence Relations

(8L)

Module IV:
Binary Operations, Groups, Product and Quotients of Groups, Semi group, Products and Quotients of Semi groups, Permutation Group, Composition of Permutation, Inverse Permutation, Cyclic Permutation, Transposition, Even and Odd Permutation, Coding of Binary Information and Error Correction, Decoding and Error Correction.

(8L)

Module V:
Introduction to Graph, Graph Terminologies and their representation, Connected & Disconnected graphs, Isomorphic Graph, Euler & Hamilton graphs.
Introduction to Trees, Versatility of Trees, Tree traversal, Spanning Trees, Minimum Spanning Tree.

(8L)

Books recommended:

TEXT BOOK

1. Mott, Abraham & Baker, "Discrete Mathematics for computer scientist & mathematicians", PHI, 2nd Edition, 2002. **(T1)**
2. ROSS & WRIGHT, "Discrete Mathematics", PHI, 2nd Edition, 1988. **(T2)**
3. Swapan Kumar Chakraborty and BikashKantiSarkar, "Discrete Mathematics", Oxford Univ. Publication, 2010. **(T3)**

4. Kolman, Rusby, Ross, "Discrete Mathematics Structures", PHI, 5th Edition, 2005. **(T4)**

REFERENCE BOOK

1. BikashKanti Sarkar and Swapan Kumar Chakraborty, "Combinatorics and Graph Theory", PHI, 2016. **(R1)**
2. Seymour Lipschutz and Mark Lipson, "Discrete Mathematics", Shaum's outlines, 2003. **(R2)**
3. C. L. LIU, "Elements of Discrete Maths", McGraw Hill, 2nd Edition, 2001. **(R3)**
4. Johnsonbaugh, R., "Discrete Mathematics", 6th Edition, Maxwell, Macmillan International. **(R4)**

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4
Continuous Internal Assessment	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1	3	1	2	1	1	2
CO2	3	2	2	2	2	2	1	1
CO3	3	3	1	2	1	1	1	1
CO4	2	2	1	2	1	2	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: MA428
Course title: NUMERICAL AND STATISTICAL METHODS
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L: 3 T: 0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: I/4
Branch: Master of Computer Applications
Name of Teacher:

Course Objectives

This course enables the students to:

1.	Derive appropriate numerical methods to solve algebraic, transcendental equations and linear system of equations
2.	Approximate a function using various interpolation techniques, to find the numerical solution of initial value problems
3.	Apply concepts in probability theory, the properties of probability distributions
4.	Estimation of mean, variance and proportion, the concepts of statistical hypothesis

Course Outcomes

After the completion of this course, students will be able to:

CO1	Solve algebraic, transcendental equation and linear system of equations using an appropriate numerical method arising in various engineering problems
CO2	Evaluate derivative at a value using an appropriate numerical method in various research problems, solve differential equation numerically

CO3	Learn basic probability axioms, rules and the moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous random variables.
CO4	Find the point and interval estimates, analyse data statistically and interpretation of the results

SYLLABUS

Module I:

Errors and their computation: absolute, relative and percentage. Solution of algebraic & transcendental equations: Bisection method, False position method, Secant method, Newton's Raphson method, Iterative method, Error analysis and convergence study.

(8L)

Module II:

Interpolation with equal & unequal intervals: Introduction, finite differences-forward, backward & central difference tables, Newton's formula for interpolation, Gauss's central difference interpolation formula, divided difference and their properties- Newton's divided differences formula, Lagrange's interpolation formula, Inverse interpolation. Numerical solution of linear system of equations: Direct Method-Gauss elimination, Gauss-Jordan, LU decomposition methods. Iterative Methods-Gauss-Jacobi and Gauss Seidel methods.

(8L)

Module III:

Numerical differential & integration: Introduction, derivatives using forward and backward difference formula, Numerical Integration-Trapezoidal rule, Simpson's 1/3 & 3/8 rules, Weddle's rule. Numerical solution of ordinary differential equations: Taylor Series method, Euler's method, Modified Euler's method, Runge-Kutta methods of 2nd and 4th order.

(8L)

Module IV:

Concepts of Probability:Experiment and Sample Space, Events and Operations with Events, Probability of an Event, Basic Probability Rules, Applications of Probability Rules, Conditional Probability, random variable:continuous and discrete**,** Mean, Variance and Standard Deviation of a Random Variable. Binomial Experiments:Structure of a Binomial Experiment, Binomial Probability Distribution, Use of Binomial Probability Table. Properties of a Normal Curve, Normal Probability Distribution, Areas Under a Normal Curve. Approximating a Binomial Probability, The Normal Theorem and the Central Limit Theorem.

(8L)

Module V:

Estimation of Population Parameters:Parameter and Statistic, Point and Interval Estimation, Interval Estimation of Three Common Parameters. Hypothesis Testing for a Single Population:Concept of a Hypothesis, Tests Involving a Population Mean, Tests Involving a Population Proportion, Tests Involving a Population Standard Deviation. Concepts of a Bivariate Data Set, Correlation Coefficient, The Regression line.

(8L)

Books recommended:

TEXT BOOK

1. S.S.Sastry, "Introductory Methods of Numerical Analysis", PHI, Private Ltd., New Delhi.**(T1)**
2. N.Pal& S. Sarkar, "Statistics: Concepts and Applications", PHI, New Delhi, 2005.**(T2)**

REFERENCE BOOK

1. R.V.Hogg et.al, "Probability and Statistical Inpane", 7th Edition, Pearson Education, New Delhi, 2006. **(R1)**
2. R.L.Burden&J.D.Faires, "Numerical Analysis", Thomson Learning-Brooks/Cole, Indian Reprint, 2005. **(R2)**

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4
Continuous Internal Assessment	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors

CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	2	1	2	1	1	2
CO2	3	2	2	2	2	2	1	1
CO3	3	3	1	2	1	1	1	1
CO4	2	2	1	2	1	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: MT123
Course title: BUSINESS COMMUNICATION
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L: 2 T: 0 P: 2
Class schedule per week: 03
Class: MCA
Semester / Level: I/1
Branch: Master of Computer Applications
Name of Teacher:

Course Objectives
This course enables the students to:

1.	Analyze and demonstrate writing and speaking processes through invention, organization, drafting, revision, editing, and presentation.
2.	Understand the importance of specifying audience and purpose and to select appropriate communication choices.

3.	Interpret and appropriately apply modes of expression, i.e., descriptive, expositive, Narrative, scientific, and self-expressive, in written, visual, and oral communication
4.	Participate effectively in groups with emphasis on listening, critical and reflective thinking, and responding.
5.	Develop the ability to research and write a documented paper and/or to give an oral presentation.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Apply business communication strategies and principles to prepare effective communication for domestic and international business situations.
CO2	Utilize analytical and problem-solving skills appropriate to business communication.
CO3	Participate in team activities that lead to the development of collaborative work skills.
CO4	Select appropriate organizational formats and channels used in developing and presenting business messages
CO5	Communicate via electronic mail, Internet, and other technologies and deliver an effective oral business presentation.

SYLLABUS

Module I:

Introduction to Business Communication:

Importance and Objectives of Business communication, Process of communication, Barriers to effective communication, Techniques of effective communication. Forms of communication (Written, Oral, audio-visual communication).

(8L)

Module II:

Managing Business Communication:

Formal and Informal communication, Non- verbal communication (Body language, Gestures, Postures, Facial expressions). The cross-cultural dimensions of business communication. Techniques to effective listening, methods and styles of reading.

(8L)

Module III:

Other aspects of communication:

Vocabulary:

Single word substitution, Idioms and phrases, Precis writing, Comprehension.

Group Discussions, Extempore, Principles of effective speech and presentations, Role-playing.

(8L)

Module IV:

Introduction to managerial writing:

Business letters: Inquiries, Circulars, Quotations, Orders, Acknowledgement, Claims & adjustments, Collection letters, Sales letters, Drafting of different resumes, Covering letters Applying for a job, Social correspondence, Invitation to speak.
Official Correspondence: Memorandum, Notice, Agenda, Minutes, Circular letters.

(8L)

Module V:

Report writing and Technical Proposals:

Business reports, Types, Characteristics, Importance, Elements of structure, Process of writing, Order of writing, the final draft, checklists for reports.
Technical proposals, Definitions, types and format.

(8L)

Books recommended:

TEXT BOOK

1. "Communication Skills", Sanjay Kumar &PushpLata, Oxford University Press. **(T1)**
2. "Business Correspondence and Report Writing", R.C.Sharma, Krishna Mohan, McGraw Hill. **(T2)**
3. "Communication for Business", Shirley Taylor, V. Chandra, Pearson. **(T3)**

REFERENCE BOOK

1. "Business Communication", HorySankar Mukherjee, Oxford University Press. **(R1)**
2. "Basic Business Communication", Lesikar I Flatley, McGraw Hill. **(R2)**
3. "Business Communication Today", Bovee, Thill and Chaterjee, Pearson. **(R3)**

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5

Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	2	1	2	2	1	2
CO2	3	1	2	1	1	2	1	1
CO3	3	3	1	2	1	1	1	1
CO4	2	2	1	2	1	1	2	1
CO5	2	1	1	3	2	2	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

CD	Course Delivery methods	Course Outcome	Course Delivery Method
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1	CD1,CD2,CD3
CD2	Tutorials/Assignments	CO2	CD1,CD2,CD3
CD3	Seminars	CO3	CD1,CD2,CD3
CD4	Mini projects/Projects	CO4	CD1,CD2,CD3,CO4 CD5
CD5	Laboratory experiments/teaching aids		
CD6	Industrial/guest lectures		
CD7	Industrial visits/in-plant training		
CD8	Self- learning such as use of NPTEL materials and internets		
CD9	Simulation		

COURSE INFORMATION SHEET

Course code: MT114
Course title: FUNDAMENTALS OF MANAGEMENT & ORGANIZATION BEHAVIOUR
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L: 3 T: 0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: I/1
Branch: Master of Computer Applications
Name of Teacher:

Course Objectives

This course enables the students to:

1.	To understand the concept of management principles and practices, as a discipline, as an art or a science, management and administration, managerial skills, roles of a manager and levels of management .
2.	To compare and contrast various development of management thought such as early classical approaches, administrative management, neo-classical approaches, behavioural approaches, modern approaches, business ethics and social responsibility.

3.	To classify the type of plans and to critically examine different types of planning and select the types of decisions for further growth of the organization.
4.	To create an organizational structure-formal and informal organization to point out span of control, authority, responsibility, accountability, delegation of authority, Departmentation, decentralization and can design a plan for manpower planning, job design, recruitment and selection, training and development and performance appraisal.
5.	To develop the core of leadership, directing function, motivational theories, communication process and different types of control system to facilitate change for the development of the organization.

Course Outcomes

After the completion of this course, students will be able to:

CO1	To Debate management principles and practices as an art or a science, classify managerial skills and roles being played by a manager and recommend appropriate organisational structure.
CO2	To identify factors affecting Decision-making and Planning activity at all levels in an organization.
CO3	To Explain the key decisions related to the various Staffing functions in an organisation.
CO4	To analyse leadership styles, Communication and Motivation strategies adopted by managers and comment on their appropriateness. vis a vis nature of the organisation.

SYLLABUS

Module I:

Introduction: Concepts, Function or Process, Management Discipline, as an Arts or Science, Understanding Management and Administration, Managerial Skills, Roles of a Manager, Levels of Management.

Development of Management Thought: Classical Approaches- Scientific Management, Administrative Management: Bureaucracy, Behavioural Approach.

(8L)

Module II:

Planning: Nature and significance of Planning, Types of plans, Process of Planning, **Organizing:** Process of Organizing, Forms of Organizational Structure, Formal and informal organization

(8L)

Module III:

Staffing: Concept, Manpower Planning, Process of Manpower planning, Recruitment & Selection, Training & Development, Performance Appraisal.

Motivating: Significance of Motivation**,** Motivation process, Theories of Motivation and their application

(8L)

Module IV:

Leading: Concept of Leadership, Leadership Style, Theories of Leadership

Communication: Process, Importance of Communication, Communication Channels, Barriers to Communication.

(8L)

Module V:

Controlling: Definition, Importance of controlling, Characteristics of control, Control process, Types of Control System, Introduction to CSR and Sustainable Development.

(8L)

Books recommended:

TEXT BOOK

1. "Management", Stoner and Freeman, Prentice Hall of India. **(T1)**
2. "Essentials of Management", Koontz and Heinz Weihrich, McGraw Hill. **(T2)**
3. "Management", Robbins &Coulter, Prentice Hall of India. **(T3)**

REFERENCE BOOK

1. "Principles of Management", Gilbert, Mc Graw Hill. **(R1)**
2. "Principles and Practices", T. N. Chhabra, Dhanpat Rai and Sons Pvt. Ltd. **(R2)**
3. "Management: A Global and Entrepreneurial Perspective", Weihrich Heinz &Koontz Harold, Mc Graw Hill. **(R3)**
4. "Principles of Management", P.C.Tripathi and P.N.Reddy, Mc Graw Hill. **(R4)**

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4
Continuous Internal Assessment	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	2	1	2	2	1	2

CO2	3	1	2	1	1	2	1	1
CO3	3	3	1	2	1	1	1	1
CO4	2	2	1	2	1	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

CD	Course Delivery methods	Course Outcome	Course Delivery Method
CD1	Lecture by use of boards/LCD projectors/OHP projectors	CO1	CD1
CD2	Tutorials/Assignments	CO2	CD1 and CD2
CD3	Seminars	CO3	CD1 and CD2
CD4	Mini projects/Projects	CO4	CD 1,CD2
CD5	Laboratory experiments/teaching aids		
CD6	Industrial/guest lectures		
CD7	Industrial visits/in-plant training		
CD8	Self- learning such as use of NPTEL materials and internets		

COURSE INFORMATION SHEET

Course code: CA401
Course title: PROGRAMMING WITH C
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L: 3 T: 0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: I/4
Branch: Master of Computer Applications
Name of Teacher:

Course Objectives

This course enables the students to:

1.	Understand how they can solve real life problems using computers.
2.	Analyze real life problems for finding solutions to them.
3.	Design mechanisms for developing the solution in computer understandable form.
4.	Implement the solution with C programming language

5.	Able to implement the algorithms designed by them using C-programming language

Course Outcomes

After the completion of this course, students will be able to:

CO1	Develop basic understanding of computers, the concept of algorithm and algorithmic thinking.
CO2	Develop efficient algorithms for solving a problem. .
CO3	Use the basic C language for solving engineering or other real-life problems.
CO4	Design an algorithmic solution for a given problem.
CO5	Implement the algorithms designed by them using C-programming language and shall be capable of explaining the various concepts like decision making, looping, branching, arrays, functions, recursion, structures, pointers, unions and files of C language .

SYLLABUS

Module I: Problem

Solving and Programming Concepts: Problem Solving in Everyday Life, Types of Problem, Problem Solving with Computers- Algorithms & Flow-Charts,Data Storage and Communication with Computer, Organizing the Problem, Computer Software and Software Development Method.

(8L)

Module II:

Overview of C: C Language Elements, Variable Declaration, Data Types, Expressions, Data Files.

Top-Down Design with Functions: Top-Down Design and Structure Charts, Functions without Arguments, Functions with Input Arguments.

Selection Structures: Problem Solving with Decisions, Control Structures, Conditions, All kinds of if statements, Switch statement.

Repetition and Loop Statements: Problem Solving with Loops, Repetition in Programs, while Statement, for Statement, Conditional Loops, Loop Design, Nested Loops, do-while Statement and Flag Controlled Loops.

(8L)

Module III:

Modular Programming: Functions with Simple Output Parameters, Multiple Calls to a Function with Input/Output Parameters, Scope of Names, Formal Output Parameters as Actual Arguments.

Arrays: Declaring and Referencing Arrays, Array Subscripts, Using for Loops for Sequential Access, Using Array Elements as Function Arguments, Array Arguments, Multidimensional Arrays.

(8L)

Module IV:

Strings: String Basics, String Comparison, Arrays and Pointers, Arrays of Pointers, Character Operations, String-to-Number and Number-to-String Conversions.

Recursion: The Nature of Recursion, Tracing a Recursive Function, Recursive Mathematical Functions, Recursive Functions with Array and String Parameters, Problem Solving with Recursion.

(8L)

Module V:

Structure and Union Types: User-Defined Structure types, Structure Type Data as Input and Output Parameters, Functions Whose Result Values are Structured, Problem Solving with Structure Types, Union types.

File Processing and Programming in the Large: Input and Output Files, Binary Files, Using Abstraction to Manage Complexity, Header Files, Implementation Files, Storage Classes, Macros, Command Line Arguments.

(8L)

Books recommended:

TEXT BOOK

1. Sprankle M., "Problem Solving and Programming Concepts", 7th Edition, Pearson Education, New Delhi, 2006.**(T1)**
2. Hanly J.R.,&Koffman E.B., "Problem Solving and Program Design in C", 4thEdition, Pearson Education, New Delhi, 2004.**(T2)**

REFERENCE BOOK

1. Venugopal K R, Prasad S R "Mastering C", Tata McGraw Hill, New Delhi,2007.**(R1)**
2. Balagurusamy E. "Programs in ANSI C", 3rd Edition, TMH, New Delhi-2004.**(R2)**
3. Frozen B.A. &Gilberg R.F. "Computer Science: A structured Programming Approach Using C", 2nd Edition, Brooks/Cole- Thomson Learning, Indian Reprint, 2003. **(R3)**

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	2	2	1
CO2	3	3	3	3	1	3	2	2
CO3	3	3	3	3	2	2	2	1
CO4	3	3	3	2	3	2	1	1
CO5	3	1	2	2	1	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CA403
Course title: COMPUTER ORGANIZATION AND ARCHITECTURE
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: I/4
Branch: Master of Computer Applications
Name of Teacher:

Course Objectives
This course enables the students to:

1.	To provide knowledge of Computer Architecture
2.	Employ knowledge of various Digital Logic Circuits, Data Representation, Register and Processor level Design and Instruction Set architecture
3.	To develop the logical ability to Determine which hardware blocks and control lines are used for specific instructions
4.	Understand memory organization, I/O organization and its impact on computer cost/performance.
5.	Know merits and pitfalls in computer performance measurements.

Course Outcomes
After the completion of this course, students will be able to:

CO1	Describe the merits and pitfalls in computer performance measurements and analyze the impact of instruction set architecture on cost-performance of computer design
CO2	Explain Digital Logic Circuits, Data Representation, Register and Processor level Design and Instruction Set architecture
CO3	Solve problems related to computer arithmetic and Determine which hardware blocks and control lines are used for specific instructions
CO4	Design a pipeline for consistent execution of instructions with minimum hazards
CO5	Explain memory organization, I/O organization and its impact on computer cost/performance.

SYLLABUS

Module I:
INTRODUCTION
Digital Logic Design: Axioms and laws of Boolean algebra, Reduction of Boolean expressions, conversion between canonical forms, Karnaugh map (4 variable), Half Adder, full adder, 4-bit parallel parity bit generator, checker circuit, Decoder, Encoder, Multiplexer, IC RAM, ROM, Memory Organization, Sequential Circuits, State transistors, Flip-flop, RS, JK, D-Latch, Master-slave.

(8L)

Module II:
INSTRUCTION SET ARCHITECTURE
Memory Locations and Addresses: Byte Addressability, Big-Endian and Little-Endian Assignments, Word Alignment, Instructions and Instruction Sequencing, Addressing Modes, Assembly Language, Subroutines, Additional Instructions, dealing with 32-Bit Immediate Values.

(8L)

Module III:
BASIC PROCESSING UNIT & PIPELINING
Basic Processing Unit: Some Fundamental Concepts, Instruction Execution, Hardware Components, Instruction Fetch and Execution Steps, Control Signals, Hardwired Control, CISC-Style Processors.
Pipelining: Basic Concept, Pipeline Organization, Pipelining Issues, Data Dependencies, Memory Delays, Branch Delays, Pipeline Performance Evaluation.

(8L)

Module IV:
MEMORY ORGANIZATION
Basic Concepts, Semiconductor RAM Memories, Read-only Memories, Direct Memory Access,

Memory Hierarchy, Cache Memories, Performance Considerations, Virtual Memory, Memory Management Requirements, Secondary Storage

(8L)

Module V:

INPUT OUTPUT & PARALLEL PROCESSING

Basic Input Output: Accessing I/O Devices, Interrupts, Input Output Organization: Bus Structure, Bus Operation, Arbitration, Interface, Interconnection Standards.

Parallel Processing: Hardware Multithreading, Vector (SIMD) Processing, Shared-Memory Multiprocessors, Cache Coherence, Message-Passing Multicomputers, Parallel Programming for Multiprocessors, Performance Modeling.

(8L)

Books recommended:

TEXT BOOK

1. Hamacher Carl, et. al, "Computer Organization and Embedded Systems", 6th Edition, Tata McGraw Hill,New Delhi, 2011.**(T1)**
2. Patterson David A., "Computer Organization and Design: The Hardware Software / Interface", 5thEdition, 1994.**(T2)**
3. Mano M. Morris, "Computer System Architecture", Revised 3rdEdition, Pearson Education.**(T3)**

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	3	2	2	1
CO2	3	3	3	3	1	3	1	1
CO3	3	3	3	3	2	2	2	1
CO4	3	3	3	2	3	2	1	1
CO5	3	1	2	2	1	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,CD6,CD7
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD3,CD4,CD5,CD7

COURSE INFORMATION SHEET

Course code: CA402
Course title: PROGRAMMING LAB IN C
Pre-requisite(s):
Co- requisite(s): Programming for Problem Solving
Credits: 1.5 L: 0 T: 0 P: 3
Class schedule per week: 03
Class: MCA
Semester / Level: I/4
Branch: Master of Computer Applications
Name of Teacher:

Course Objectives
This course enables the students:

1.	To learn computer language.
2.	To Learn coding for problems.
3.	To learn the problem-solving process through computer.
4.	To know the limitations of system during program execution.
5.	To know the practical application of various programming techniques.

Course Outcomes
After the completion of this course, students will be able:

CO1	To formulate simple algorithms for arithmetic and logical problems.
CO2	To translate the algorithms to programs.
CO3	To test and execute the programs and correct syntax and logical errors.
CO4	To apply programming to solve simple numerical method problems, differentiation of function and simple integration.
CO5	To decompose a problem into functions and synthesize a complete program using

	divide and conquer approach.

SYLLABUS

List of Programs as Assignments:

1. Write an interactive program that will read in a +ve integer value and determine the following
   i) If the integer is a prime number ii) If the integer is a Fibonacci number
2. WAP in C to compute $\sin x = x - x^3/3! + x^5/3! - x^7/7!$ ….. Continue adding successive terms in the series until the value of the next term becomes smaller (in magnitude) than 10^{-5}. Test the program for x = 1, x = 2, and x = 3. In each case display the number of terms used to obtain the final answer.
3. WAP to generate every 3rd integer beginning with I = 2 and continue for all integers that are less than 150. Calculate the sum of those integers that are evenly divisible by 5.
4. WAP to find whether a given year is a leap year or not. Modify it to generate a list of leap years between two year limits given by user.
5. WAP to display the following pattern:

```
                    11
                11  10  11
            11  10  9   10  11
        11  10  9   8   9   10  11
```

6. Using Ternary / Conditional operator find the greatest among 3 numbers.

7. WAP to convert a decimal number into an equivalent number of the input base. Test your program for base 2,8,10 & 16.

8. WAP to read a number n, and print it out digit-by-digit, as a series of words. For e.g. 123 would be printed as "one two three".
9. WAP to check whether any input +ve integer is palindrome or not.
10. WAP to simulate a simple calculator (+ - / * %) that takes two operands and an operator as input and displays the result.
11. WAP to find the GCD of two input +ve integer numbers.
12. WAP to swap the values of two variables without using a third variable.
13. Read a line of mixed text, and then write it out with all lower case and uppercase letters reversed, all digits replaced by 0s and all other characters (non-letters and non-digits) replaced by '*'.
14. WAP to find the product of two matrices A and B. Display the source matrices and product matrix C in matrix format.
15. WAP to find whether a given matrix is a triangular matrix or not.
16. WAP to find the transpose of a matrix. Display the source and the transposed matrix in matrix format.
17. Implement Prob. No. – 14 to 16 using functions for reading, manipulating and displaying the corresponding matrices in matrix form.
18. WAP to sort a list of strings alphabetically using a 2-dim. Character array.
19. WAP to display the row sum and the column – sum of an input 2- dim. Matrix. Display the source matrix with row and column sum.
20. Write a recursive function to calculate S = 2 + 4 + 6 + 8 + …… +2N. Implement the function in a complete C program.
21. Write a function that accepts two arguments an array and its size n. It performs Bubble up sort on the array elements. Using indirection operator '*' implement this in a complete C program. Display the source and the sorted array.
22. Using pointer, write a function that receives a character string and a character as argument. Delete all occurrences of this character in the string. The function should return corrected string with no holes.
23. Write a function for reading character string using pointer. Calculate the length of the string (without using strlen ()). Finally print the string in reverse order, using pointer.
24. Implement prob. No. 14 using pointers representation of 2 – dim. array.
25. Implement prob. No. 15 using pointer representation of 2 dim. array.
26. Implement prob. No. 16 using pointer representation of 2 dim. array.
27. WAP to sort a list of strings into alphabetical order using array of pointers.
28. Create records of 60 students, where each record has fields-name, roll, gpa and fees. Write a function update () to reduce the fees of those students who have obtained gpa greater than 8.5 by 25% of the original fees. Write a complete program to exercise this function in the main program and display all the records before and after updation.

29. Define a structure that describes a hotel. It should have members that include the name, address, grade, average room charge and number of rooms. Write a function to perform the following operations:
    a) To print out hotels of a given grade in order of charges.
    b) To print out hotels with room charges less than a given value.
30. WAP to concatenate the contents of two files into a third file.
31. WAP to copy the content of one file into another file. Names of both the files are to be input as command line arguments

Books recommended:

TEXT BOOK

1. Jery R Hanly, "Problem solving and Program design in C", Paerson Education, 7th Edition. **(T1)**
2. Byron Gottfried, "Schaum's Outline of Programming with C", McGraw-Hill. **(T2)**
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill. **(T3)**
4. R.G.Dromey, How to Solve it by Computer, Pearson Education. **(T4)**

REFERENCE BOOK

1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Prentice Hall India Learning Private Limited. **(R1)**

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	2	1	2	1
CO2	3	3	3	3	2	1	2	2
CO3	3	3	3	3	2	1	2	1
CO4	3	3	3	3	1	1	1	1
CO5	3	3	3	3	2	1	1	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: MA429
Course title: NUMERICAL AND STATISTICAL METHODS LAB
Pre-requisite(s):
Co- requisite(s):
Credits: 1.5 L: 0 T: 0 P: 3
Class schedule per week: 03
Class: MCA
Semester / Level: I/4
Branch: Master of Computer Applications
Name of Teacher:

Course Objectives

This course enables the students to:

1.	Derive appropriate numerical methods to solve algebraic, transcendental equations and linear system of equations
2.	Approximate a function using various interpolation techniques, to find the numerical solution of initial value problems

3.	Apply concepts in probability theory, the properties of probability distributions
4.	Estimation of mean, variance and proportion, the concepts of statistical hypothesis

Course Outcomes

After the completion of this course, students will be able to:

CO1	Solve algebraic, transcendental equation and linear system of equations using an appropriate numerical method arising in various engineering problems
CO2	Evaluate derivative at a value using an appropriate numerical method in various research problems, solve differential equation numerically
CO3	Learn basic probability axioms, rules and the moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous random variables.
CO4	Find the point and interval estimates, analyse data statistically and interpretation of the results

SYLLABUS

List of Programs as Assignments:

1. Find a simple root of $f(x) = 0$ using bisection method. Read the end points of the interval (a,b) in which the root lies, maximum number of iterations n and error tolerance eps.
2. Find a simple root of $f(x) = 0$ using Regula-Falsi method. Read the end points of the interval (a,b) in which the root lies, maximum number of iterations n and error tolerance eps.
3. Find a simple root of $f(x) = 0$ using Newton Raphson method. Read any initial approximation x_0, maximum number of iterations n and error tolerance eps.
4. Solution of a system of $n \times n$ linear equations using Gauss elimination method with partial pivoting.
5. Matrix inversion and solution of $n \times n$ system of equations using Gauss-Jordan method.
6. Program to solve a system of equation using Gauss-Seidel iteration method. Order of the matrix is n, maximum number of iterations $niter$, error tolerance is eps and the initial approximation to the solution vector is x_0.
7. Program for Lagrange and Newton divided difference interpolation.
8. Program for Newton's forward and backward interpolation.

9. Program for Gauss's central difference interpolation (both backward and forward).

10. Program to evaluate the integral of $f(x)$ between the limits a to b using Trapezoidal rule of integration based on n subintervals or $n+1$ nodal points. The values of a,b and n are to be read. The program is tested for $f(x)=1/(1+x)$.

11. Program to evaluate the integral of $f(x)$ between the limits a to b using Simpson's rule of integration based on $2n$ subintervals or $2n+1$ nodal points. The values of a,b and n are to be read and the integrand is written as a function subprogram. The program is tested for $f(x)=1/(1+x)$.

12. Program to solve an IVP, $dy/dx = f(x), y(x_0) = y_0$ using Euler method. The initial value x_0, y_0 the final value x_f and the step size h are to be read. The program is tested for $f(x, y) = -2xy^2$.

13. Program to solve an IVP, $dy/dx = f(x), y(x_0) = y_0$ using the classical Runge-Kutta fourth order method with step size h, $h/2$ and also computes the estimate of the truncation error. Input parameters are: initial point, initial value, number of intervals and the step length h. Solutions with h, $h/2$ and the estimate of the truncation error are available as output. The right hand side The program is tested for $f(x, y) = -2xy^2$.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty

2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	3	3	2	1	1
CO2	2	3	3	1	2	2	2	2
CO3	1	1	2	2	3	1	2	1
CO4	3	1	2	1	2	1	1	1
CO5	2	2	1	2	2	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA455
Course title: FUNDAMENTALS OF DATA STRUCTURES
Pre-requisite(s): High Level languages like C, C++, Java or Python
Co- requisite(s): Data Structures Lab
Credits:4 L: 3 T: 1 P: 0
Class schedule per week: 4
Class: MCA
Semester / Level: II/4
Branch: MCA

Course Objectives

This course enables the students:

A.	To provide knowledge of practical implementations and usage of Data Structures and Algorithms.
B.	Employ knowledge of various data structures during construction of a program.
C.	To develop the logical ability to store and retrieve data efficiently.
D.	To develop an appreciation of graph theory-based solutions for real life problems.
E.	Design and construct object-oriented software with an appreciation for data abstraction.

Course Outcomes

After the completion of this course, students are expected to

1.	Identify various data structures and their usages.
2.	Apply data structures in the modelling of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design.
3.	Demonstrate the usage of optimal trees, heaps and priority queues.
4.	Implement sorting algorithms.
5.	Develop programs using algorithms in graph theory.

SYLLABUS

MODULE I

Fundamental Data Structures: Using Arrays, Singly Linked Lists, Circularly Linked Lists, Doubly Linked Lists, Asymptotic Analysis. **(8L)**

MODULE II

Stacks, Queues, Dequeues: The Stack, Queue, Dequeue ADTs, Simple Array Based Stack, Queue, Dequeue Implementation, Implementing Stack, Queue with Singly Linked List, Reversing an Array using Stack, Matching Parenthesis and HTML tags, A Circular Queue.**(8L)**

MODULE III

Trees: General Trees, Binary Trees, Implementing Trees, Tree Traversal Algorithms, BinarySearch Trees, AVL Trees, B Trees.

(8L)

MODULE IV

Sorting: Merge sort, Quick sort, Studying sorting through algorithmic lens, Comparing SortingAlgorithms. **(8L)**

Heap: Priority Queues, Array Implementation of Heaps, Construction of Heaps, Heap Sort.

MODULE V

Graphs: Data Structures for graphs, Graph Traversals, Transitive Closure, Directed Acyclic Graphs, Shortest Paths, Minimum Spanning Trees. **(8L)**

Text book:

1. Goodrich Michael T., Tamassia Roberto, Goldwasser Michael H. "Data Structures and Algorithms in Java", Wiley, 6th Edition, 2014.
2. Klein Shmuel Tomi, Basic Concepts in Data Structures, Cambridge University Press, 1st Edition, 2016.

Reference books:

1. YedidyahLangsam, Moshe Augenstein J., Tenenbaum Aaron M. "Data Structures using JAVA", Pearson Education, 2009.
2. Brass Peter "Advanced Data Structures", Cambridge University Press, 1st Edition.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment

Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	**% Distribution**
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	3	3	3	2	1	1
CO2	2	3	3	1	2	2	2	2
CO3	1	1	2	2	3	1	2	1
CO4	3	1	2	1	2	1	1	1
CO5	2	2	1	2	2	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6

CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: BT417
Course title: Bioinformatics
Pre-requisite(s): Biological Science,Data Structure
Co- requisite(s): None
Credits: 3 L:3 T:0 P:0
Class schedule per week: 03
Class: MCA.
Semester / Level: II/4
Branch: MCA

Course Objectives
After the completion of this course, students will be:

A.	Developing computer skills to solve computational problems in biology
B.	Using the biological databases to retrieve various biological information
C.	Applying the tools to do biological analysis
D.	Identifying and solving various biological challenges
E.	Able to predict the secondary and tertiary structures of protein sequences.

Course Outcomes
After the completion of this course, students will be:

1.	Describe the contents and properties of the most important bioinformatics databases.
2.	Analyze and discuss the results of sequence-based searches in light of molecular biological knowledge.
3.	Explain the principle for, and execute pairwise sequence alignment by dynamic programming.
4.	Illustrate the major steps in pairwise and multiple sequence alignment.
5.	Perform text- and sequence-based searches.

SYLLABUS

Module 1:
Major Information Resources & Databases in Bioinformatics: Information Resources: NCBI, EBI, ExPasy, Entrez, Derived (Secondary) Databases of Sequences, Different Bio-sequence File Formats. **(8L)**

Module 2:
Sequence Analysis: Homology, Gap Penalty, Scoring matrices (PAM, BLOSUM), Dot matrix method, Dynamic programming using Needleman-Wunschalgorithm,Scoring methods of MSA (Sum of Pair), BLAST and FASTA.**(8L)**

Module 3:
Phylogenetic Analysis: Molecular Phylogenetics: Basics, molecular clock, Substitution Models of evolution, Tree reconstruction methods (Distance based).**(8L)**

Module 4:
Molecular Modeling and Molecular Docking: Structure alignment: superimposition and RMSD calculations, DALI, Classification of 3-D structures of proteins,SCOP, CATH, Structure Prediction of Protein Structure (Chou-Fasman), Homology modelling. **(8L)**

Module 5:
Applications of Bioinformatics: Cheminformatics, Bigdata analysis, Microarray - Data analysis, Theory and Algorithms, motif analysis and presentation.**(8L)**

Textbook

1. **Bioinformatics: Sequence and Genome Analysis,** David W Mount, Cold Spring Harbor Laboratory Press, New York (September 2004)
2. ***Guidebook on Molecular Modeling In Drug Design (Illustrated),*** J. G. Vinter, Mark Gardner (Editor), J. G. Vinter (Editor), CRC Press (May 1994) ISBN: 0849377722
3. **Binformatics: a practical guide to the analysis of genes and proteins,** Baxevanis A., Ouellette F.B.F., John Wiley and Sons, New York.

Reference books:
1. Fundamental Concepts of Bioinformatics, Dan E Krane, Michael L Raymer, Benjamin-Cummings Pub Co (Sept 2002, ISBN 0805346333)

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	1	2	2	1	1	1
CO2	3	2	3	2	2	3	1	1
CO3	3	2	1	1	2	2	1	1
CO4	3	2	1	3	3	1	2	2
CO5	2	1	2	2	1	1	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7
CO5	CD2,CD3,CD5

COURSE INFORMATION SHEET

Course code: CA457
Course title: OPERATING SYSTEM
Pre-requisite(s): Data Structure, Computer System Architecture, Basic Course on Computer Programming
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: II/4
Branch: MCA

Course Objectives
This course enables the students to:

1.	Present the main components of OS and their working
2.	Introduce the concepts of process and thread and their scheduling policies
3.	Introduce the various memory management techniques.
4.	Analyze the different techniques for managing memory, I/O, disk and files.
5.	Introduce the security and protection features of an Operating System.

Course Outcomes
After the completion of the course student will be able to:

1.	Describe the main components of OS and their working
2.	Explain the concepts of process and thread and their scheduling policies
3.	Explain the various memory management techniques.
4.	Compare the different techniques for managing memory, I/O, disk and files.
5.	Explains the security and protection features of an Operating System.

SYLLABUS

MODULE: I

Overview of Operating Systems: OS and the Computer System, Efficiency, System Performance and User Convenience, Classes of Operating Systems, Batch Processing Systems, Multiprogramming Systems, Time Sharing Systems, Real Time Operating Systems, Distributed Operating Systems, Modern Operating Systems.**(8L)**

MODULE: II

Processes and Threads: Processes and Programs, Programmer view of Processes, OS view of Processes, Threads, Case studies of Processes and Threads.**(8L)**

Scheduling: Preliminaries, Non-preemptive Scheduling Policies, Preemptive Scheduling Policies, Scheduling in Practice, Real Time Scheduling, Scheduling in Unix, Scheduling in Linux, Scheduling in Windows, Performance Analysis of Scheduling Policies.

MODULE: III

Memory Management: Managing the Memory Hierarchy, Static and Dynamic Memory Allocation, Memory Allocation to a Process, Reuse of Memory, Contiguous Memory Allocation, Noncontiguous Memory Allocation, Paging, Segmentation, Segmentation with Paging, Kernel Memory Allocation, A Review of Relocation, Linking and Program Forms.**(8L)**

Virtual Memory: Virtual Memory Basics, Demand Paging, Page Replacement Policies, Memory Allocation to a Process, Shared Pages, Memory Mapped Files, Unix Virtual Memory, Linux Virtual Memory, Virtual Memory using Segmentation.**(8L)**

MODULE: IV

File Systems: File System and IOCS, Files and File Operations, Fundamental File Organizations, Directory Structures, File Protection, Interface between File System and IOCS, Allocation of Disk Space, Implementing File Access, File Sharing Semantics, File System Reliability, Virtual File System, Unix File System, Linux File System, Windows File System, Performance of File Systems.**(8L)**

MODULE: V

Security and Protection: Overview of Security and Protection, Goals of Security and Protection, Security Attacks, Formal and Practical aspects of Security, Encryption, Authentication and Password Security, Access Descriptors and the Access Control Matrix, Protection Structures, Capabilities, Unix Security, Linux Security, Windows Security.**(8L)**

Text Book:

1. Dhamdhere D.M., "Operating Systems: A Concept-Based Approach", 2nd Edition, TMH, New Delhi, 2006.

Reference Books:

1. SilberschatzA.,Galvin Peter B.,Greg Gagne, "Operating System Concepts", 6th Edition, John Wiley, Indian Reprint, 2003.
2. Crowley C., "Operating Systems: A Design-Oriented Approach", TMH, New Delhi, 2002.
3. Deitel H.M., "Operating Systems", 2nd Edition, Pearson Education, 2003.
4. Tanenbaum A.S., "Operating System: Design and Implementation", PHI, New Delhi, 2002.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	3	3	2	1	1
CO2	2	3	3	1	2	2	2	2
CO3	1	1	2	2	3	1	2	1
CO4	3	1	2	1	2	1	1	1
CO5	2	2	1	2	2	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA459
Course title: OBJECT ORIENTED DESIGN AND PROGRAMMING
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 3
Class: MCA
Semester / Level:II/4
Branch: MCA

Course Objectives
This course enables the students:

A.	The course shall allow students to understand the basic tenets of OOP.
B.	The course will exemplify the basic syntax and constructs of C++.
C.	The course will help students understand the application OOP principles in various use cases.
D.	The course will explain basic C++ characteristics and their working.
E.	The course aims to expose students to newer C++ constructs like NIO, Lambdas etc.

Course Outcomes
After the completion of this course, students will be:

1.	Identify the difference between procedural and OO programming.
2.	Construct programs using various OOP principles.

3.	Design programs using C++
4.	Operate on files and strings in real life scenarios.
5.	Analyze thread performance and inter thread communication issues

SYLLABUS

MODULE: I

Computing and the Object-Oriented Design Methodology: Basic Computing Terminology, Software, Engineering Software, Object-Oriented Design.
C++ -The Fundamentals: Program Organization, A First Program, A Second Program, Comments, Assigning a Value, Fundamental C++ Objects, Constants, Names, Definitions, Expressions, Output Statements, Computing Average Velocity.**(8L)**

MODULE: II

Modifying Objects: Assignment, Const Definitions, Input Statements, Computing the Number of Molecules in a Hydrocarbon, Compound Assignment, Increment and Decrement, Estimating Yearly Savings of Change, The String Class, EzWindows, Moving Lawns.**(8L)**

Control Constructs: Boolean Algebra, A Boolean Type, Conditional Execution Using the if Statement, Conditional Execution Using the switch Statement, Computing a Requested Expression, Validating a Date, Iteration Using the while Statement, Simple String and Character Processing, Iteration Using the for Statement, Simple Data Visualization, Solving the Lazy Hobo Riddle, Iteration Using the do Construct.**(8L)**

MODULE: III

Functions Usage Basics and Libraries: Function Basics, The Preprocessor, Using Software Libraries, The iostream Library, The iomanip Library, The fstream Library, The math Library, Library ctype, The assert macros.

Programmer-Defined Functions: Basics, A Tasty Problem, Some Useful Functions, Integrating a Quadratic Polynomial, The Logic Scope, Displaying a Price-Interval Chart, Recursive Functions.

Advanced Parameter Passing: Reference Parameters, Passing Objects by Reference, Validating Telephone Access Codes, Constant Parameters, Default Parameters, Casting of Function Parameters, Function Overloading, Random Numbers, A Factory Automation Trainer.

(8L)

MODULE: IV

The Class Construct and Object-Oriented Design: Introducing a Parameter-Defined Data Type, The Rectangle Shape Class, Using the Rectangle Shape Class, Constructors, Building a Kaleidoscope, Object-Oriented Analysis and Design.

Pointers and Dynamic Memory: Lvalues and Rvalues, Pointer Basics, Constant Pointers and Pointers to Constants, Arrays and Pointers, Character String Processing, Program Command-line Parameters, Pointers to Functions, Dynamic Objects, A Simple ADT for Representing Lists of Integer Values.**(8L)**

MODULE: V

Inheritance: Object-Oriented Design Using Inheritance, Reuse via Inheritance, A Hierarchy of Shapes, Protected Members and Inheritance, Controlling Inheritance, Multiple Inheritance, A Prettier Kaleidoscope.

Templates and Polymorphism: Generic actions and Types, Function Templates, Class Templates, A Simple List Class Using a Class Template, Sequential Lists, Polymorphism, Virtual Function Nuances, Abstract Base Classes, Virtual Multiple Inheritance.**(8L)**

Text Book:

1. Cohoon J.P. & Davidson J.W., "C++ Program Design: An Introduction to Programming and Object-Oriented Design", 2nd Edition, TMH Education, New Delhi, 2000.

Reference Book:

1. Friedman F.L. &Koffman E.B., "Problem Solving, Abstraction, and Design Using C++", 4th Edition, Pearson Education, Inc. 2004.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2	1	3	2	1
CO2	3	2	3	3	1	3	1	2
CO3	1	3	3	3	2	2	2	1
CO4	2	1	2	2	3	2	1	1
CO5	1	1	2	2	1	1	1	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA461
Course title: DATABASE MANAGEMENT SYSTEM
Pre-requisite(s):
Co-requisite(s):
Credits: 4 L:3 T:1 P:0
Class schedule per week: 4
Class: MCA
Semester / Level:II/4
Branch: MCA

Course Objectives

This course enables the students:

A.	To observe that how the real world data is stored, retrieved, and communicate under the DBMS environment
B.	To design a logical model which having the unique relation between the Data.
C.	To apply the query for the modification of the system.
D.	To develop a conceptual design which allows as to avoid anomalies in superior's data.

E.	To discuss a system which allows to restrict the uncontrolled exaction and provide rigorous variation of the task.

Course Outcomes

After the completion of this course, students will be able to:

1.	Describe various data models and schemas used in database management systems.
2.	Explain the fundamental concepts, data definitions and query processing tasks in relational querylanguages.
3.	Recognize database design theory, and evaluate functional dependencies and normal forms indatabases.
4.	Formulate the operations of transaction and concurrent query processing tasks to obtain the correctresults even under strict time constraints.
5.	Interpret the foundational concepts of distributed databases. Illustrate several techniques related totransaction management and query processing in distributed database management systems.

SYLLABUS

MODULE - I

Introduction and Conceptual Modelling: Purpose of Database Systems, Data Models, Schemas and Instances, Three-Schema Architecture and Data Independence, Database languages, Database Architecture, Classification of DBMS, relational database, Database users and Administrators, Advantages of DBMS. Entities and Entity Sets, Relationships and Relationship Sets, Keys, Mapping, Constraints, ER Diagram, Reducing ER Diagram to tables, Generalization and Specialization, Aggregation.**(8L)**

MODULE - II

Relational Model: Concepts, Constraints, Languages, Design and Programming: Relational database Schemas, Relational Algebra, Relational Calculus (Tuple Relational calculus and Domain Relational calculus), Update operations, Transactions, Dealing with constraint violations. Binary Relational operation: JOIN and DIVISION, SQL, More complex SQL Queries, Security & Integrity violations, authorization and views, integrity constants, encryption, Statistical databases

(8L)

MODULE - III

Database Design Theory and Methodology: Pitfalls in relational database design, Functional Dependencies, Decomposition Using Functional Dependencies. Normalization using functional Dependencies, General Definition of First, Second, Third and Forth Normal Form. Boyce-Codd Normal Form(BCNF), Multivalued and join dependencies, DKNF, Atomic values, Data-base Design Process. Modeling Temporal Data, Alternative approaches to database design. **(8L)**

MODULE - IV

Transaction Processing Concepts and Concurrency Control Techniques: Transaction Processing, Desirable Properties of Transactions, Transaction State, Characterizing Schedules based on Recoverability and Serializability. Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity, Deadlock Handling, Recovery and Atomicity, Log-Based Recovery.**(8L)**

MODULE - V

Distributed Databases and Client-Server Architectures: Concepts and Types of Distributed databases, data fragmentation, Replication and Allocation Techniques for Distributed Database Design, Query Processing in Distributed Databases, Overview of Concurrency Control and Recovery in Distributed Databases, An Overview of 3-Tier Client-Server Architecture.**(8L)**

Text Book:

1. ElmasriRamez, &Navathe S.B., "Fundamentals of Database Systems", 5th Edition, Pearson Education, 2006.

Reference Book:

1. Silberschatz A., &Korth H., "Database Systems Concepts", 5th Edition, McGraw Hill Higher Education, 2005.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	3	3	3	2	2	1
CO2	3	3	1	2	1	3	1	2
CO3	2	2	3	3	2	2	2	1
CO4	3	1	2	2	3	2	1	1
CO5	1	2	2	2	1	1	1	2

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: MT117

Course title: Basics of Financial Accounting and Management

Pre-requisite(s): NIL

Co- requisite(s): NIL

Credits: 3 L:3 T:0 P:0

Class schedule per week: 3

Semester/Level: II/4

Branch:MCA
Name of Teacher:

Course Objectives

This course enables the students:

A.	To impart knowledge about the scope of financial management and accounting with understanding the concept of financial functions and decision making.
B.	To give knowledge about the various sources of finance
C.	To impart knowledge on capital budgeting decision making with a basic concept of different techniques to appraise business projects
D.	To impart knowledge of working capital management and its policies.
E.	To give knowledge on management of cost and various techniques of cost management.

Course Outcomes

After the completion of this course, students will be able to:

1.	Apply the concepts of financial management as well as accounting and analyse the statements with the help of Ratio Analysis.
2.	Identify and implement long and short term sources of finance through capital market and money market.
3.	Applydiverse appraisal techniques including Non-Discounting and Discounting factors like, Pay Back, ARR, NPV, IRR, Profitability Index etc
4.	Analyse and implement various techniques of working capital management and its policy implications.
5.	Explain conceptual framework on management of cost and various techniques of cost management.

SYLLABUS

Module I

Introduction to Financial Management, Accounting Concept Concept, Finance Functions, Role of Finance Manager, Decision Making. Principles and conventions, Double Entry System, Accounting Statements, Analysis of Financial Statement: Ratio Analysis.**(8L)**

Module II

Sources of Finance: -Short term &Long term, Stock Market: Primary Market & Secondary Market, Shares: Equity Shares & Preference Shares, Debenture: Definition & Types, Venture Capital, Mutual Fund, Bank Loan: Working Capital Loan & Term Loan.**(8L)**

Module III

Capital Budgeting: -Definition, Concept, Objective, Methods of appraisal; Payback Period, ARR, NPV, IRR, Benefit Cost Ratio.**(8L)**

Module IV

Working Capital Management: -Working Capital:Definition, Gross Working Capital, Net Working Capital, Importance, influencing factors, Working Capital Cycle, Working CapitalPolicies, Working Capital Financing Policies.**(8L)**

Module 5

Cost Management- Cost:Definition, Concept, Classification, Cost Centre: Concept and Types, Cost Sheet. Marginal Costing: Definition, Importance, CVP Analysis: Break Even Analysis, Margin of Safety, Angle of incidence, Graphical Representation, Limitations. **(8L)**

Text/Reference Books:-

1. Financial Management by I.M. Pandey. Vikas Publication.
2. An Introduction to Financial Accounting by S.N. Maheshwari, Vikas Publication.
3. Cost & Management Accounting by M.N.Arora, Vikas Publication
4. Financial Management: Theory & Practices by Chandra Prasanna, TMH Publication

Gaps in the syllabus (to meet Industry/Profession requirements)
POs met through Gaps in the Syllabus
Topics beyond syllabus/Advanced topics/Design
POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods
Lecture by use of boards/LCD projectors/OHP projectors
Tutorials/Assignments
Seminars
Mini projects/Projects

Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of NPTEL materials and internets
Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
End Sem Examination Marks	50
Mid Sem Examination Marks	25
Quiz (s)	20
Independent Teaching Assessment	5

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1
CD2	Tutorials/Assignments		CO2	CD1, CD2, CD4
CD3	Seminars		CO3	CD1
CD4	Mini projects/Projects		CO4	CD1, CD2, CD5, CD8
CD5	Laboratory experiments/teaching aids		CO5	CD1, CD2, CD3, CD4, CD6, CD8

CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

COURSE INFORMATION SHEET

Course code: CA456
Course title: DATA STRUCTURES LAB
Pre-requisite(s): High Level languages like C, C++, Java or Python
Co- requisite(s): Data Structures Lab
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester / Level: II/4
Branch: MCA

Course Objectives
This course enables the students:

A.	To assess how the choice of data structures and algorithm design methods impact the performance of programs.
B.	To choose the appropriate data structure and algorithm design method for a specified application.
C.	To solve problems using data structures such as linear lists, stacks, queues, hash tables, binary trees, heaps, binary search trees, and graphs and writing programs for these solutions.
D.	Analyse and compare the different algorithms

Course Outcomes
After the completion of this course, students will be able to:

1.	Choose an appropriate data structure given a computational problem
2.	Design and analyze the time and space efficiency of various data structures
3.	Analyze run-time execution of previous learned sorting methods, including selection, merge sort, heap sort and quick sort

4.	Have practical knowledge on the applications of data structures
5.	Justify the choice of data structure for a given problem

SYLLABUS

1. Program to Find the Number of Elements in an Array
2. Develop and Implement a menu driven program in C for the following Array operations
    a. Creating Array of N Integer elements.
    b. Display of Array elements with suitable headings.
    c. Inserting an element (ELEM) at a given valid position (POS).
    d. Deleting an element at a given valid position (POS).
    e. Exit
3. Programs for Stack, Queues and Circular Queues using Arrays
4. Program to convert an Infix Expression into Postfix and Postfix Evaluation
5. Program to implement stack using arrays
6. Program to implement stack using linked list
7. Program to implement multiple stack in a single array
8. Program to convert infix notation to postfix notation using stacks
9. Program to implement queue using arrays
10. Program to implement queue using pointers
11. Program to reverse elements in a queue
12. Program to implement circular queue using arrays
13. Program to create add remove & display element from single linked list
14. Program to create add remove & display element from double linked list
15. Program to count number of nodes in linear linked list
16. Program to create add remove & display element from circular linked list
17. Programs to implement stack & queues using linked representation
18. Program to concatenate two linear linked lists
19. Program to accept a singly linked list of integers & sort the list in ascending order.
20. Program to reverse linked list
21. Program to represent polynomial using linked list
22. Program to add two polynomials using linked list
23. Program for the creation of binary tree, provide insertion & deletion in c
24. Program for pre-order, post-order & in-order traversals of a binary tree using non reccursive.
25. Program to count no, of leaves of binary tree
26. Program for implementation of B-tree (insertion & deletion)
27. Program for implementation of multi-way tree in c
28. Program for implementation of AVL tree
29. Program to implement bubble sort program using arrays
30. Program to implement merge sort using arrays
31. Program to implement selection sort program using arrays
32. Program to implement insertion sort program using arrays
33. Program to implement topological sort using arrays
34. Program to implement heap sort using arrays

35. Program to implement heap sort using pointers
36. Program to implement bubble sort program using pointers
37. Program to implement linear search using pointers
38. Program to implement binary search using pointers
39. Program to implement linear search using arrays
40. Program to implement binary search using arrays

Text books:

1. Baluja G S, "Data Structure through C", Ganpat Rai Publication, New Delhi, 2015.
2. Pai G A V, "Data Structures and Algorithms: Concepts, Techniques and Applications", 2nd Edn, Tata McGraw-Hill, 2008.
3. Horowitz E., Sahni S., Susan A., "Fundamentals of Data Structures in C", 2nd Edition, University Press, 2010.

Reference books:

4. Tremblay J. P., Sorenson P. G, "An Introduction to Data Structures with Applications", 2nd Edn, McGraw-Hill, Inc. New York, NY, USA.
5. Lipschutz Seymour, "Data Structures", 6th Edn, 9th Reprint 2008, Tata McGraw-Hill.
6. Drozdek Adam, "Data Structures and Algorithms in C++", Thomson Learning, New Delhi – 2007.
7. Feller J., Fitzgerald B., "Understanding Open Source Software Development", Pearson Education Ltd. New Delhi

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods	
CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	3	2	1	2	1
CO2	3	3	3	3	2	1	2	2
CO3	3	3	3	3	2	1	2	1
CO4	3	3	3	3	1	1	1	1
CO5	3	3	3	3	2	1	1	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA458
Course title: OPERATING SYSTEM LAB
Pre-requisite(s): Data Structure, Computer System Architecture, Basic Course on Computer Programming
Co- requisite(s):
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester / Level:II/4
Branch: MCA

Course Objectives
This course enables the students to:

1.	Present the main components of OS and their working
2.	Introduce the concepts of process and thread and their scheduling policies
3.	Introduce various memory management techniques.
4.	Analyze the different techniques for managing memory, I/O, disk and files.
5.	Introduce the security and protection features of an Operating System.

Course Outcomes
After the completion of the course student will be able to:

1.	Describe the main components of OS and their working
2.	Explain the concepts of process and thread and their scheduling policies
3.	Explain the various memory management techniques.
4.	Compare the different techniques for managing memory, I/O, disk and files.
5.	Explains the security and protection features of an Operating System.

1. Implement in C the following UNIX commands using System calls : cat and mv
2. WAP in C to Determine the size of a file using the lseek command.
3. WAP to calculate the number of blocks assigned for the file.
4. Write a C program that deletes a directory with all its subfolders. The name of the directory should be read from the command line.

5. Write a program that deletes every 5th byte from a file, but without using a temporary file or allocating a buffer in the memory.
6. WAP in C to implement FCFS CPU scheduling Algorithm.
7. WAP in C to implement SJF CPU scheduling Algorithm.
8. WAP in C to implement Priority CPU scheduling Algorithm.
9. WAP in C to implement Round Robin (RR) CPU scheduling Algorithm.
10. WAP in c to read from the buffer & produce desired output.
11. WAP ii C to create Userid& Password.
12. WAP in c to implement and find how many Users currently login in NetWork.
13. WAP in c to create your won system call just like a copy.
14. WAP in c to create your won system call just like a delete.
15. WAP in c to find the Disk Space.
16. WAP In C to find The number of pages in the process.
17. WAP In C to find The number of frames allocated to the process.
18. WAP in c to find the no. of blocks occupied by a file.
19. WAP in c to create your won system call just like a delete.
20. WAP in c to create your won system call just like a ls.
21. WAP in c to find a PID no. of any Process.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30

Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	3	3	3	2	2	1
CO2	3	3	1	2	1	3	1	2
CO3	2	2	3	3	2	2	2	1
CO4	3	1	2	2	3	2	1	1
CO5	1	2	2	2	1	1	1	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA460
Course title: C++ PROGRAMMING LAB
Pre-requisite(s):
Co- requisite(s):
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester / Level:II/4
Branch: MCA

Course Objectives
This course enables the students to:

1.	Introduce the concepts ofobject-oriented programming and features of object-oriented programming languages.
2.	To learn advanced features of the C++ programming language as a continuation of the previous course.
3.	To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods
4.	To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.
5.	To enhance problem solving and programming skills in C++ with extensive programming projects

Course Outcomes
After the completion of this course, students will be able to:

CO1	Explain basic concepts of object-oriented programming.
CO2	Use the characteristics of an object-oriented programming language in a program.

CO3	Use the basic object-oriented design principles in computer problem solving
CO4	Develop their own Applications /Projects using C++
CO5	Simulate the problem in the subjects like Operating system, Computer networks and real world problems.

SYLLABUS

List of Programs as Assignments:

Objective: To Understand and Implement basic OOP features

1.Write a Program to design a class having static member function named showcount() which has the property of displaying the number of objects created of the class.

2. Write a Program which creates & uses array of object of a class.(for eg. implementing the list of Managers of a Company having details such as Name, Age, etc..).

Objective: To Understand and Implement special types of functions like friend function

3. Write a Program to swap private data members of classes named as class_1, class_2 using friend function.

4.Write an inline function to find largest of three number

Objective: To Understand and Implement the concept of constructors

5. Write a Program using copy constructor to copy data of an object to another object.

6. Write a program to perform addition of two complex numbers using constructor overloading. The first constructor which takes no argument is used to create objects which are not initialized, second which takes one argument is used to initialize real and imag parts to equal values and third which takes two argument is used to initialized real and imag to two different values.

Objective: To Understand and Implement the concept of Polymorphism

7. Write a program for overloading operator++ and operator—using friend functions

8. Write a program for developing a matrix class which can handle integer matrices of different dimensions. Also overload the operator for addition, multiplication & comparison of matrices.

9.Writea C++ program to compute area of right angle triangle, equilateral triangle, isosceles triangle using function overloading concept.

Objective: To Understand and Implement the concept of Inheritance

10.Write a Program to design a student class representing student roll no. and a test class (derived class of student) representing the scores of the student in various subjects and

sports class representing the score in sports. The sports and test class should be inherited by a result class having the functionality to add the scores and display the final result for a student.

11. Write a Program illustrating how the constructors are implemented and the order in which they are called when the classes are inherited. Use three classes named alpha, beta, gamma such that alpha, beta are base class and gamma is derived class inheriting alpha & beta.

Objective: To Understand and Implement exception handling

12. Write a program to raise an exception if any attempt is made to refer to an element whose index is beyond the array size.

Objective: To Understand and Implement File Operations

13. Write a program to read the class object of student info such as name , age ,sex ,height and weight from the keyboard and to store them on a specified file using read() and write() functions. Again the same file is opened for reading and displaying the contents of the file on the screen.

14. Write a program to perform the deletion of white spaces such as horizontal tab, vertical tab, space ,linefeed ,new line and carriage return from a text file and store the contents of the file without the white spaces on another file.

Books recommended:

TEXT BOOKS

1. J.P.Cohoon&J.W.Davidson- C++ Program Design: An Introduction to Programming and Object-Oriented Design, 2nd Edn, TMH Edn, New Delhi-2000.

REFERENCE BOOKS

1. F.L.Friedman&E.B.Koffman- Problem Solving, Abstraction, and Design Using C++, 4th Edn, Pearson Education, Inc. 2004.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures

CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	1	2	3	3	2	1	1	1
CO2	3	3	3	2	1	2	2	2
CO3	2	3	3	1	1	2	1	1
CO4	2	3	2	3	3	1	2	1
CO5	2	3	2	3	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA412
Course title: RDBMS LAB
Pre-requisite(s):
Co-requisite(s):
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester/Level: II/4
Branch: MCA

Course Objectives

This course enables the students:

A.	To observe that how the real world data is stored, retrieved, and communicate under the DBMS environment
B.	To design a logical model which having the unique relation between the Data.
C.	To apply the query for the modification of the system.
D.	To develop a conceptual design which allows as to avoid anomalies in superior's data.
E.	To discuss a system which allows to restrict the uncontrolled exaction and provide rigorous variation of the task.

Course Outcomes

After the completion of this course, students will be able to:

1.	Describe various data models and schemas used in database management systems.

2.	Explain the fundamental concepts, data definitions and query processing tasks in relational querylanguages.
3.	Recognize database design theory, and evaluate functional dependencies and normal forms indatabases.
4.	Formulate the operations of transaction and concurrent query processing tasks to obtain the correctresults even under strict time constraints.
5.	Interpret the foundational concepts of distributed databases. Illustrate several techniques related totransaction management and query processing in distributed database management systems.

Consider the following tables:

emp(empno,ename,job,mgr,hiredate,sal,comm,deptno,gr),

dept(deptno,dname,loc)

Write the following queries:

1. List all information about all department from emp table.
2. List all employee names along with their salaries from emp table.
3. List all department numbers, employee numbers and their managers numbers in descending order of deptno from emp table.
4. List department names and locations from the dept table.
5. List the employees belonging to the department 20.
6. List the name and salary of the employees whose salary is more than 1000.
7. List the names of the clerks working in the department 20.
8. List the names of analysts and salesmen.
9. List the details of the employees who have joined before the end of September 81.
10. List the names of employees who are not managers.
11. List the names of employees whose employee number are 7369, 7521, 7839, 7934, 7788.
12. List the employee details not belonging to the department 10, 30, and 40.
13. List the employee name and salary, whose salary is between 1000 and 2000.
14. List the employee names, who are not eligible for commission.(salary having >15,000 eligible for commission)
15. List the employees who are eligible for commission.

16. List the details of employees, whose salary is greater than 2000 and commission is NULL.
17. List the employees whose names start with an “S” (not”s”).
18. List the name, salary and PF amount of all the employees(PF is calculated as 10% of salary).
19. List the empno, ename, sal in ascending order of salary.
20. List the employee name, salary, job and Department no descending order of Department No and salary.
21. List the employee details in ascending order of salary.
22. List the employee details in descending order of salary
23. Display name, and sal and commission of all employees whose monthly salary is greater than their commission.
24. Select SMITH HAS WORKED IN THE POSITION OF CLERK IN DEPT 20.Display result in this format.
25. Generate a statement which prompts the user at runtime. The intention is to display employees hired between 2 given dates.
26. Define a variable representing an expression used to calculate total annual remuneration. Use the variable in a statement which finds all employees who earn $30000 a year or more.
27. List all the employees name and salaries increased by 15% and expressed as a whole number of dollars.

28. Produce the following

EMPLOYEE AND	**JOB**
SMITH	CLERK
ALLEN	SALESMAN

29. Produce the following output:

SMITH (Clerk)

ALLEN (Salesman)

30. Do a case sensitive search for a list of employees with a job that the user enters.
31. It has been discovered that the sales people in dept. 30 are not all male. Please produce thefollowingoutput.

ENAME	**DEPTNO**	**JOB**
ALLEN	30	Sales Person

32. Display each employees name and hiredate of dept 20.

33. Display each employees name, hiredate and salary review date. Assume salary review date

is one year fromhiredate. Output should be in ascending review date.

34. Print list of employees displaying just salary, if more than 1500. If exactly 1500 display " On Target". If less than 1500 display " Below 1500".
35. Write a query which returns DAY of the week (i.e. MONDAY) for any date entered in the

format DD/MM/YY.

36. Write a query to calculate length of service of each employee.
37. Find the minimum salary of all employees.
38. Find the maximum, minimum, and average salaries of all employees.
39. List the maximum and minimum salary of each job type.
40. Find how many managers are in each dept.
41. Find the average salary and average total remuneration of each job type. Remembers sales man earn commission.
42. Find out the difference between highest and lowest salary.
43. Find all department s which have more than three employees.
44. Check whether all employee nos are unique. (No Duplicate)
45. List lowest paid employee working for each Manager. Exclude any groups where the minimum salary is less than 1000. Sort the output by salary.
46. Produce a list showing employees 'salary grade'.(> 10000 A, >10000 &<20000 B, >20000 C)
47. Show only employee on Grade C.
48. .Show all employee in Dallas.
49. List the employees name, job, salary, grade and department for everyone in the company except clerks. Sort on salary, displaying the highest first.
50. List the following details of employees who earn $36000 a year or who are clerks.

Ename Job Annual Sal Dept no Dname Grade

51. Display all employees who earn less than their managers.
52. Display all employees by name and eno along with their managers name and number.
53. Modify above spoliation to display KING who has no MANAGER.
54. Find the job that was files in the first half of 1983 and the name job that was filled in the same period in 1984.
55. Find all employees who have joined before their manager.

EMPLOYEE HIREDATE MANAGER HIREDATE

56. Find the employees who earn the highest salary in each job, type, sort in descending order

of salary.

57. Find the employees who earn the minimum salary for their job, Display the result in descending order of salary

58. Find the most recently hired employees in the department. Order by hiredate.

59. Show the details of any employee who earns a salary greater than the average for their department. Sort in department number order.

60. List all department where there are no employees.

Text book:

1. SQL, PL/SQL the programming Language of Oracle, Ivan Bayross, 4th edition

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution

Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	2	3	1	3	2	2	1
CO2	3	3	1	2	1	1	1	2
CO3	2	2	3	1	2	3	3	1
CO4	1	1	1	2	3	2	1	1
CO5	3	2	1	2	1	1	1	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA501
Course title: JAVA PROGRAMMING
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P:0
Class schedule per week: 3
Class: MCA
Semester / Level: III/5
Branch: MCA

Course Objectives:

This course enables the students:

A.	Help students realize the advanced features in JAVA.
B.	Establish the relationship between the core and advanced JAVA frameworks.
C.	Understand problems where Advanced JAVA is required.
D.	Evaluate the advantages and short comings of advanced JAVA
E.	Understand how frameworks and APIs are designed.

Course Outcomes:

After the completion of this course, students will be able to:

1.	Learn the architecture of advanced swing components and design GUIs using them.
2.	Learn to interface with external data sources with Java.
3.	Leverage Java to create and deploy network programs.
4.	Use Java to design enterprise level Web sites.
5.	Understand Java's component based programming model.

SYLLABUS

MODULE: I

Fundamentals of Java Programming: Data in Java Programs, Arithmetic Operators and Expressions, Simple Program Input and Output.**(8L)**

Making Decisions with Java: Comparing Numbers in Java, Comparing Strings in Java, Logical (Boolean) Operators and Order of Precedence, Selection Structures in Java.

MODULE: II

Repeating Program Statements: The **while** Statement, The**for** Statement, The **do…while** Statement, Nested Loops, **break**, and **continue**.

Methods and Classes: Predefined Java Methods, Programmer-Defined Methods.

Arrays: The One-Dimensional Array, Multidimensional Arrays, Other Array Topics.**(8L)**

MODULE: III

Characters, Strings, and Formatting: Working with Characters, Working with Strings, Formatting Data for Output.

Exceptions and Assertions: Exception Handling, Assertions**(8L)**

MODULE: IV

File Input and Output: Inputting Data from a Text File, Outputting Data to a Text file, Performing Input and Output with Binary Files.**(8L)**

MODULE: V

Graphical User Interfaces: Creating User Interfaces, Overview of a Java GUI, Developing a Java GUI, Adding Functionality to a GUI, Improving GUI Layout.**(8L)**

Text Book:

1. Johnson Richard A., "An Introduction to Java Programming and Object-Oriented Application Development", 1st Edition, Thomson Learning, New Delhi, 2007.

Reference Books:

1. Dietel&Dietel, "Java How to Program", 5th Edition, Pearson Education, New Delhi, 2006.
2. Balagurusamy E. "JAVA Programming", 3rd Edition, TMH, New Delhi, 2005.
3. Sleek James M. Sleek "Programming and Problem Solving with JAVA", Thomson Learning, Indian Edition, 2007.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids

CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	3	3	3	2	2	1
CO2	3	3	1	2	1	3	1	2
CO3	2	2	3	3	2	2	2	1
CO4	3	1	2	2	3	2	1	1
CO5	1	2	2	2	1	1	1	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA503
Course title: COMPUTER ALGORITHM DESIGN
Pre-requisite(s):

Co- requisite(s):
Credits: 4 L:3 T:1 P: 0
Class schedule per week: 04
Class: MCA
Semester / Level: III/5
Branch: MCA

Course Objectives
After the completion of this course, students will be:

1.	Understand different notions of asymptotic complexity
2.	Find about and infer the practical implications of asymptotic notations
3.	know and use basic and advanced graph algorithms
4.	Analyse the difference between the dynamic programming concept and a greedy approach
5.	Implement, analyze, and compare algorithm

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify the different notions of asymptotic complexity and determine the asymptotic complexity of algorithms including the solving of recurrence relations
2.	Able to determine the practical implications of asymptotic notations.
3.	Describe and use basic and advanced graph algorithms including DFS, BFS, and Bellman Ford
4.	Analyse the difference between the dynamic programming concept and a greedy approach
5.	Implement, analyze, and compare various algorithms

SYLLABUS

MODULE: I

Elementary Algorithmic: Introduction, Problems and instances, The efficiency of algorithms, Average and worst-case analyses, What is an elementary operation, why look for efficiency.

Asymptotic Notation: Introduction, A notation for "the order of", Other asymptotic notation, Conditional asymptotic notation, Conditional asymptotic notation, Asymptotic notation with several parameters, Operations on asymptotic notation. **(8L)**

MODULE: II

Analysis of Algorithm: Introduction, Analyzing control structures, Using a barometer, Supplementary examples, Average-case analysis, Amortized analysis, Solving recurrences.

Greedy Algorithms: General characteristics of greedy algorithms, Graphs: Minimum spanning trees, Shortest paths, The knapsack problem, scheduling. **(8L)**

MODULE: III

Divide-and-conquer: Introduction: Multiplying large integers, The general template, Binary search, Sorting, Finding the median, Matrix Multiplication, Exponentiation. **(8L)**

MODULE: IV

Dynamic Programming: Calculation the binomial coefficient, The World Series, Making change, The principle of optimality, The knapsack problem, Shortest paths, Chained matrix multiplication. **(8L)**

MODULE: V

Exploring Graphs: Graphs and games: An introduction, Traversing trees, Depth-first search: Undirected graphs, Depth-first search: directed graphs, Breadth-first search, Backtracking, Branch-and-bound, the minimax principle.

Probabilistic Algorithms: Introduction, Probabilistic does not imply uncertain, Expected versus average time, Pseudorandom generation, Numerical probabilistic algorithms, Monte Carlo algorithms, Las Vegas algorithms. **(8L)**

Text Book:

1. Brassard G. & Bratley P., "Fundamentals of Algorithms", New Delhi, 2005.

Reference Books:

1. E.Horowitz. et.al., "Fundamentals of Computer Algorithms", Galgotia Publication Pvt. Ltd.,New Delhi, 2004.
2. Kleinberg J. &Tardos E., "Algorithm Design", Pearson Education, New Delhi, 2006.
3. Cormen T.H., Leiserson Charles E.,Rivest Ronald, Stein Clifford "Introduction to Algorithms" 3rd Edition, PHI, New Delhi, 2005.
4. Dasgupta S., Papadimitriou C.H., Vaziran U.V, " Algorithm" 3rd Edition , TMH, New Delhi, 2007.
5. Sahani S., "Data Structures Algorithms and Applications in C++" 2nd Edition, Universities Press (India) Pvt. Ltd., 2005.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	3	3	2	2	1
CO2	3	3	3	2	1	3	1	2
CO3	2	2	3	3	3	3	2	1
CO4	1	3	1	1	3	2	1	1
CO5	3	2	2	2	1	1	1	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6

CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA504
Course title: AUTOMATA THEORY
Pre-requisite(s):
Co- requisite(s):
Credits: 4 L:3 T:1 P: 0
Class schedule per week: 04
Class: MCA
Semester / Level: III/5
Branch: MCA

Course Objectives
This course enables the students to:

A.	Define a system and recognize the behavior of a system.
B.	Design finite state machines and the equivalent regular expressions.
C.	Construct pushdown automata and the equivalent context free grammars
D.	Design Turing machines and Post machines
E.	Learn about the issues in finite representations for languages and machines, as well as gain a more formal understanding of algorithms and procedures.

Course Outcomes
After the completion of this course, students will be able to:

1.	Relate formal languages and mathematical models of computation
2.	Attain knowledge about different types of languages and the corresponding machines
3.	Learn about the pushdown machine and its role in compiler construction
4.	Understand the capability of real computers and learn examples of unsolvable problems.
5.	Analyse classes of P, NP, NP-C and NP-Hard problems

SYLLABUS

MODULE: I

Basic Mathematical Objects and Mathematical Induction: Sets, logic, Functions, Relations, Alphabets, Strings, Languages, Principle of mathematical induction, Recursive definition. **(8L)**

MODULE: II

Regular Expressions and Finite Automata: Regular languages and Regular Expressions, Memory required to recognize a language, Finite Automata, capability & limitations of FSM, Deterministic Finite Automata , Non-Deterministic Finite Automata, NFA with e-moves, regular sets & regular expressions, Equivalence of DFA and NDFA, NFA from regular expressions, regular expressions from DFA, Moore versus Mealy m/c, two way finite automata equivalence with one way , Kleen's Theorem, applications of finite automata. **(8L)**

MODULE: III

Regular and Non-regular languages: Criterion for Regularity, Minimal Finite Automata, Pumping Lemma for Regular Languages, Decision problems, Regular Languages and Computers.

Context Free Grammars: Introduction, definition, Regular Grammar, Derivation trees, Ambiguity, Simplified forms and Normal Forms, Applications.**(8L)**

MODULE: IV

Pushdown Automata: Definition, Moves, Instantaneous Descriptions, Language recognised by PDA, Deterministic PDA, Acceptance by final state & empty stack, Equivalence of PDA , Pumping lemma for CFL, Interaction and Complements of CFL,Decision algorithms.

Turing Machines: Definition and examples, Computing Partial Functions with Turing Machine(TM), Combining TMs, Variations of TMs, Multi-tape TMs, Non-deterministic TM, Universal TM, Church Thesis. **(8L)**

MODULE: V

Recursively Enumerable Languages: Recursively Enumerable and Recursive, Enumerating Language, Context Sensitive and Chomosky Hierarchy.

Unsolvable Problems and Computable Functions: Nonrecursive Language and unsolvable Problems, Halting Problem, Rice Theorem, Post Correspondence Problem.

Computational Complexity: Discussion on P, NP, NPC and NP-Hard Problems. **(8L)**

Text Books:

1. Martin John "Introduction to Languages and the Theory of Computation", 3rd Edition, TMH.

Reference Books:

1. Mishra K.L.P &Chandrasekharan N., "Theory of Computer Science", PHI.

2. Hopcroft John E. And Ullman Jeffrey D., "Introduction to Automata Theory, Languages & Computation", 3rd Edition, Narosa, 2008.
3. Lewis H. R. and Papadimitrou C. H, "Elements of the theory of Computation", PHI.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	1	2	1	1	2

CO2	3	3	3	2	1	2	2	2
CO3	3	3	3	1	1	2	1	1
CO4	3	2	1	3	3	1	2	1
CO5	3	2	1	3	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA505
Course title: SOFTWARE ENGINEERING
Pre-requisite(s):
Co- requisite(s):
Credits: 4 L:3 T:1 P: 0
Class schedule per week: 04
Class: MCA
Semester / Level: III/5
Branch: MCA

Course Objectives
This course enables the students to:

1.	Students are effective team members, aware of cultural diversity, who conduct themselves ethically and professionally
2.	Students use effective communication skills and technical skills to assure production of quality software, on time and within budget.
3.	Students build upon and adapt knowledge of science, mathematics, and engineering to take on more expansive tasks.
4.	Able to increase level of self-reliance, technical expertise, and leadership.

Course Outcomes
After the completion of this course, students will be:

1.	Explain the software engineering principles and techniques
2.	Apply Software Project Management Practices
3.	Apply the knowledge gained for their project work as well as to develop software following software engineering standards
4.	Analyze various methods of software testing strategies
5.	Develop self-reliance, technical expertise, and leadership.

SYLLABUS

MODULE: I

Introduction to Software Engineering: Evolving Role of Software, Changing Nature of Software, Legacy Software, Process Frame work, Process Patterns, Process Models, Waterfall Model, Incremental Process Models, Evolutionary Process Models, Specialized Process Models, Unified Process Model, Agile Process Model. **(8L)**

MODULE: II

Requirement Engineering: A bridge to design and construction, Requirement Engineering Task, Initiating the Requirement Engineering Process, Eliciting Requirements, Developing Use case, Building the Analysis Model, Negotiating Requirements, Validating Requirements.**(8L)**

MODULE: III

Design Engineering: Design Process and Design Quality, Design Concepts, Design Models, Pattern Based Software Design. **(8L)**

MODULE: IV

Testing Strategies and Testing Tactics: Strategic Approach to software Testing, Test Strategies for conventional and Object Oriented Software, Validation Testing System Testing, White Box Testing, Basic Path Testing Control Structure Testing, Black Box Testing, Object Oriented Testing Methods. **(8L)**

MODULE: V

Metric for process and Estimation Techniques: Process metrics, Software Measurement, Software Project Estimation, Decomposition Techniques, Empirical Estimation Models, Estimation for Object Oriented Projects Specialized Estimation Techniques.

Software Quality and Configuration Management: Quality Concepts, Software Quality Assurance, Software Reliability, Software Configuration Management, SCM Repository, SCM Process. **(8L)**

Text Book:

1. Pressman Roger S., "Software Engineering – A Practitioner's Approach", 6th Edition., Tata McGraw Hill.

Reference Books:

1. Vliet Haus Van, "Software Engineering – Principles and Practice", Wiley John and Sons, 2nd Edition.
2. Sommerville Ian, "Software Engineering", 7th Edition., Pearson Education.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	1	2	1	1	1
CO2	2	1	3	3	2	2	2	1
CO3	2	3	1	1	2	2	3	2
CO4	3	2	1	3	3	1	2	1
CO5	2	2	3	1	3	3	1	3

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7
CO5	CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: MT121
Course title: Corporate Social Responsibility
Pre-requisite(s):NIL
Co- requisite(s): NIL
Credits: 2 L:2 T:0 P:0
Class schedule per week: 2
Semester / Level: III/1
Name of Teacher:

Course Objectives

A.	Introduce the concept of Corporate Social Responsibility and Sustainability in business context
B.	Understand the challenges faced by the organization while implementing CSR
C.	Understand who are all of the stakeholders, and how they are affected by the actions of corporations.
D.	Explain the drivers of CSR .

Course Outcomes

After the completion of this course, students will be able to:

1.	Explain the core concepts of CSR and sustainability.
2.	Analyze the complex issues confronting organizational leaders as they develop their CSR program
3.	To formulate strategies to satisfy stakeholders.
4.	Faced with a management problem, suggesting solutions that are ethical and socially responsible and that respect the principles of good governance.

Syllabus

Module I

Introduction to CSR:Meaning& Definition of CSR, History& evolution of CSR. Corporate Citizenship,. Concept of sustainability & Stakeholder, Management.CSR through triple bottom line and Sustainable Business; environmental aspect of CSR; ; theories of CSR , Carroll's model. **(8L)**

Module II

SUSTAINABLE DEVELOPMENT Sustainable development goals, United Nations (UN) Global Compact 2011.UN guiding principles on business and human rights.

(8L)

Module III

CSR-Legislation In India & the world. Section 135 of Companies Act 2013.**(8L)**

Module IV

The Drivers of CSR in India, Relation between CSR and Corporate governance; Identifying key stakeholders of CSR & their roles. (Stakeholders: Organization, Government, Society and Regulatory Environments) **(8L)**

UNIT V

Review current trends and opportunities in CSR.CSR as a Strategic Business tool for Sustainable development. Review of successful corporate initiatives & challenges of CSR.**(8L)**

Reference Books:

1. Corporate Social Responsibility : Kotler and Lee
2. Theory and practices of CSR : **Idowu**, Samuel O., **Louche**, Celine
3. CSR in India : Sanjay Aggarwal

Gaps in the syllabus (to meet Industry/Profession requirements) :
POs met through Gaps in the Syllabus -
Topics beyond syllabus/Advanced topics/Design :
POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods

Lecture by use of boards/LCD projectors/OHP projectors
Tutorials/Assignments
Seminars
Mini projects/Projects
Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of NPTEL materials and internets
Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure
Direct Assessment

Assessment Tool	% Contribution during CO Assessment
End Sem Examination Marks	50
Mid Sem Examination Marks	25
Quiz (s)	20
Independent Teaching Assessment	5

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	2	1	2	2	1	2
CO2	3	1	2	1	1	2	1	1
CO3	3	3	1	2	1	1	1	1
CO4	2	2	1	2	1	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1, CD5,CD8
CD2	Tutorials/Assignments		CO2	CD1,CD2,CD4,CD5
CD3	Seminars		CO3	CD1 ,CD2,CD4,CD5
CD4	Mini projects/Projects		CO4	CD1, CD4,CD8
CD5	Laboratory experiments/teaching aids/Case Studies			CD1,CD4,CD5,CD8,CD2

CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

COURSE INFORMATION SHEET

Course code: CA530
Course title: DISTRIBUTED DATABASES
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: III/5
Branch: MCA

Course Objectives

This course enables the students:

A.	To understand the structure of databases distributed over the network.
B.	To learn Query processing and decomposition.
C.	To understand how to create a distributed database using fragmentation.
D.	To learn transaction processing in a distributed environment.
E.	To understand how concurrency control is performed in a distributed environment.

Course Outcomes

After the completion of this course, students will be able to:

1.	Explain detailed architecture of distributed database.
2.	Design a distributed database for any environment using horizontal and vertical fragmentation.
3.	Describe transaction execution, rules and protocols used in concurrent access in a distributed environment.
4.	Perform Query Processing and its decomposition a distributed database.
5.	Design a reliable database.

SYLLABUS

Module I

Introduction: Distributed Data Processing, What is a Distributed Database System? Promises of DDBSs, Problem Areas. **(8L)**

Module II

Distributed DBMS Architecture: DBMS Standardization, Architectural Models for Distributed DBMSs, Distributed DBMS Architecture.

Distributed Database Design: Alternative Design Strategies, Distribution Design Issues, Fragmentation, Allocation. **(8L)**

Module III

Overview of Query Processing: Query Processing Problem, Objectives of Query Processing, Complexity of Relational Algebra Operations, Layers of Query Processing.
Query Decomposition and Optimization: Query Decomposition, Query Optimization, Centralized Query Optimization, Distributed Query Optimization Algorithms.**(8L)**

Module IV
Transaction Management and Concurrency Control: Definition of a Transaction, properties of Transactions, Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Locking-based Concurrency Control Algorithms, Timestamp-based Concurrency Control Algorithms, Deadlock Management. **(8L)**

Module V
Distributed DBMS Reliability: Reliability Concepts and Measures, Failures and Fault Tolerance in Distributed Systems, Failures in Distributed DBMS, Local Reliability Protocols, Distributed Reliability Protocols. **(8L)**

Text Books:

1. M. Tamer Ozsu, Patrick Valduriez, "Distributed Database Systems", 2nd Edition, Pearson, 2011.

Reference Books:

1. ElmasriNavathe, "Fundamental of Database Systems", 5th Edition, Pearson Education, 2008.
2. Thomas Connolly, Carolyn Begg, "Database Systems – A Practical Approach to Design, implementation and Management", 4th Edition, Pearson Education, 2008.
3. Silberschatz, Korth, Sudarshan, "Database System Concepts", 4th Edition, McGraw Hill, 2002.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5

Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	1	1	2	1	2	1	1	1
CO2	1	3	3	3	2	3	2	1
CO3	2	3	1	1	2	2	3	1
CO4	3	1	3	2	3	1	2	1
CO5	3	1	3	3	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA531
Course title: DECISION SUPPORT SYSTEMS
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03

Class: MCA
Semester / Level:III/5
Branch: MCA

Course Objectives
This course enables the students:

A.	To understand the basic components of DSS
B.	To learn different phases and models for Decision making
C.	To understand how to create a distributed database using fragmentation.
D.	To learn transaction processing in a distributed environment.
E.	To understand how concurrency control is performed in a distributed environment.

Course Outcomes
After the completion of this course, students will be able to:

1.	Discuss the basic components of DSS
2.	Classify the different phases and models for Decision making
3.	Design a DSS according to the requirements.
4.	Model and develop different levels in DSS using Software engineering principles
5.	Analyse the system with pros and cons.

SYLLABUS

MODULE – I

Decision Making Process: An Over view, Introduction, Managerial decision making and Information System, Need for computerized decision support and the supporting technologies, Framework of DSS, Group Support System, Executive information system, Knowledge management Systems. **(8L)**

MODULE – II

Decision Making, System, Models: Decision Making – Introduction and Definition, System, Models, previews of modeling process, Decision making – The intelligence phase, the design phase and the choice phase.
Evaluation – Multiple Goals, sensitivity analysis, What – if and goal seeking.
Decision Making - The implementation phase, Alternative decision making models.

(8L)

MODULE – III

DSS – Configurations, Definitions, Characteristics & Capabilities, Components, The Data management Subsystem, Model Management Subsystem, Knowledge – based management, Subsystem, User interface Subsystem, DSS Classification, DSS H/W, Difference between Management Science and MIS.

Modeling & Analysis - Modeling for MSS, Static & Dynamic Models, Treating Certainty, Uncertainty and Risk, Interface diags, MSS modeling in spreadsheets, Decision analysis (Decision tables and Decision trees), Optimization via mathematied programming, Meusistic Programming, Multidimensional Modeling – OLAP.

(8L)

MODULE – IV

DSS Development – Introduction, The Traditional System Development life cycle, Alternate Development Methodologies, Prototyping, DSS Technology Levels and Tools, DSS Development Platforms, DSS Development Tool Selection, Team Developed DSS, End – User Developed DSS, DSS System Integration. **(8L)**

MODULE – V

Collaboration Communication, Enterprise DSS Group Decision Making – Communication & Collaboration, Communication Support, Collaboration Support – Computer Supported Co-operative work, Group Support System, GSS Technologies. **(8L)**

Text Book:

1. Turloan E. & Aronson E. "Decision Support System & Intelligent System", 6th Edition, Pearson Education.

Reference Book:

1. Marakas G.M. "Decision Support Systems", 2nd Edition, Pearson /Prentice Hall of India.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	3	2	3	3	1	2
CO2	3	2	2	2	2	2	2	1
CO3	1	3	3	3	2	2	3	2
CO4	3	2	1	1	3	1	2	1
CO5	3	3	3	2	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA532
Course title: Data Mining and Warehousing
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: III/5
Branch: MCA

Course Objectives
This course enables the students:

A.	Examine the types of the data to be mined and apply pre-processing methods on raw data.
B.	To introduce the basic concepts of Data Warehouse and Data Mining techniques
C.	Apply the techniques of clustering, classification, association finding, feature selection and visualization to real world data
D.	Prepare students for research in the area of data mining and related applications and Enhance students communication and problem solving skills
E.	Provide the students with practice on applying data mining solutions using common data mining software tool /programming languages.

Course Outcomes
After the completion of this course, students will be able to:

1.	Describe the fundamentals of data mining systems as well as issues related to access and retrieval of data at scale.
2.	Explain the various data mining functionalities and data warehousing techniques.
3.	Apply the various data mining techniques to solve classification, clustering and association rule mining problems.
4.	Analyze and choose among different approaches of a data mining task.
5.	Design and evaluate data mining models to be used in solving real life problems, keeping in view social impacts of data mining.

SYLLABUS

MODULE – I

Data Mining: Introduction, Relational Databases, Data Warehouses, Transactional databases, Advanced database Systems and Application, Data Mining Functionalities, Classification of Data Mining Systems, Major Issues in Data Mining.

Data Processing: Data Cleaning, Data Integration and Transformation, Data Reduction.**(8L)**

MODULE – II

Data Warehouse: Introduction, A Multidimensional data Model, Data Warehouse Architecture, Data Warehouse Implementation, Data Cube Technology, From Data Warehousing to Data Mining. Data Cube Computation and Data Generalization**(8L)**

MODULE – III

Mining Association Rules in Large Databases: Association Rule Mining, Single – Dimensional Boolean Association Rules, Multilevel Association Rules from Transaction Databases, Multi Dimensional Association Rules from Relational Databases, From Association Mining to Correlation Analysis. **(8L)**

MODULE – IV

Classification and Prediction: Classification & Prediction, Issues Regarding Classification & Prediction, Classification by decision Tree Induction, Bayesian Classification, Classification by Back propagation, Classification based on concepts & Association Rule Analysis, Other Classification Methods, Prediction, Classification Accuracy. **(8L)**

MODULE – V

Cluster Analysis: Introduction, Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Method - k- Medoids Algorithm, CLARANS, Hierarchical Methods - BIRCH, ROCK Density-Based Methods - DBSCAN, Outlier Analysis. **(8L)**

Text books:

1. Jiawei Han & Micheline Kamber "Data Mining Concepts & Techniques", Publisher Harcourt India. Private Limited, 2nd Edition.

Reference books:

1. Gupta G.K. "Introduction to Data Mining with case Studies", PHI, New Delhi, 2006.
2. Berson A. & Smith S.J. "Data Warehousing Data Mining", COLAP, TMH, New Delhi, 2004.
3. Dunham H.M. & Sridhar S. "Data Mining", Pearson Education, New Delhi, 2006.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	1	2	3	2	1
CO2	2	3	3	3	2	2	2	1

CO3	3	3	1	1	2	2	3	2
CO4	3	2	2	3	3	1	2	1
CO4	3	3	2	3	3	2	2	1
CO5	3	2	2	1	2	2	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA533
Course title: MULTIMEDIA DATABASES
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: III/5
Branch: MCA

Course Objectives
This course enables the students to:

A.	Understand issues related to use of digital media
B.	Know techniques Multimedia database Searching for real-time requirements
C.	Know Multimedia Browsing, Video Browsing
D.	Obtain an understanding for Spatial and Temporal Relations of Semantic Objects
E.	Understand Object Composition Petri Net Model, Interval Based Conceptual Models.

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify multiple issues related to digital media, including audio, image, and video content
2.	Analyses techniques for streaming media
3.	Elaborate Multimedia database Searching techniques
4.	Assess the applications, parameters, and requirements of multimedia databases
5.	Summarize Characteristics of Video Data Modeling , Motion Detection and Tracking Approaches.

SYLLABUS

MODULE -I

Introduction, Multimedia Information Applications, Issues and Challenges, Semantic Models for Multimedia Information Systems, Multimedia Semantic Models.
(8L)

MODULE -II

Multimedia database Searching, Image Segmentation,Video Parsing and Segmentation Approaches ,Iconic-Based Grouping and Browsing Approaches , Knowledge-Based Event Modeling Approaches , Characteristics of Video Data Modeling , Motion Detection and Tracking Approaches ,Object Recognition Approaches ,Content-Based Retrieval.**(8L)**

MODULE -III

Multimedia Browsing, Video Browsing, Key Frame Selections. **(8L)**

MODULE -IV

Augmented Transition Network Model (ATN), Spatial and Temporal Relations of Semantic Objects, Multimedia Presentations, Multimedia Database Searching, Multimedia Browsing, User Interactions and Loops. **(8L)**

MODULE -V

Object Composition Petri Net Model, Interval Based Conceptual Models.**(8L)**

Text Book:

1. Chen S. C., Kashyap R. L., Ghafoor A. "Semantic Models for Multimedia Database Searching and Browsing", Kluwer Academic Publishers.

Reference Book:

1. Muneesawang P. "Guan L-Multimedia Database Retrieval A Human-Centered Approach", Springer Publication, 2006.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment					
Semester End Examination					

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2	2	1	1	1
CO2	3	1	3	3	1	2	2	1
CO3	3	3	1	1	2	2	3	2
CO4	3	2	1	3	3	1	2	1
CO5	3	3	2	3	2	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA502
Course title: JAVA PROGRAMMING LAB
Pre-requisite(s):
Co- requisite(s):
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester / Level: III/5
Branch: MCA

Course Objectives:
This course enables the students to:

A.	Realize the advanced features in JAVA.
B.	Establish the relationship between the core and advanced JAVA frameworks.
C.	Understand problems where Advanced JAVA is required.
D.	Evaluate the advantages and short comings of advanced JAVA
E.	Understand how frameworks and APIs are designed.

Course Outcomes:
After the completion of this course, students will be:

1.	Learn the architecture of advanced swing components and design GUIs using them.
2.	Learn to interface with external data sources with Java.
3.	Leverage Java to create and deploy network programs.
4.	Use Java to design enterprise level Web sites.
5.	Understand Java's component based programming model.

1. WAJP to show the characteristic of a number. {E.g. 24 it has two coefficients 2 in tens position and 4 in units position. It is composed of 2 and 3. It is a positive number. Also show whether it is odd or even.

2. WAJP to take input through command line argument and do the following:
    a) Check whether the number is prime.
    b) Generate the reverse a number.
3. Write a menu driven program using switch in Java to perform following:
    a) For input of 1, check whether the number is prime
    b) For input of 3, find the factors of the number
    c) For input of 5, check the number is odd or even.
4. Write a program in Java to generate hexadecimal equivalent of a number without using array.
5. WAJP to take two number inputs through command line argument and do the following:
    a) Check whether two numbers are prime to each other or not.
    b) Find LCM of two numbers.
6. WAJP to create a class and exhibit the role of static functions (other than main) by declaring, defining and calling them.
7. WAJP to compute and display the count of occurrence of 4 in a number. E.g. 4564 will compute 2.
8. WAJP to take an angle value in degrees and then compute the equivalent radians and then prove $\sin^2\theta + \cos^2\theta = 1$. Note $180^o = \pi^c$.
9. WAJP to sort a list of numbers in ascending order.
10. WAJP to generate Pascal's Triangle using a square matrix.
11. Write a program in Java to take input of two 3×3 matrices through command line argument and then:
    a) Add them up and display the result
    b) Subtract them and display the result
    c) Multiply them and display product
12. WAJP to count the number of words, characters in a sentence.
13. Write a program in Java to take input of a sentence through command line argument and then count the number of words and vowels.
14. WAJP to handle the Exception using try and multiple catch block; the exceptions that you will handle are, number format error, array bound error and divide by zero.
15. WAJP to create a class called **Room** with two data member length and width and then implement constructor overloading in it.
16. Write a program in Java to explain the role of the following:
    a) Non-parameterized constructor
    b) Parameterized constructor
    c) Copy constructor

Take input and display the output.

17. WAJP to create a class called **Fraction** with data member numerator and denominator; take input (through command line argument) of two fractions and then add, subtract, multiply and divide, finally display the result in reduced term.
18. Write a program in Java to create a class for **Employee** having 2 data member code and name. Then create 3 classes **Officer**, **AdminStaff** and **MStaff**. The **Officer** class has data members designation and pay-scale; the **AdminStaff** has data members grade and pay-band; the **MStaff**has data member department and two sub-classes **Regular** and **Casual**. The **Regular** staff has data members level and

consolidated-pay and **Casual** has data member daily-wage. Take all inputs through constructors and write appropriate methods for displaying one data for each type of class.

19. WAJP to design a class called **Account** using the inheritance and static that show all function of bank (withdrawal, deposit) and generate account number dynamically.
20. WAJP to design an application *Password.java* that produces and prints a random password depending upon name of an individual. If the input is Abdul Kalam then the password would be *33421LAM*. Note: take the first name A=1, B=2, D=4, U=21 where 2+1=3, and L=12, where 1+2=3; so the number comes to be *12433*, so u can find out.
21. WAJP to draw a format like

```
    *
   ***
  *****
 *******
  *****
   ***
    *
```

22. WAJP to take a string count all vowels and then delete the same from the string.
23. Write a **Patient** class which inherits from the **Person** class. Patient can again be of two types, indoor and outdoor. The Patient class requires the following:
    a) a variable to store the patient ID for the patient
    b) a variable to store the department of hospital
    c) a variable to store the ward of hospital
    d) a variable to store the patient 's date of joining the hospital
    e) a variable to store the patient 's address
    f) a variable to store the medical fees that the patient pays
    g) constructor methods, which initialize the variables
    h) a method to calculate the medical fees (for both indoor and outdoor patient)
24. WAJP to take a string as password and check whether it contains at least two numbers, 3 alphabets and no space in it. If any contrary throw message.
25. Write a program in Java to create a class called Rational having two data members for numerator and denominator. Take two inputs of rational numbers and perform multiplication and division. Display the result in reduced form.
26. Write a program in Java to print a format like,

```
* * * * * * *
  * * * * *
    * * *
      *
```

27. Write a class called **Shape** which contains a user-defined interface for **Computation**, which contains methods for calculation of area, perimeter and volume. Write four classes for **circle, rectangle, sphere** and **rectangular parallelepiped**, and all these classes inherit from Shape. Now take input for the following:
    a) radius of circle and compute its area and perimeter
    b) Length and breadth of rectangle and compute its area and perimeter
    c) Length, breadth and height for **rectangular parallelepiped** and compute its area and volume
    d) Radius of sphere and compute its area and volume

** Area of circle= πr^2 , perimeter of circle= $2\pi r$, area of sphere= $4\pi r^2$, volume of sphere= $\frac{4}{3}\pi r^3$, volume of rectangular parallelepiped = $l \times b \times h$ area of rectangular parallelepiped= $2(l \times b + b \times h + h \times l)$

28. Write a class called Employee, which requires the following:
    a) a variable to store the employee ID
        a. employee ID should be of format EMP**M**1234, EMP**S**1234, EMP**A**1234, EMP**C**1234, where M=manager, S=supervisor, A=analyst, C=clerk; number can be any no. but first three characters should be EMP
    b) a variable to store the employee name
    c) a variable to store department
    d) a variable to store city
    e) a variable to store basic salary
    f) a method to calculate the salary of employee
        a. if the city is metro then the HRA would be 30% else 20%
        b. if the employee ID contain M then DA would be 120%, if S then DA would be 110%, if A then DA would be 100%, and if C then DA would be 90%
    g) constructor methods, which initialize the variables
29. WAJP to create 4 threads and show exhibit their execution after the call of the "start ( )" method.
30. Write a program in Java to create 3 threads and exhibit their behaviour by changing their priorities in the "main" thread. Display the possible output.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment					
Semester End Examination					

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	1	2	1	1	2
CO2	1	2	3	3	3	2	1	1
CO3	1	3	2	1	2	1	1	2
CO4	3	2	2	3	3	1	2	1
CO5	3	2	3	2	3	1	3	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA506
Course title: SOFTWARE ENGINEERING LAB
Pre-requisite(s):
Co- requisite(s):
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester / Level: III/5
Branch: MCA

Course Objectives

This course enables the students:

A.	To understand the concept of UML
B.	To gain knowledge of various diagrams.
C.	Learn about software requirement specification.

D.	To gain knowledge about software design specification.
E.	To learn about the relationships among different UML diagrams.

Course Outcomes

After the completion of this course, students will be able to:

CO1.	Identify the software requirement capturing process.
CO2.	Elaborate knowledge about dynamic view of system.
CO3.	Analyzeabout static view of software system.
CO4.	Analysis the relationship among static and dynamic view of system.
CO5.	Identify the process of deployment of software system.

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**

Objective: To Understand and Implement Identification of Requirements from Problem Statements

Q1. To consider the problem statement for a project to be developed and list out the ambiguities, inconsistencies and incompleteness of the problem statement.

Q2. To identify different functionaries to be obtained from a system and characteristics that a system should have, but not possessed by the system itself

2. **Lab Assignment No: 2**

Objective: To Understand and Implement Estimation ofProject Metrics

Q1. To estimate the minimum size of the team one would require to develop a project through application of intermediate COCOMO.

Q2. To use Halstead's metrics to estimate the effort required to recreate a program in JAVA from C.

3. **Lab Assignment No: 3**

Objective: To Understand and Implement Modeling UML Use Case Diagrams and Capturing Use Case Scenarios

Q1. To draw a use case diagram for the given case study.

Q2. To identify the primary and secondary actors for the system and generalization of use cases and «include» stereotypes to prevent redundancy in the coding phase.

4. Lab Assignment No: 4

Objective: To Understand and Implement E-R Modeling from the Problem Statements

Q1. To identify the possible entity sets, their attributes, and relationships for the given case study.

Q2. To draw an ER diagram for the given case study.

5. Lab Assignment No: 5

Objective: To Understand and Implement Identification of Domain Classes from the Problem Statements

Q1. To identify potential classes and their attributes for the given case study.

Q2. To utilize expert knowledge on the subject matter to identify other relevant classes.

6. Lab Assignment No: 6

Objective: To Understand and Implement Identification of Components from the Problem Statements

Q1. To identify potential components for the given case study.

Q2. To draw component diagram for the given case study

7. Lab Assignment No: 7

Objective: To Understand and Implement State Chart and Activity Modeling

Q1. To draw a statechart diagram to graphically represent the given case study.

Q2. To draw an activity diagram to graphically represent the workflow of the given case study.

8. Lab Assignment No: 8

Objective: To Understand and Implement Modeling UML Class Diagrams and Sequence diagrams

Q1. To draw class diagram for the given case study.

Q2. To draw sequence diagram for the given case study.

9. Lab Assignment No: 9

Objective: To Understand and Implement Modeling Data Flow Diagrams

Q1. To draw data flow diagram (Level 0, 1 and 2) for the given case study.

10. Lab Assignment No: 10

Objective: To Understand and Implement Estimation of Test Coverage Metrics and Structural Complexity

Q1. To identify the basic blocks for a given program

Q2. To draw a CFG using the basic blocks

Q3. To determine McCabe's complexity from a CFG.

11. Lab Assignment No: 11

Objective: To Understand and Implement Designing Test Suites

Q1. To design a test suite for the given case study.

Q2. To verify implementation of functional requirements by writing test cases.

Q3. To analyze results of testing to ascertain the current state of the project.

12. Lab Assignment No: 12

Objective: To Understand and Implement Forward and Reverse Engineering

Q1. To obtain programs from UML diagrams.

Q2. To obtain UML diagrams from programs.

Books recommended:

TEXT BOOKS

1. Software Engineering, Ian Sommerville, Pearson, 10th Edition, 2016.**(T1)**
2. Software Engineering: A Practioner's Approach, Roger S. Pressman, McGraw Hills, 7th Edition, 2009.**(T2)**

REFERENCE BOOKS

1. Fundamentals of Software Engineering, Rajib Mall, Prentice-Hall of India, 3rd Edition, 2009.**(R1)**

Course Evaluation:

Day to day progressive evaluation, Lab Quizzes, Surprise Tests, Online Lab performance and Viva Voce

Gaps in the syllabus (to meet Industry/Profession requirements):

Implementing of real world problems

POs met through Gaps in the Syllabus: PO2, 5 & 6

Topics beyond syllabus/Advanced topics/Design:

POs met through Topics beyond syllabus/Advanced topics/Design: Teaching through research papers.

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids

CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	3	1	3	1
CO2	3	2	1	1	1	1
CO3	3	3	2	1	3	1
CO4	2	3	2	2	3	2
CO5	2	1	1	3	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2, CD3, CD6, CD7
CO2	CD1, CD2, CD3, CD7
CO3	CD1, CD2, CD3, CD6, CD7
CO4	CD1, CD2, CD3,CD6
CO5	CD1,CD2, CD3, CD6, CD7

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7

CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: CA422
Course title: IT Tools & Techniques Lab
Pre-requisite(s):
Co- requisite(s):
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives
This course enables the students

1.	To introduce the intricacies of working with large data.
2.	Present programming tricks and tools for handling large data.
3.	Highlight different specialized functions for working with large data
4.	Understand the challenges of working with unstructured data
5	Understand how to automate tasks related to large volumes of data

Course Outcomes
After the completion of this course, students will be able to:

CO1	code language constructs specifically related to working with large datasets.
CO2	Recognize patterns in data amenable for application of specialized data handling functions
CO3	Scrape websites to collect data for data science purposes.
CO4	Design algorithms for different kinds of data like structured, unstructured, dates etc.
CO5	Automate data handling tasks.

SYLLABUS

Module 1:
Working with large data – Introduction, Lists, List comprehensions, tuples, working with dictionaries, nested dictionaries, working with collections
Module 2:

Functions, lambda functions, specialized functions e.g. map, filter, reduce, variable number of parameters, keyword arguments.

Module 3:

Specialized string handling, working with files, regular expressions, working with data file formats e.g. csv, json, excel etc.

Module 4:

Web scraping, collecting data from the internet, Sending emails,

Module 5:

Working with dates and times, scheduling tasks, automatically launching programs

Books recommended:

TEXT BOOKS

1. Introduction to Computation and Programming using Python, with Application to Computational Modeling and Understanding Data 3rd Edition, J. V. Guttag, MIT Press, 2021
2. Python Crash Course, A Hands on, Project based Introduction to Programming, 2nd Edition, Eric Matthes, No Starch Press, 2018

REFERENCE BOOKS

1. Fluent Python, Luciano Ramalho, Oreilly Press, 1st Edition, 2016
2. Data science from Scratch: First Principles with Python, Joel Grus, OReilly Press, 2015

COURSE INFORMATION SHEET

Course code: CA557
Course title: FRONT END DESIGN
Pre-requisite(s):
Co- requisite(s):
Credits: 4 L:3 T:1 P: 0
Class schedule per week: 04
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives

This course enables the students

1.	To impart the basic concepts of User Interface Design.
2.	To develop understanding about human computer interaction methods that utilize more general, widespread and easier-to-learn capabilities.
3.	The cognitive and perceptual constraints that affect interface design
4.	Techniques for evaluating the usability of an interface
5	How to communicate the results of a design process, both in oral and written form

Course Outcomes

After the completion of this course, students will be able to:

1.	Identify the key terms related to user interfaces and user interface design and implementation
2.	Identify and describe various types of computer users and computer use contexts
3.	Identify and describe various types of user interfaces
4.	Explain the user interface design process
5	Identify and describe common abstract user interface components, such as radio buttons and group boxes

SYLLABUS

Module I

Introduction: Importance of user interface – definition, importance of good design, brief history – Graphical User Interface – Web User Interface – Theories, Principles and Guidelines of User interface design **(8L)**

Module II

Design Process: Obstacles in development path deigning for people-Understanding Human Interaction with computers, Importance of Human Characteristics, Human consideration, Human Interaction speeds – Understanding Business function**(8L)**

Module II

Screen Designing: Design goals - screen meaning and purpose, organizing screen elements ordering of screen data and content – screen navigation and flow – visually pleasing composition – amount of information – focus and emphasis – presenting information simply and meaningfully – information retrieval on web – Statistical graphics – Technological considerations in Interface Design.

(8L)

Module IV

Menus and navigation schemes: structures of menus-functions of menus- contents of menus - formatting of menus – phrasing the menu- selecting menu choices-navigating menus-kinds of graphical menus- Selection of windows-Window characteristics-components of windows-window presentation styles-types of windows-window management-organising window functions-window operations-Selection of device based and screen based controls - text and messages – icons and images – Multimedia – colours- uses, problems, choosing colours. **(8L)**

Module V

Distributed and Collaborative Interaction: Device consistency-distribution of the user interface-event distribution-graphical package layer-programmable API-Model semantics distribution-data layer distribution-asynchronous Collaboration-Software tools-specification methods- interface building tools –evaluation and critiquing tools-Interaction devices keyboard and function keys - pointing devices- speech recognition, digitization and generation – image and video displays – printers. **(8L)**

Text books:

1. Galitz Wilbert O. "The Essential Guide to User Interface Design" 3rdEdition., Wiley Dreamtech, Delhi, 2007.
2. Shneiderman Ben "Designing the User Interface", 5thEdition., Pearson Education Asia, Delhi, 2014.

Reference books:

1. Dan R. Olsen, Human Computer Interaction, Cengage, New Delhi, 2009.
2. John M. Carroll, Human Computer Interaction, Pearson Education Asia, Delhi, 2002.
3. Alan Cooper, The Essentials of User Interface Design, Wiley Dreamtech, Delhi, 2002.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8

CO1	3	3	3	1	2	2	1	1
CO2	3	2	3	2	3	2	2	2
CO3	2	3	1	1	1	2	3	2
CO4	3	2	1	3	3	1	2	1
CO5	3	3	3	2	3	2	3	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA559
Course title: DATA COMMUNICATION AND COMPUTER NETWORK
Pre-requisite(s):
Co- requisite(s):
Credits: 4 L:3 T:1 P:0
Class schedule per week: 04
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives
This course enables the students:

A.	To build an understanding of the fundamental concepts of the data communication model and communications architecture.
B.	To study characteristics of communication mediums and the characteristics of signals propagated through different transmission media, including concepts of transmission impairments.
C.	To understand the basic principles of signal encoding techniques, error-detection, and error-correction techniques.
D.	To understand techniques for flow control and multiplexing for maximum utilization of bandwidths in the data communications process.
E.	To understand the various switching techniques and routing techniques for efficient transmission.

Course Outcomes
After the completion of this course, students will be able to:

1.	Understand and be able to explain the principles of a layered protocol architecture; be able to identify and describe the system functions in the correct protocol layer and further describe how the layers interact.
2.	Understand, explain and calculate digital transmission over different types of communication media.
3.	Understand, explain and solve mathematical problems for data-link and network protocols.
4.	Describe the principles of access control to shared media and perform performance calculations.
5.	Understand and explain the principles and protocols for route calculations and be able to perform such calculations.

SYLLABUS

MODULE - I

Data Communications and Networking Overview: A Communications Model, Data Communications, Data Communication Networking.

Protocol Architecture: The Need for a Protocol Architecture, A Simple Protocol Architecture, OSI, The TCP/IP Protocol Architecture**(8L)**

MODULE - II

Data Transmission: Concepts and Terminology, Analog and Digital Data Transmission, Transmission Impairments, Channel Capacity.

Guided and Wireless Transmission: Guided Transmission Media, Wireless Transmission, Wireless Propagation, Line-of-Sight Transmission.**(8L)**

MODULE - III

Signal Encoding Techniques: Digital Data Digital Signals, Digital Data Analog Signals, Analog Data Digital Signals, Analog Data Analog Signals.

Digital Data Communication Techniques: Asynchronous and Synchronous Transmission, Types of Errors, Error Detection, Error Correction, Line Configurations, Interfacing.**(8L)**

MODULE – IV

Data Link Control: Flow Control, Error Control, High-Level Data Link Control (HDLC).

Multiplexing: Frequency Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing.

Circuit Switching and Packet Switching: Switching Networks, Circuit-Switching Networks, Circuit-Switching Concepts, Control Signaling, Softswitch Architecture, Packet-Switching Principles, X.25, Frame Relay.**(8L)**

MODULE -V

Asynchronous Transfer Model: Protocol Architecture, ATM Logical Connections, ATM Cells, Transmission of ATM Cells, ATM Service Categories, ATM Adaptation Layer.

Routing in Switched Networks: Routing in Circuit-Switching Networks, Routing in Packet-Switching Networks, Least-Cost Algorithms**(8L)**

Text Book:

1. Stallings W. "Data and Computer Communications", 7th Edition., Pearson Education./ PHI, New Delhi, 2006.

Reference Books:

1. Forouzan B. A., "Data Communications and Networking", 4th Edition. TMH, New Delhi, 2006.
2. Gupta P.C. "Data Communications and Computer Networks", PHI, New Delhi 2006.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment					
Semester End Examination					

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	2	2	1	1	2	1
CO2	3	3	3	3	2	2	2	1
CO3	2	3	1	1	2	3	3	2

CO4	3	2	1	3	3	1	3	1
CO5	3	3	3	2	3	2	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA561
Course title: SOFTWARE PROJECT MANAGEMENT
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives:
This course enables the students to:

1.	Illustrate the concepts of Project Management for developing software projects.
2.	Demonstrate the software project evaluation issues
3.	Classify the software projects for development using suitable process models
4.	Predict the software cost and risk for the software projects
5.	Design a framework for managing various aspects of software projects like resource allocation, monitoring and control, contract and quality management etc.

Course Outcomes
After the completion of this course, students will be able to:

1.	Apply the concepts of Project Management for developing software projects.
2.	Solve the software project evaluation issues.
3.	Categorize the software projects for development using suitable process models
4.	Estimate the software cost and risk for the software projects.
5.	Create a framework for managing various aspects of software projects like resource allocation, monitoring and control, contract and quality management etc.

SYLLABUS

MODULE – I

Managing Software Project: Process & Project Management, Project Management and the CMM, Project Management at Infosys, Introduction to CMMI, PCMM.
The Project Planning Infrastructure: The process data base, The process capability Baseline, Process Assets and the Body of Knowledge System. **(8L)**

Module – II
Planning: The Infosys Development Process, Requirement Change Management
Effort Estimation & Scheduling: Estimation and Scheduling Concepts, Effort – Estimation, Scheduling. **(8L)**

Module – III

Quality Planning: Quality Concepts, Quantitative quality Management Planning, Defect Prevention Planning.
Risk Management: Concepts of Risks and Risk Management, Risk Assessment, Risk Control, Examples. **(8L)**

Module – IV
Measurement and Tracking Planning: Concepts in measurement, Measurements, Project tracking.
Project Management Plan: Team Management, Customer Communication and Issue Resolution, Structure of the Project Management Plan.**(8L)**

Module – V
Configuration Plan: Concepts in Configuration Management, Configuration Management Process.
Reviews: The Reviews, Review process Data Collection, Monitoring & Control, Introduction of Reviews & the NAH Syndrome.

Project Monitoring & Control: Project tracing, Milestone Analysis, Activity Level Analysis using SPC, Defect Analysis & Prevention Process Monitoring & audit.**(8L)**

Text Book:

1. Jalote Pankaj "Software Project Management in Practice", Pearson Education, New Delhi, 2002.

Reference Books:

1. Huges B. and Cotterell M. "Software Project Management", 3rd Edition, Tata Mcgraw Hill, New Delhi, 2004.
2. Jalote Pankaj "CMM in Practice, Pearson Education", New Delhi, 2002.
3. Grey W. Humph "Managing the Software Process", Addition – Wesley, 1989.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2	3	3	1	2	2
CO2	3	3	3	1	1	2	2	1
CO3	1	1	2	2	2	2	3	2
CO4	3	2	2	3	3	1	2	1
CO5	3	3	3	3	3	2	3	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA580
Course title: ADVANCED JAVA PROGRAMMING
Pre-requisite(s): Java Programming
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives
This course enables the students:

A.	Help students realise the advanced features in JAVA.
B.	Establish the relationship between the core and advanced JAVA frameworks.
C.	Understand problems where Advanced JAVA is required.
D.	Evaluate the advantages and short comings of advanced JAVA
E.	Understand how frameworks and APIs are designed.

Course Outcomes
After the completion of this course, students will be:

1.	Learn the architecture of advanced swing components and design GUIs using them.
2.	Learn to interface with external data sources with Java.
3.	Leverage Java to create and deploy network programs.
4.	Use Java to design enterprise level Web sites.
5.	Understand Java's component based programming model.

SYLLABUS

MODULE -I

Components and Facilities or Rich Graphical User Interfaces: Programming with the JFC, Swing API Components, Jcomponent Class, Windows, Dialog Boxes, and Panels, Labels, Buttons, and Check Boxes, Menus, Toolbars, and Actions, Sliders, Spinners, Progress Bars, and Scrollbars, Lists and Combo Boxes, Text-Entry Components, Color and File Choosers, Tables and Trees, Printing with the 2D API, Java Print Service API.**(8L)**

MODULE -II

Using Relational Database: Introduction, Best Practices for Programming for Databases, JDBC Drivers for RDBM Systems, SQL to Java Type Mappings, Understanding the Database used in this chapter, Using the **java.sql** API, Coding Transactions, Using the **javax.sql** API, Connection Pooling. **(8L)**

MODULE -III

XML: Introduction, XML Structure, XML Example Document with SAX, Parsing an XML Document with DOM, Generating an XML Document with DOM, Validating XML Documents using DTD and XML Schema, Transforming XML using XSLT.**Network Programming:** Introduction, Working with URLs, Working with Sockets, Remote Method Invocation.**(8L)**

MODULE -IV

Building Web Applications: Introduction, The Technology of the Web, J2EE Web Application Packaging, Servlets, The Servlet API, The User Experience, Building a Web App with Continuity,

Java Server Pages, JSP Tags and API, How the Server Processes JSPs, Java Coding in JSPs, Frameworks for Building Web Applications, Building Robust WebApps.**(8L)**

MODULE -V

Enterprise JavaBeans: Introduction, Enterprise Programming, What are EJBs? Session EJBs, EJB Clients, Entity EJBs, Message-Driven Beans, EJB Transactional Characteristics, EJB Security, Best Practices for Designing EJB-Based Applications.**(8L)**

Text Book:

1. Wigglesworth & McMillan "JavaTM Programming Advanced Topics", 3rd Edition, India Edition, Thomson Education, New Delhi, 2007.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment					
Semester End Examination					

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	2	3	2	1	2	1	1	2
CO2	3	3	2	3	3	2	2	1
CO3	2	3	1	1	2	3	1	2
CO4	3	2	1	3	3	1	2	1
CO5	3	1	3	2	3	2	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA581
Course title: SYSTEMS PROGRAMMING
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P:0
Class schedule per week: 03
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives
This course enables the students:

A.	Describe the utility of different system programs & system tools.
B.	Familiarize with the trade-offs between run-time and compile-time processing (Linking & Loading techniques).
C.	To learn the concepts and techniques behind the designing of various system softwares.
D.	To organize the functionalities & components of system software & tools into different layers for efficient code generation.
E	Understand the designing of text editors, debuggers etc.

Course Outcomes

After the completion of this course, students will be able to:

1.	Elaborate the evolution of various system software.
2.	Define various data structures that helps in the proper functioning of the system programs.
3.	Analyse basic design of various system software.
4.	Apply functionalities & components of system software & tools into different layers for efficient code generation.
5.	Development and designing of text editors, debuggers etc.

SYLLABUS

MODULE -I

Introduction: System Softwares& its Components, Evolution of System Softwares- Operating System, Loaders, Interpreters, Compilers, Linkers, Assemblers.**Assemblers:** Elements of Assembly Language Programming, Assembly Process, Single Pass Assembler, Design of a 2-Pass assembler for In 8088.**(8L)**

MODULE -II

Macros & Macro processors: Macros, Different forms of Macros, Macros using AIF, AGO, REPT. Etc, Design of a Macro Processor, Macro Assembler.**(8L)**

MODULE -III

Loaders: Basic Loader Functions, Absolute Loader, Compile & go Loader, Relocating Loader, Direct Linking Loader.**(8L)**

MODULE -IV

Linkage Editors: Linking and Relocation, Program Relocability, Linkage Editor and its Application in IBP-PC, Linking for Program Overlays.**(8L)**

MODULE -V

Software Tools: Spectrum of Software Tools, Text Editors, Interpreter and Program Generators, Debug Monitors, Programming Environments.**(8L)**

Text Book:

1. Dhamdhere D.M. "System Programming and Operating Systems", 2nd Edition, TMH, New Delhi.

Reference Book:

1. Donovon J.J. "System Programming", TMH, New Delhi.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8

CO1	3	2	1	1	2	1	1	2
CO2	3	1	3	3	2	2	2	1
CO3	2	3	1	1	2	2	3	2
CO4	3	2	1	3	3	1	2	2
CO5	3	2	3	2	3	1	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA582
Course title: COMPILER DESIGN
Pre-requisite(s): Automata theory
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level:IV/5
Branch: MCA

Course Objectives
This course enables the students to:

A.	Understand the need of compiler
B.	Provide a thorough understanding of design, working, and implementation of programming languages
C.	Trace the major concept areas of language translation and compiler design
D.	Create an awareness of the function and complexity of modern compilers.
E.	Develop knowledge for developing tool for natural language processing

Course Outcomes

After the completion of this course, students will be able to

1.	Understand the need of compiler for *interfaci*ng between users and machine
2.	Perceive the role of several phases of compilation process
3.	Trace the major concept areas of language translation and compiler design
4.	Develop a comprehensive Compiler for a given language
5.	Apply knowledge for developing tool for natural language processing

SYLLABUS

MODULE -I

Introduction to Compiling: Translators, Interpreters, Compiler, other language processors, Phases of a compiler, Passes of compiler, Back-end and Front-end of compiler, Basic idea on Symbol Table, Issues in Compiler construction, Concept on *l*-value and r-value, Programming Language basics, Compiler construction tools.

Lexical and Syntax Analysis: *Lexical analysis*: Role of a Lexical analyser, Input buffering, Specification and recognition of tokens, State-machine driven lexical analysers and their implementations, Lexical analyser generator tool: LEX/FLEX. **(8L)**

MODULE -II

Syntax analysis: Need and Role of Parser, Importance of Context Free Grammars in designing Parser, Parse trees, derivations and sentential forms, Ambiguity.
Top down parsing: Backtracking, Recursive descent and Predictive parsers (LL), Error-detection in LL parser
Bottom-up parsing: Simple Shift-Reduce parsing, LR Parsers: SLR, CLR and LALR parsers, Error detection in S-R parsing, Handling ambiguous grammar, Parser generator tool: YACC/BISON **(8L)**

MODULE -III
Syntax Directed Translation: Syntax directed definitions, Construction of syntax tree, Attribute grammars, Inherited and synthesized attributes, Dependency graphs, Evaluation orders of attributes, S-Attributed definitions, L-attributed definitions.

Intermediate code generation: Variants of Syntax Trees, Three-address codes of different constructs, Translation of expressions, Type checking: Rules for type checking, Type conversion;

(8L)

MODULE -IV

Machine independent code optimization: Sources of optimization, DAG, Peephole optimization and Basic Blocks, Loops in Flow Graphs, Data flow analysis and equations **(8L)**

MODULE -V

Runtime Environment and Code Generation:
Runtime environment: Storage organization: Static and Dynamic, Stack allocation and Heap allocation of memory;
Code generation: Issues in designing of a code generator, Register allocation and Assignment, Target machine (assembly code for 80- series) **(8L)**

Text Book:

1. Aho A.V., Sheth R. I. and Ullman J.D. "Compilers Principles Techniques and Tools", Pearson Education.

Reference Books:

1. Levine John R., Mason Tony, Brown Doug "Lex &Yacc", O'reilly.
2. Appel Andrew N., "Modern Compiler Implementation in C", Cambridge University Press.
3. Cooper & Linda "Engineering a Compiler", Elsevier theory.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	2	1	2	1	1	1
CO2	2	1	3	3	2	2	2	1
CO3	2	3	1	1	2	2	3	2
CO4	3	2	1	3	3	1	2	1
CO5	2	3	3	2	3	1	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA583
Course title: PROGRAMMING LANGUAGE DESIGN AND CONCEPTS
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives
This course enables the students to:

A.	Understand the need of Programming Language Design
B.	Provide a thorough understanding of design, working, and implementation of programming languages
C.	Understand how to develop programming language effectively
D.	Learn the design principles of design principle of programming languages with it's merits and demerits.
E.	Able to Design a programming Language considering the underlying components and concepts

Course Outcomes
After the completion of this course, students will be able to:

1.	Understand the concept of Programming Language Design
2.	Differentiate the types of Programming languages using design strategy
3.	Design a programming Language considering the underlying components and concepts
4.	Develop a programming language effectively
5.	Analyse the design principle with its merits and demerits.

SYLLABUS

MODULE -I
Introduction:

The Role of Programming Languages: Toward Higher-Level Languages, Programming Paradigms, Languages Implementation: Bridging the Gap.

Language Description: Syntactic Structure: Expression Notations, Abstract Syntax Trees, Lexical Syntax, Context- Free Grammars, Grammars for Expressions.**(8L)**

MODULE -II

Imperative Programming:
Statements: Structured Programming: The Need for Structured Programming, Syntax-Directed Control Flow, Design Considerations: Syntax, Handling Special Cases in Loops, Programming with Invariants, Proof Rules for Partial Correctness, Control Flow in C.**(8L)**
MODULE -III

Types: Data Representation: The Role of Types, Basic Types, Arrays: Sequences of Elements, Records: Named Fields, Unions and Variant Records, Sets, Pointers: Efficiency and Dynamic Allocation, Two String Tables, Types and Error Checking.
Procedure Activations: Introduction to Procedures, Parameter- Passing Methods, Scope Rules for Names, Nested Scopes in the Source Text, Activation Records, Lexical Scope: Procedures as in C.

(8L)

MODULE -IV

Object-Oriented Programming:
Grouping of Data and Operations: Constructs for Program Structuring, Information Hiding, Program Design with Modules, Modules and Defined Types, Class Declarations in C++, Dynamic Allocation in C++, Templates: Parameterized Types, Implementation of Objects in C++.
Object-Oriented Programming: What is an Object?, Object-Oriented Thinking, Inheritance, Object-Oriented Programming in C++, Derived Classes and Information Hiding, Objects in Smalltalk, Smalltalk Objects have a Self. **(8L)**

MODULE -V

Functional Programming:
Elements of Functional Programming: A Little Language of Expressions, Types: Values and Operations, Approaches to Expression Evaluation, Lexical Scope, Type Checking.
Functional Programming in a Typed Language: Exploring a List, Function Declaration by Cases, Functions as First-Class Values, ML: Implicit Types, Data Types, Exception handling in ML.
Functional Programming with Lists: Scheme, Dialect of Lisp, The Structure of Lists, List Manipulation, A Motivating Example: Differentiation, Simplification of Expressions.**(8L)**

Text Book:

1. Sethi R. & Viswanathan K.V. "Programming Languages Concepts & Constructs", 2nd Edition, Pearson Education, 2007.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	1	2	1	3	1
CO2	2	3	3	3	2	2	2	2
CO3	2	3	1	2	2	2	3	2
CO4	3	2	1	3	3	1	2	1
CO4	3	1	3	3	3	1	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA584
Course title: WEB PROGRAMMING
Pre-requisite(s):
Co-requisite(s):
Credits: 3 L:3 T:0 P:0
Class schedule per week: 03
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives
This course enables the students:

A.	To appreciate problems of traditional web designing techniques.
B.	To understand the basics of the MVC architecture
C.	To understand ASP.NET's implementation of the MVC model
D.	To understand how to leverage the model for medium to large projects
E.	To optimize the performance and rendering of web sites for different types of clients.

Course Outcomes
After the completion of this course, students will:

1.	Be able to design models, controllers and views in ASP.NET
2.	Be able to establish secure and optimized database connections from the web sites
3.	Be able to perform secure and optimized user management and role handling
4.	Optimize the design aspects of the web sites in a responsive fashion.
5.	Understand techniques to handle scalability of web sites i.e. using caches

SYLLABUS

MODULE -I
MVC, Asp.NET MVC, ORMs, Entity Framework, Models, Database Contexts, Adding Controllers, Views, Filtering, Searching related entitites.**(8L)**

MODULE -II
ViewBag, View Model, Complex Filtering, Data Validation, Annotations, Sorting, Paging, Routing Configurations, Many to many relationships with the Entity Framework, Partial Views.

(8L)
MODULE -III
Authentication, Authorization, ASP.NET Identity, Role Management, User management, Password management. **(8L)**

MODULE -IV
CSS Fundamentals, Selectors, Inheritance, Cascading, Box Model, Advanced CSS, Animations. **(8L)**

MODULE -V
Designing Responsive web sites, Media Queries, Developing for mobiles and Tablets.**(8L)**

Text books:

1. Naylor L., "ASP.NET MVC with Entity Framework and CSS", 1st Edition, Apress, 2017.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	2	3	2	1	1	2
CO2	3	1	3	1	2	2	2	2
CO3	2	3	2	1	2	2	3	2
CO4	3	2	1	3	3	1	2	1
CO5	3	1	3	3	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA558
Course title: FRONT END DESIGN LAB
Pre-requisite(s):
Co- requisite(s):
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives
This course enables the students

1.	To impart the basic concepts of User Interface Design.
2.	To develop understanding about human computer interaction methods that utilize more general, widespread and easier-to-learn capabilities.
3.	The cognitive and perceptual constraints that affect interface design
4.	Techniques for evaluating the usability of an interface
5	How to communicate the results of a design process, both in oral and written form

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify the key terms related to user interfaces and user interface design and implementation
2.	Identify and describe various types of computer users and computer use contexts
3.	Identify and describe various types of user interfaces
4.	Explain the user interface design process
5	Identify and describe common abstract user interface components, such as radio buttons and group boxes

SYLLABUS

List of Programs as Assignments:

1. **Lab Assignment No: 1**

   Objective: To Understand and Implement HTML

   Q1. To create a simple html file to demonstrate the use of different tags.

   Q2. To create an html file to link to different html page which contains images, tables, and also link within a page.

   Q3. To create an html page with different types of frames such as floating frame, navigation frame & mixed frame.

   Q4. To create a registration form as mentioned below.

   Create an html page named as "registration.html"

   a) set background colors

   b) use table for alignment

   c) provide font colors & size

2. **Lab Assignment No: 2**

   Objective: To Understand and Implement CSS

   Q1. To create an html file by applying the different styles using inline, external & internal style sheets.

   1. Create a external style sheet named as "external_css.css" and provide some styles for h2, hr, p & a tags.

   2. Create an html file named as "Style_sheet.html"

   a) Include the external style sheet with necessary tag.

   b) Include the internal style sheet for body tags & also use class name, so that the style can be applied for all tags.

   c) Include a tags with inline style sheet.

3. **Lab Assignment No: 3**

Objective: To Understand and Implement JavaScript

Q1. To write a Javascript program to define a user defined function for sorting the values in an array.

Q2. Create an html page named as “exception.html” and do the following.

1. within the script tag write code to handle exception

a) define a method RunTest() to get any string values(str) from the user and cll the method Areletters(str).

b) In Areletters(str) method check whether str contain only alphabets (a-z, AZ), if not throw exception.

c) Define a exception method Input Exception(str) to handle the exception thrown bythe above method.

2. Within the body tag define a script tag to call Runtest() method defined.

Q3. To display the calendar using javascript code by getting the year from the user.

Q4. To create a html page to display a new image & text when the mouse comes over the existing content in the page.

4. **Lab Assignment No: 4**

Objective: To Understand and Implement ASP

Q1. To create an ASP file to find the no of hits on the page and to have rotating banner content.

Q2. To create a table of content using ASP program & navigate within the pages.

Q3. Create an ASP file named as request.asp

a) Create a simple form to get the first name & last name and a button submit. When the button is clicked the values in the text box are printed by response object by Request.QueryString

b) Create a hyperlink with some values defined in the tag & display the same using request & response object.

Q4.To display all the content in the database using ASP program.

Lab Assignment No: 5

Objective: To Understand and Implement Java Servlets

Q1. To create a simple servlet program to display the date (using Tomcat server).

Q2. To create a servlet program to retrieve the values entered in the html file (Using NetBeans IDE).

Q3. To display the cookie values that are entered in the html page using servlet program. (usingNetBean IDE).

Lab Assignment No: 6

Objective: To Understand and Implement XML

Q1. To create a simple catalog using XML file

Q2. To create external style sheet and using the style sheet in xml file.

Lab Assignment No: 7

Objective: To Understand and Implement PHP

Q1. To create a php program to demonstrate the different file handling methods.

Q2. To create a php program to demonstrate the different predefined function in array, Math, Data & Regular Expression.

Books recommended:

TEXT BOOKS

1. Web Technologies: A Computer Science Perspective , Jeffrey C Jackson , Pearson Education , India.
2. Stephen Wynkoop, Running a perfect website, QUE, 1999

REFERENCE BOOKS

1. Eric Ladd, Jim O' Donnel, Using HTML 4, XML and Java, Prentice Hall of India-QUE, 1999
2. Chris Bates, Web Programming - Building Intranet applications, Wiley Publications, 2004
3. Deitel, Deitel& Nieto, Internet and World Wide Web - How to Program, Pearson Education Asia, 2000

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓

Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2	1	2	2	2	1
CO2	3	1	2	3	2	2	2	1
CO3	2	3	1	1	3	2	3	2
CO4	3	2	1	3	3	1	2	1
CO5	3	2	3	2	3	1	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA560
Course title: DCCN LAB
Pre-requisite(s):
Co- requisite(s):
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester / Level: IV/5
Branch: MCA

Course Objectives

This course enables the students to:

1.	To familiarize the student in introducing and exploring various Network topologies and networking protocols
2.	To understand the use of client/server architecture in application
3.	To enable the student on how to approach for networking problems using networking simulation tools.

4.	To Design reliable servers using both TCP and UDP sockets
5.	Familiar with network tools and network programming.

Course Outcomes

After the completion of this course, students will be able to:

CO1	Express programming & simulation for networking problems.
CO2	Get a thorough understanding of various aspects of networking devices
CO3	Design and implement simulation of a simple LAN and a WAN that meet a specific set of criteria
CO4	Identify the elements of a communication network
CO5	Simulate various OSI layer protocols using C/C++/ Java

SYLLABUS

List of Programs as Assignments:

5. **Lab Assignment No: 1**

   Q1. To familiarize with the Lab Network Topology, Locating different interfaces, routers and switches. Studying different pools of IP addresses.

   Q2. Implement the data link layer framing methods such as character, character stuffing, and bit stuffing.

   Q3. To learn and observe the usage of different networking commands e.g.PING, TRACEROUTE. Learning remote login using telnet session. Measuringtypical average delays between different locations of the network.

6. **Lab Assignment No: 2**

   Q1. What is the IP of the machine you are using? Compare it with the IP of your neighbors. Are the IPs of your neighbors same? Why or Why not?

   Q2. Ping" is a tool used to determine if a server is responding and to estimate the round trip time of a message sent to that server. Use the ping command for the following URLs and record the success or failure statistics along with the average round trip time.

a) google.com
b) facebook.com
c) bitmesra.ac.in

Q3. Trace the route that is taken when you try to access:
a) google.com
b) facebook.com
c) bitmesra.ac.in

Q4. Network Commands on Linux / Unix

7. **Lab Assignment No: 3**

Q1. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC 32.

Q2. Implementation of Sub-netting and Super-netting.

Q3. To study different types of transmission media, various topologies, and configure modem of computer HUB and Switches.

8. **Lab Assignment No: 4**

Q1. Write a C/C++ program to determine if the IP address is in Class A, B, C, D, or E.

Q2. Write a C/C++ program to determine if the IP address is in Class A, B, or C.

Q3. Write a C/C++ program to translate dotted decimal IP address into 32 bit address.

Q4. To implement a routing protocol and check its connectivity in a variable length subnet masked network

Q5. Write a C/C++ program to perform bit stuffing and de-stuffing.

9. **Lab Assignment No: 5**

Q1. Implement Dijkstra‘s algorithm to compute the Shortest path through a graph.

Q2. Take an example subnet graph with weights indicating delay between nodes. Now obtain Routing table art each node using distance vector routing algorithm

Q3. Take an example subnet of hosts. Obtain broadcast tree for it.

10. **Lab Assignment No: 6**

Q1. Build implementations of the Internet protocols
Q2. Implementation of Stop and Wait Protocol and Sliding Window Protocol.
Q3. Write a code simulating ARP /RARP protocols.

11. **Lab Assignment No: 7**
    Q1. Create a socket for HTTP for web page upload and download
    Q2. Write a code simulating PING and TRACEROUTE commands.
12. **Lab Assignment No: 8**
    Q1. Study and implement model for Socket Programming and Client – Server model.
    Q2. Experiments with NS2(or any other simulator) to study behavior (especially performance of) link layer protocols such as Ethernet and 802.11 wireless LAN..
13. **Lab Assignment No: 9**
    Q1. Experimental study of application protocols such as HTTP, FTP,SMTP, using network packet sniffers and analyzers such as **Wireshark**. Small exercises in socket programming in C/C++/Java..
14. **Lab Assignment No: 10**

    Q1. Take a 64 bit playing text and encrypt the same using DES algorithm.

    Q2. Write a program to break the above DES coding

    Q3. Using RSA algorithm encrypts a text data and Decrypt the samebjective: To Understand and Implement Data Interpolation
15. **Lab Assignment No: 11**
    Q1. Applications using TCP and UDP Sockets like d. DNS e. SNMP f. File Transfer
    Q2. Study of Network simulator (NS).and Simulation of Congestion Control Algorithms using NS
    Q3. Echo client and echo server b. Chat c. File Transfer

Books recommended:

TEXT BOOKS

1. William Stallings, Data and Computer Communication, Prentice Hall of India.
2. Behrouz A. Forouzan, Data Communication and Networking, McGraw-Hill.
3. Andrew S. Tanenbaum, Computer Networks, Prentice Hall.

REFERENCE BOOKS

1. W. Richard Stevens, TCP/IP Illustrated, Volume 1, Addison-Wesley

2. Douglas Comer, Internetworking with TCP/IP, Volume 1, Prentice Hall of India.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**
CO1	3	3	2	2	2	1
CO2	3	3	2	1	1	2
CO3	2	3	2	1	1	1
CO4	3	2	2	1	1	1
CO5	3	2	1	1	3	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD6
CO2	CD1, CD6,CD7
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD7

COURSE INFORMATION SHEET

Course code: MT116
Course title: Quantitative Methods for Business Decisions
Pre-requisite(s): NIL
Co- requisite(s): NIL
Credits: 3 L:3 T:0 P:0
Class schedule per week: 3
Semester / Level:V/1
Branch:MCA
Name of Teacher:

Course Objectives

This course enables the students:

A.	To provide a basic understanding of the value and use of quantitative methods in administrative and operational problem solving and decision-making.
B.	To develop an understanding of a variety of statistical and quantitative techniques applicable to a wide range of business situations.
C.	To recognize particular techniques and their applications so as to be able to apply these techniques in problem solving for management decision making.
D.	To be able to read and interpret statistical information and be able recognize when meaningful statistics are (and are not) being used.
E.	To be able to performance statistical analysis.

Course Outcomes

After the completion of this course, students will be:

1.	Explain the application of quantitative methods in administrative and operational problem solving and decision-making.
2.	Explain the application of statistical and quantitative techniques applicable to a wide range of business situations.
3.	Apply select quantitative techniques in problem solving for management decision making.
4.	Interpret statistical findings and recognize when meaningful statistics are (and are not) being used.
5.	Recommend decisions based on statistical analysis.

SYLLABUS

Module-I–

Statistics: Meaning and Applications of Statistics in business decision making and research. Collection, Tabulation andpresentation of data.Measures of central tendency: Mean, Median and Mode. Measures of dispersion: Range, Mean Deviation, Standard Deviation. Relative measure of Dispersion **(8L)**

Module-II

Correlation: Karl Pearson's coefficient of correlation, Rank, Probable error and coefficient of determination.Regression Analysis: Regression Lines, Equations and Coefficients.Analysis of

Time Series and Business Forecasting: Components, Moving Averages, Exponential smoothing and Least Squares Method. **(8L)**

Module-III

Probability Theory: Concepts, Conditional Distribution, Bayes' Theorem and application. Random Variable. Distribution Theory: Discrete and Continuous: Binomial and Poisson Distribution and Normal Distribution. Application of Distribution theory to Engineering and Management Science problems **(8L)**

Module -IV

Sampling Theory and Distribution. EstimationTheory: Unbiasedness and Minimum Variance Unbiased Estimator. **(8L)**

Module- V

Testing of Hypotheses: Null and Alternative Hypothesis, Type-I and II error. p test, t test, Chi Square test, F Test and their applications. ANOVA - One way test. **(8L)**

Text Books:

1. Levin Richard I. & Rubin, David S, Statistics for Management, Prentice Hall Of India, New Delhi.

3. Gupta S.P Gupta M P, Business Statistics, Sultan Chand.

3. Terry, Sineich, Business Statistics by Examples, Collier McMillan Publisher.

Gaps in the syllabus (to meet Industry/Profession requirements)
POs met through Gaps in the Syllabus
Topics beyond syllabus/Advanced topics/Design
POs met through Topics beyond syllabus/Advanced topics/Design

Course Delivery methods
Lecture by use of boards/LCD projectors/OHP projectors
Tutorials/Assignments
Seminars
Mini projects/Projects
Laboratory experiments/teaching aids
Industrial/guest lectures
Industrial visits/in-plant training
Self- learning such as use of NPTEL materials and internets
Simulation

Course Outcome (CO) Attainment Assessment tools & Evaluation procedure
Direct Assessment

Assessment Tool	% Contribution during CO Assessment
End Sem Examination Marks	50
Mid Sem Examination Marks	25
Quiz (s)	20
Independent Teaching Assessment	5

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes					
	PO1	PO2	PO3	PO4	PO5	PO6
CO1	3	1	1	1	2	1
CO2	3	3	2	1	1	2
CO3	2	3	2	2	2	1
CO4	3	2	2	1	1	1
CO5	3	2	1	1	3	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

Mapping Between COs and Course Delivery (CD) methods				
CD	**Course Delivery methods**		**Course Outcome**	**Course Delivery Method**
CD1	Lecture by use of boards/LCD projectors/OHP projectors		CO1	CD1
CD2	Tutorials/Assignments		CO2	CD1, CD2, CD4

CD3	Seminars		CO3	CD1
CD4	Mini projects/Projects		CO4	CD1, CD2, CD5, CD8
CD5	Laboratory experiments/teaching aids		CO5	CD1, CD2, CD3, CD4, CD6, CD8
CD6	Industrial/guest lectures			
CD7	Industrial visits/in-plant training			
CD8	Self- learning such as use of NPTEL materials and internets			
CD9	Simulation			

COURSE INFORMATION SHEET

Course code: CA601
Course title: COMPUTER GRAPHICS
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: V/6
Branch: MCA

Course Objectives
This course enables the students:

A.	To perform visual computations for geometrical drawings.
B.	To understand different hardware used for graphical requirement
C.	To perform visual computations for geometrical drawings.
D.	To display 3D objects in a 2D display devices using projection techniques.
E.	To create realistic images using color and shading techniques.

Course Outcomes

After the completion of this course, students will be:

1.	Able to understand the concept of image formation as realized by human visual system.
2.	Able to Illustrate the digitization process of images and related algorithms for drawing basic geometric figures in the 2D display devices.
3.	Able to describe architecture of basic Input/ Output devices and their underlying working principles along with various primitives for drawing shapes.
4.	Able to apply fundamental mathematics in producing spatial 3D-image of an object in an inherently 2D display device.
5.	Able to produce realism in the target object/ objects in a scene.

SYLLABUS

MODULE -I

Introduction: Image Processing as Picture Analysis, The Advantages of Interactive Graphics, Representative Uses of Computer Graphics, Classification of Applications, Development of Hardware and Software for Computer Graphics, Conceptual Framework for Interactive Graphics.

Basic Raster Graphics Algorithms for Drawing 2D Primitives: Overview, Scan Converting Lines, Scan Converting Circles, Scan Converting Ellipses, Filling Rectangles, Filling Polygons, Filling Ellipse Arcs, Pattern Filling, Thick Primitives, Line Style and Pen Style, Clipping in a Raster World, Clipping Lines, Clipping Circles and Ellipses, Clipping Polygons, Generating Characters, SRGP_copyPixel, Antialising.**(8L)**

Module- II

Graphics Hardware: Hardcopy Technologies, Display Technologies, Raster-Scan Display Systems, The Video Controller, Random-Scan Display Processor, Input Devices for Operator Interaction, Image Scanners.

Geometrical Transformations: 2D Transformations, Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composition of 2D Transformations, The Window-to-View port Transformation, Efficiency, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Transformations as a Change in Coordinate System.

(8L)

Module- III

Viewing in 3D: Projections, Specifying an Arbitrary 3D View, Examples of 3D Viewing, The Mathematics of Planar geometric Projections, Implementing Planar Geometric Projections, Coordinate Systems. **(8L)**

Module -IV

Input Devices, Interaction Techniques, and Interaction Tasks: Interaction Hardware, Basic Interaction Tasks, Composite Interaction Tasks.

Representation Curves and Surfaces : Polygon Meshes, Parametric Cubic Curves, Parametric Bicubic Surfaces, Quadric Surfaces.

Achromatic and Colored Light: Achromatic Light, Chromatic Color, Color Models for Raster Graphics, Reproducing Color, Using Color in Computer Graphics. **(8L)**

Module-V

The Quest for Visual Realism: Why Realism?, Fundamental Difficulties, Rendering Techniques for Line Drawings, Rendering Techniques for Shaded Images, Improved Object Models, Dynamics, Stereosis, Improved Displays, Interacting with Our Other Senses, Aliasing and Antialiasing.

Visible-Surface Determination: Functions of Two Variables, Techniques for Efficient Visible-Surface Algorithms, Algorithms for Visible-Line Determination, The z-Buffer Algorithms, List-Priority Algorithms, Area-Subdivision Algorithms, Algorithms for Octress, Algorithms for Curved Surfaces, Visible-Surface Ray Tracing.

Illumination and Shading: Illumination Models, Shading Models for Polygons, Surface Detail, Shadows, Transparency, Inter object Reflections, Physically Based Illumination Models, Extended Light Sources, Spectral Sampling. **(8L)**

Text Book:

1. Foley, Dam Van, Feiner, Hughes "Computer Graphics Principles & Practice", 11th Edition., Pearson Education, New Delhi, 2004.

Reference Book:

1. Hearn D. & Baker M.P. "Computer Graphics", PHI, New Delhi, 2006.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	2	1	2	1	1	1
CO2	3	1	3	3	2	2	2	1
CO3	3	2	1	3	2	2	2	2
CO4	3	2	1	3	3	1	2	1
CO5	3	2	3	2	3	1	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA603
Course title: SYSTEM SIMULATION AND MODELLING
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L: 3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: V/6
Branch: MCA
Name of Teacher:

Course Objectives
This course enables the students:

A.	To Characterize engineering systems in terms of their essential elements, purpose, parameters, constraints, performance requirements, sub-systems, interconnections and environmental context.
B.	To understand Engineering problem modelling and solving through the relationship between theoretical and mathematical
C.	To provide Mathematical modelling real world situations related to engineering systems development,
D.	To able Generate random numbers and random variates using different techniques.
E.	To provide the knowledge of queuing theory to solve real life problem

Course Outcomes
After the completion of this course, students will be able to:

1.	Define basic concepts in modeling and simulation (M&S).
2.	Classify various simulation models and give practical examples for each category.
3.	Understand the behavior of a dynamic system and create an analogous model for a dynamic system.
4.	Generate and test random number variates and apply them to develop simulation models.
5.	Develop a real life model using queuing system.

SYLLABUS

Module –I

The concepts of a system, System Environment, Stochastic Activities, continuous and discrete systems, System Modeling, Types of models.

System Studies: Subsystem, A Corporate Model, Environment segment, Production Segment, Management Segment, full Corporate Model, Types of System study, System Analysis, System Design, System Postulation. **(8L)**

Module –II

The technique of simulation, the Monte Carlo method, comparison of simulation and analytical methods, experimental nature of simulation, types of system simulation, numerical computation technique for continuous & discrete models, distributed lag models, cobweb models.

Continuous system models, differential equations, analog computers & methods, hybrid computers, CSSLs, CSMP-III, Feedback Systems, Simulation of an Autopilot.**(8L)**

Module –III

Exponential Growth & decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamics diagrams, Simple system dynamics diagrams, multi–segment models, representation of time delays.**(8L)**

Module –IV

Evaluation of continuous probability functions, continuous uniformly distributed random numbers, a uniform random number numbers, generating discrete distributions, non-uniform continuously distributed random numbers, the rejection method.

Random numbers Generators: Techniques for generating random numbers. Test for random numbers.

Random vitiate Generation: Inverse transform technique, exponential distribution, uniform distribution.**(8L)**

Module –V

Queuing disciplines, measures of queues. Discrete events, representation of time, generation of arrival patterns, simulation of a telephone system, delayed calls, Simulation programming tasks, measuring utilization and occupancy.
(8L)

Text books:

1. Gordon Geoffrey, "System Simulation", 2nd Edition, Pearson Education, 2007.
2. Banks J., Carson J. S., Nelson B.L., Nicol D.M. Nicol, "Discrete-Event System Simulation", 4th Edition, Pearson Education, 2007.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8

CO1	3	3	2	1	2	1	1	1
CO2	3	1	3	3	3	2	2	3
CO3	2	2	1	1	2	3	3	2
CO4	3	3	1	3	3	1	2	1
CO5	3	1	3	3	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA605
Course title:OPTIMIZATION TECHNIQUES
Pre-requisite(s):
Co- requisite(s):
Credits:3 L:3 T:0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level:V/6
Branch: MCA

Course Objectives
This course enables the students to:

A.	Construct the operational models for the real-world applications using Linear Programming
B.	Illustrate the techniques to solve the Network Optimization models
C.	Explain the computational feasibility of the solutions using the Deterministic and Probabilistic Dynamic Programming
D.	Model problems using Non-Linear Programming and evaluate the suitability of the available techniques for the problem at hand
E.	Produce the meta-heuristic algorithms for real world optimization

Course Outcomes
After the completion of this course, students will be able to:

1.	Prepare the operational models for the real-world applications using Linear Programming
2.	Apply the techniques to solve the Network Optimization models
3.	Analyse the computational feasibility of the solutions using the Deterministic and Probabilistic Dynamic Programming
4.	Model problems using Non-Linear Programming and evaluate the suitability of the available techniques for the problem at hand
5	Apply the meta-heuristic algorithms for real world optimization

SYLLABUS

MODULE I

Operation Research – An overview, Organ and Development of OR, Nature and Features of OR, Modeling in OR, General Solution Methods for OR models, Scientific method in OR, Methodology of OR, Application, Opportunities and Shortcomings of OR.**(8L)**

MODULE II

Linear Programming Problem: Introduction, Mathematical Formulation of the Problem, Graphical Solution Method, Some Exceptional Cases, General LPP, Canonical and Standard forms of LPP, Simplex Method: Introduction, Fundamental properties of solutions, the Computational Procedure, Use of Artificial variables, Solution to simulation Linear Equations, Investing a Matrix using Simplex Method. **(8L)**

MODULE III

Duality in LPP: Introduction, General Primal – Dual pair, Formulating a Dual Problem, Primal Dual pair in Matrix form, Halting theorems, Dual simplex method, Post optical Analysis, Introduction: Variation in cost vector, Requirement Vector, Coefficient Matrix, Structural Variation. **(8L)**

MODULE IV

Integer Programming and Advance LPP techniques: Introduction, Gomory's Method, Court ruction of Gomorra's constraints, Fractional Cut Method: All Integer & Mixed Integer, Revised Simplex Method, Bounded Variable, Parametric LPP, KarmakarAlgorith.**(8L)**

MODULE V

Dynamic Programming & Introduction: Characteristic of Dynamic Programming, Dynamic Programming Algorithm, Solution of LPP by Dynamic Programming.

NLPP: Introduction, Formulality**(8L)**

Text Book:

1. Hiller S. & Lieberman G.J. "Operations Research", 9th Edition, TMH, New Delhi, 2012.

Reference Books:

1. Taha H.A. "Operations Research", 9th Edition, Pearson Education, New Delhi, 2013.
2. Pai Pradeep Prabhakar "Operations Research", 1st Edition, Oxford University Press 2012.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets

CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	3	1	2	1	2	1
CO2	3	2	3	3	2	2	2	1
CO3	2	3	1	2	2	1	3	1
CO4	3	2	1	3	3	1	1	1
CO5	3	3	2	3	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA635
Course title: NATURAL LANGUAGE PROCESSING
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L: 3 T: 0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: V/6
Branch: MCA

Course Objectives

This course enables the students:

A.	To understand the algorithms available for the processing of linguistic information and computational properties of natural languages.
B.	To conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.
C.	To familiarize various NLP software libraries and data sets publicly available.
D.	To develop systems for various NLP problems with moderate complexity.
E.	To learn various strategies for NLP system evaluation and error analysis.

Course Outcomes

After the completion of this course, students will be able to:

1.	Describe the typical NLP problems, their importance & difficulty; and concepts of morphology, syntax, semantics, discourse & pragmatics of natural language.
2.	Demonstrate understanding of the relationship between NLP and statistics & machine learning.
3.	Discover various linguistic and statistical features relevant to the basic NLP task, namely, spelling correction, morphological analysis, parts-of-speech tagging, parsing and semantic analysis.
4.	Develop systems for various NLP problems with moderate complexity.
5.	Evaluate a NLP system, identify shortcomings and suggest solutions for these shortcomings.

SYLLABUS

MODULE-I

Introduction to NLP

NLP – introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English. **(8L)**

MODULE-II

Language Modelling: N-gram and Neural Language Models

Language Modelling with N-gram, Simple N-gram models, Smoothing (basic techniques), Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development.**(8L)**

MODULE-III

Parts-of-speech Tagging

Parts-of-speech Tagging: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, POS Tagging using Maximum Entropy Model.**(8L)**

MODULE-IV

Parsing

Basic concepts: top down and bottom up parsing, treebank; Syntactic parsing: CKY parsing; Statistical Parsing basics: Probabilistic Context Free Grammar (PCFG); Probabilistic CKY Parsing of PCFGs. **(8L)**

MODULE-V

Semantics

Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embeddings from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WordNet.**(8L)**

Text books:

1. Jurafsky Dan and Martin James H. "Speech and Language Processing" ,3rd Edition, 2018.

Reference books:

1. Jurafsky D. and Martin J. H., "Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Goldberg Yoav "A Primer on Neural Network Models for Natural Language Processing".

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS &EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
✓ Continuous Internal Assessment	✓	✓	✓	✓	✓
✓ Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	2	1	3	2	3	1
CO2	3	1	3	3	2	2	2	1
CO3	2	2	1	1	2	2	3	1
CO4	3	2	1	3	3	1	2	1
CO5	2	3	2	3	3	2	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7
CO5	CD2, CD3, CD6, CD7

COURSE INFORMATION SHEET

Course code: CA636
Course title: ARTIFICIAL INTELLIGENCE
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L: 3 T: 0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: V/6
Branch: MCA

Course Objectives

This course enables the students:

A.	An ability to apply knowledge of mathematics, science and engineering to both software and hardware design problems.
B.	An ability to design and conduct experiments and to analyze and interpret data related to software and hardware design solutions.
C.	An ability to design a system, component or process to meet desired needs within realistic constraints.
D.	An ability to function on multidisciplinary teams using current computer engineering tools and technologies.
E.	An ability to identify, formulate and solve engineering problems based on a fundamental understanding of concepts of computer engineering topics.

Course Outcomes

After the completion of this course, students will be able to:

1.	Recall the principles and approaches of artificial intelligence and understand different aspects of Intelligent agent.
2.	Apply different search techniques for solving real world problems and select the most appropriate solution by comparative evaluation.
3.	Understanding the various concepts of knowledge representations and demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information.
4.	To develop a basic understanding of some of the more advanced topics of AI such as learning, natural language processing, Robotics etc.
5.	Write various types of LISP and PROLOG programs and explore more sophisticated LISP and PROLOG code.

SYLLABUS

MODULE-I

Introduction: Overview of Artificial Intelligence- Problems of AI, AI Technique, Tic - Tac - Toe Problem.

Intelligent Agents: Agents & Environment, Nature Of Environment, Structure Of Agents, Goal Based Agents, Utility Based Agents, Learning Agents.

Problem Solving: Problems, Problem Space & Search: Defining The Problem As State Space Search, Production System, Problem Characteristics, Issues In The Design Of Search Programs.

(8L)

MODULE-II

Search Techniques: Solving Problems By Searching, Problem Solving Agents, Searching For

Solutions; Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Bi-directional Search, Comparing Uniform Search Strategies.

Heuristic Search Strategies: Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search, Simulated Annealing Search, Local Beam Search, Genetic Algorithms; Constraint Satisfaction Problems, Local Search For Constraint Satisfaction Problems.

Adversarial Search: Games, Optimal Decisions & Strategies in Games, The Mini Max Search Procedure, Alpha-Beta Pruning, Additional Refinements, Iterative Deepening.**(8L)**

MODULE-III

Knowledge & Reasoning: Knowledge Representation Issues, Representation & Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation.

Using Predicate Logic: Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, and Natural Deduction. **Representing Knowledge Using Rules:** Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge**(8L)**

MODULE-IV

Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, Bayesian Networks, Dempster-Shafer Theory.

Planning: Overview, Components of A Planning System, Goal Stack Planning, Hierarchical Planning.

Learning: Forms Of Learning, Inductive Learning, Explanation Based Learning, Neural Net Learning & Genetic Learning.

(8L)

MODULE-V

Natural Language Processing: Brief introduction to Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing.

Robotics: Introduction, Robot hardware, robotic perception, planning to move, planning uncertain movements, robotic software architecture, application domains.**(8L)**

Text books:

1. Russel S. and Norvig P. "Artificial Intelligence a Modern Approach", 3rd Edition, Pearson Education.
2. Rich E. & Knight K. "Artificial Intelligence", 2nd Edition, TMH, New Delhi.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	1	2	2	1	1
CO2	3	1	3	2	1	2	2	1

CO3	2	2	3	1	1	2	3	2
CO4	2	2	1	3	3	1	1	1
CO5	3	2	3	2	2	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7
CO4	CD2, CD6, CD7

COURSE INFORMATION SHEET

Course code: CA637
Course title: IMAGE PROCESSING
Pre-requisite(s): Discrete Mathematics,

Co- requisite(s): Data Structures
Credits: 3 L: 3 T: 0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: V/6
Branch: MCA

Course Objective:
This course enables the students:

A.	Understand the fundamentals of digital image processing.
B.	Develop a Broad knowledge of Spatial and Frequency image transforms used for enhancing an image.
C.	Learn Image restoration techniques and noise models used for restoring an image.
D.	Understand Lossless and lossy image compression techniques.
E.	Know Morphological processing algorithms for various operations on an image.

Course Outcomes
After the completion of this course, students will be able to:

1.	Understand the concept of image formation, digitization and the role human visual system plays in perception of image data.
2.	Acquire an appreciation for spatial and frequency based techniques for enhancing the appearance of an image duly applying them in different applications.
3.	Discern the difference between noise models, gain an insight into assessing the degradation function and realize different spatial and frequency based filtering techniques for reduction and removal of noise.
4.	Synthesize a solution to image compression using the concept of information theory and lossless and lossy compression techniques.
5.	Design and create practical solutions using morphological operators for common image processing problems and assess the results.

SYLLABUS

MODULE -I
What Is Digital Image Processing, Fundamental Steps in Digital Image Processing , Components of an Image Processing System, Elements of Visual Perception, Light and the Electromagnetic

Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations. **(8L)**

MODULE -II

Enhancements in Spatial Domain: Some Basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods. **Enhancements in Frequency Domain**: Introduction to the Fourier Transform and the Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency Domain Filters, Homomorphism Filtering **(8L)**

MODULE -III

Image Restoration: A Model of the Image Degradation/Restoration Process, Noise Models. Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear, Position-Invariant Degradations, Estimating the Degradation Function, Inverse Filtering, Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Geometric Transformations. **(8L)**

MODULE -IV

Image Compression: Fundamentals, Image Compression Models, Elements of Information Theory, Error-Free Compression, Lossy Compression.**(8L)**

MODULE -V

Morphological Image Processing and Segmentation: Preliminaries, Dilation and Erosion, Opening and Closing, The Hit-or-Miss Transformation. Some Basic Morphological Algorithms, Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation. **(8L)**

Text books:

1. Rafael. C. & Woods Richard E. "Digital Image Processing", 3rd Edition, Pearson Education, New Delhi, 2009.

Reference books:

1. Pratt W.K. "Digital Image Processing", 4th Edition, John Wiley & sons Inc., 2006.
2. Sonka M., Hlavac Vaclav, Boyle Roger "Image Processing, Analysis and Machine Vision", 2nd Edition, Thomson Learning, India Edition, 2007.
3. Jayaraman "Digital Image Processing", Tata McGraw. Hill Education, 2011.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	3	1	2	1	2	2
CO2	1	3	1	3	2	2	1	1
CO3	2	3	1	1	2	2	2	2
CO4	3	2	3	3	3	1	2	1
CO5	3	1	3	3	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA638
Course title: SOFT COMPUTING
Pre-requisite(s):
Co- requisite(s):
Credits: 3 L: 3 T: 0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level: V/6
Branch: MCA

Course Objective:
This course enables the students:

A.	To know the basic functions of different AI branches.
B.	To understand the functionalities of neural networks .
C.	To know the application of fuzzy logic.
D.	To understand the basic functionalities of optimizations through soft computing.
E.	To find the basic functions of soft computing.

Course Outcomes
After the completion of this course, students will be able to:

1.	Solve numerical on Fuzzy sets and Fuzzy Reasoning.
2.	Develop Fuzzy Inference System (FIS).
3.	Solve problems on Genetic Algorithms
4.	Explain concepts of neural networks
5.	Develop neural networks models for various applications.

SYLLABUS

MODULE – I

Introduction to Artificial Intelligence System, Neural Network, Fuzzy Logic & Genetic Algorithm. Fuzzy Set Theory: Fuzzy Versus Crisp, Crisp Set, Fuzzy Set, Crip Relation, Fuzzy Relations. **(8L)**

MODULE – II

Fuzzy System: Crisp Logic, Predicate Logic, Fuzzy Logic, Fuzzy Rule Based System, Defuzzification Methods, and Applications.**(8L)**

MODULE – III

Genetic Algorithms, Basic Concepts, Creation Of Offspring, Working Principle, Encoding, Fitness Function, Reproduction.
Genetic Modeling, Inheritance Operations, Cross Over, Inversion And Deletion, Mutation Operator, Bit Wise Operators, Generation Cycle, Convergence Of Genetic Algorithm, Application, Multi-Level Optimization, Real Life Problems, Difference And Similarities Between GA And Other Traditional Methods, Advanced In GA.**(8L)**

MODULE – IV

Fundamentals Of Neural Networks, Basic Concepts Of Neural Network, Human Brain, Model Of An Artificial Neuron, Neural Network Architectures, Characteristic Of Neural Networks, Learning Method, Taxonomy Of Neural Network Architectures, History Of Neural Network Research, Early Neural Network Architectures, Some Application Domains.**(8L)**

MODULE – V

Back Propagation Network Architecture Of Back Propagation Network, Back Propagation Learning, Illustration, Applications, Effect Of Tuning Parameters Of The Back Propagation Neural Network, Selection Of Various Parameters In BPN, Variations Of Standard Back Propagation Algorithm.
Associative Memory And Adaptive Resonance Theory, Autocorrelations, Hetrocorrelators , Multiple Training Encoding Strategy, Exponential BAM, Associative Memory For Real Coded Pattern Pairs, Applications, Introduction To Adaptive Resonance Theory, ARTI, Character Recognition Using ARI1**(8L)**

Text Book:

1. Rajasekharan S. &Vijayalakshmi G. A. "Neural Network Fuzzy Logic and GenticAlgorithm Synthesis and Applications", Prentice Hall of India PLT, Pai, 2004.

Reference Book:

1. Jang JyhShing R, Sun C. T., Mizutani E. "Neuro Fuzzy and Soft Computing –A Computational Approach to Learning and Machine Intelligence", Prentice Hall of India, 1997.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	3	1	1	1	1	1	1
CO2	3	2	3	3	3	2	2	3
CO3	3	1	2	1	2	2	3	2
CO4	3	2	1	3	3	1	2	1
CO4	3	2	3	2	3	1	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA639
Course title: CLOUD COMPUTING
Pre-requisite(s):
Co-requisite(s):
Credits:3 L:3 T:0 P:0
Class schedule per week: 03
Class: MCA
Semester / Level:V/6
Branch: MCA

Course Objectives
This course enables the students to:

1.	Understand about security requirements in cloud.
2.	Learn about infrastructure security at different levels
3.	Know about management standards of cloud security
4.	Develop and Apply trust-based security model to different layers

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify security aspects of each cloud model
2.	Implement a public cloud instance using a public cloud service provider
3.	Apply trust-based security model to different layer
4.	Develop a risk-management strategy for moving to the Cloud
5.	Identify various research domain of cloud computing

SYLLABUS

Module I

Introduction: Online Social Networks and Applications, Cloud introduction and overview, Different clouds, Risks, Novel applications of cloud computing

(8L)

Module II

Requirements, Introduction Cloud computing architecture, On Demand Computing Virtualization at the infrastructure level, Security in Cloud computing environments, CPU Virtualization, A discussion on Hypervisors Storage Virtualization Cloud Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software Model, The Cloud Services Delivery Model, Key Drivers to Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud, Barriers to Cloud Computing Adoption in the Enterprise

(8L)

Module III

Infrastructure Security, Infrastructure Security: The Network Level, The Host Level, The Application Level, Data Security and Storage, Aspects of Data Security, Data Security Mitigation Provider Data and Its Security Identity and Access Management Trust Boundaries and IAM, IAM Challenges, Relevant IAM Standards and Protocols for Cloud Services, IAM Practices in the Cloud, Cloud Authorization Management.

(8L)

Module IV

Security Management Standards, Security Management in the Cloud, Availability Management: SaaS, PaaS, IaaS, Privacy Issues: Privacy Issues, Data Life Cycle, Key Privacy Concerns in the Cloud, Protecting Privacy, Changes to Privacy Risk Management and Compliance in Relation to Cloud Computing, Legal and Regulatory Implications, U.S. Laws and Regulations, International Laws and Regulations.

(8L)

Module V

Internal Policy Compliance, Governance, Risk, and Compliance (GRC), Regulatory/External Compliance, Cloud Security Alliance, Auditing the Cloud for Compliance, Security-as-a-Cloud, Recent developments in hybrid cloud and cloud security**(8L)**

Text Books:

1. Rhoton John, "Cloud Computing Explained: Implementation Handbook for Enterprises", 2009.
2. Tim Mather, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance (Theory in Practice)", ISBN-10: 0596802765, O'Reilly Media, 2009.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures

CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	2	3	1	1	1	1
CO2	3	2	1	3	3	2	1	1
CO3	1	1	1	2	1	2	3	1
CO4	3	2	1	3	3	2	2	1
CO5	3	3	2	2	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA640
Course title: MACHINE LEARNING
Pre-requisite(s): Design of Algorithms, Mathematics 2, Artificial Intelligence
Co- requisite(s): None
Credits:3 L: 3 T: 0 P: 0
Class schedule per week: 03
Class: MCA
Semester / Level:V/6
Branch: MCA

Course Objectives
This course enables the students:

1.	To formulate machine learning problems corresponding to different applications.
2.	To understand various supervised, semi-supervised and unsupervised machine learning algorithms.
3.	To familiarize various machine learning software libraries and data sets publicly available.
4.	To develop machine learning based system for various real-world problems.
5.	To assess how the choice of a machine learning algorithm impacts the accuracy of a system.

Course Outcomes

After the completion of this course, students will be able to:

1.	Formulate machine learning problems corresponding to different applications: data, model selection, model complexity
2.	Demonstrate understanding of a range of machine learning algorithms along with their strengths and weaknesses
3.	Implement machine learning solutions to classification, regression, and clustering problems
4.	Design and implement various machine learning algorithms in a range of real-world applications
5.	Evaluate and analyse the performance of a machine learning algorithm or a system based on machine learning algorithm.

SYLLABUS

Module I

Introduction to Machine Learning

Machine Learning – what and why? Basics of Linear Algebra and Statistics, Overview of target function representations; Linear Regression.

(8L)

Module II

Supervised Learning

Basics of Feature Selection and Evaluation, Decision Tree, Overfitting and Pruning, Logistic regression, Support Vector Machine and Kernel; Noise, bias-variance trade-off, under-fitting and over-fitting concepts.

(8L)

Module III

Neural Networks

Perceptrons: representational limitation and gradient descent training. Multilayer networks and backpropagation. Hidden layers and constructing intermediate, distributed representations. Overfitting, learning network structure, recurrent networks.

(8L)

Module IV

Unsupervised and Semi Supervised Learning

Learning from unclassified data. Clustering. Hierarchical Agglomerative Clustering. k-meanspartitional clustering. Expectation maximization (EM) for soft clustering. Semi-supervised learning with EM using labeled and unlabled data.

(8L)

Module V

Ensemble

Committees of multiple hypotheses, bagging, boosting, active learning with ensembles.

(8L)

Text Books:

1. Mitchell Tom, "Machine Learning", Latest Edition, Mc-Graw Hill.

Reference Books:

1. Shwartz Shai Shalev, and David Shai Ben, "Understanding Machine Learning", Cambridge University Press, 2017.
2. Bishop Christopher "Pattern Recognition and Machine Learning", Springer, 2006.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	2	1	3	1	1	2
CO2	3	2	3	3	2	2	2	1
CO3	2	3	1	1	1	1	1	2
CO4	3	2	1	3	3	1	2	1
CO5	3	3	3	2	2	1	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA641
Course title: IN-MEMORY COMPUTING
Pre-requisite(s):
Co-requisite(s):
Credits: 3 L:3 T:0 P:0
Class schedule per week: 03
Class: MCA
Semester / Level: V/6
Branch: MCA

Course Objectives
This course enables the students:

A.	To appreciate the problems of computing with big data
B.	To understand the basic architecture of Apache Spark
C.	To Understand the structured APIs and data structures in Spark
D.	To understand how to handle data streams in Spark
E.	To apply Spark for basic machine learning problems.

Course Outcomes

After the completion of this course, students will be:

1.	Able to map problems to in memory computing architectures.
2.	Able to apply Spark for solving simple problems using the basic data structures
3.	Able to perform joins, sorts, shuffles and other related operations
4.	Able to work with streaming data in Spark and analyse the results
5.	Able to perform simple classification and clustering algorithms using Spark.

SYLLABUS

MODULE -I

An introduction to Apache Spark, Basic Architecture, Spark APIs, Spark Session, Dataframes, Transformations, Actions, Datasets, Structured Streaming**(8L)**

MODULE -II

Structured APIs, Overview, Basic Structured Operations, Different types of Data, Aggregations, Joins, Data Sources, SparkSQL, Datasets
(8L)

MODULE -III

Low Level API, Resilient Distributed Datasets, Advanced Resilient Distributed Datasets, Distributed shared variables. **(8L)**

MODULE -IV
Streaming, Fundamentals, Structured Streaming basics, Event time and stateful processing

(8L)
MODULE -V
Machine Learning, Preprocessing and feature engineering, Classification, Unsupervised learning

(8L)
Text books:

1. Chambers B., Zaharaia M., "Spark The Definitive Guide – Big Data Processing made Simple", 1st Edition, O'Reilly Media, 2018.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	2	2	2	1	2	1
CO2	3	2	3	3	2	2	1	1
CO3	3	3	1	1	2	1	1	1
CO4	2	2	1	3	3	1	2	1
CO5	3	1	3	3	3	1	2	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD5

COURSE INFORMATION SHEET

Course code: CA630

Course title: NETWORK SECURITY AND CRYPTOGRAPHY
Pre-requisite(s):
Co- requisite(s):
Credits:4 L:3 T:1 P:0
Class schedule per week: 04
Class: MCA
Semester / Level:V/6
Branch: MCA

Course Objectives
This course enables the students:

1.	To understand the foundations of cryptographic attacks.
2.	To gain knowledge of encrypting data, and to choose between different algorithms.
3.	Prepare students for research in the area of cryptography and enhance students communication and problem solving skills
4.	To differentiate between the encryption techniques and know their suitability to an application.
5.	To effectively apply their knowledge to the construction of secure cryptosystems.

Course Outcomes
After the completion of this course, students will be able to:

1.	Understand the various types of cryptographic attacks and the mathematics behind cryptography.
2.	Describe the various types of ciphers and hash functions.
3.	Apply the different cryptographic techniques to solve real life problems.
4.	Evaluate different techniques as to their suitability to various applications.
5.	Develop a cryptosystem keeping in view social issues and societal impacts.

SYLLABUS

Module I

Foundations – Protocol Building Blocks - Basic Protocols - Intermediate Protocols - Advanced Protocols - Zero-Knowledge Proofs - Zero-Knowledge Proofs of Identity -Blind Signatures - Identity-Based Public-Key Cryptography.
(8L)

Module II
Key Length - Key Management – Public Key Cryptography versus Symmetric Cryptography - Encrypting Communications Channels - Encrypting Data for Storage - Hardware Encryption versus Software Encryption - Compression, Encoding, and Encryption - Detecting Encryption – Hiding and Destroying Information. **(8L)**

Module III
Information Theory - Complexity Theory - Number Theory - Factoring - Prime Number Generation - Discrete Logarithms in a Finite Field - Data Encryption Standard (DES) – Lucifer - Madryga - NewDES - GOST – 3 Way – Crab – RC5 - Double Encryption - Triple Encryption - CDMF Key Shortening - Whitening. **(8L)**

Module IV
Pseudo-Random-Sequence Generators and Stream Ciphers – RC4 - SEAL - Feedback with Carry Shift Registers - Stream Ciphers Using FCSRs - Nonlinear-Feedback Shift Registers - System-Theoretic Approach to Stream-Cipher Design - Complexity-Theoretic Approach to Stream-Cipher Design - N- Hash - MD4 - MD5 - MD2 - Secure Hash Algorithm (SHA) - OneWay Hash Functions Using Symmetric Block Algorithms - Using Public-Key Algorithms - Message Authentication Codes **(8L)**

Module V
RSA - Pohlig-Hellman - McEliece - Elliptic Curve Cryptosystems -Digital Signature Algorithm (DSA) - Gost Digital Signature Algorithm - Discrete Logarithm Signature Schemes - Ongchnorr-Shamir -Cellular Automata - Feige-Fiat-Shamir -Guillou-Quisquater - Diffie-Hellman - Station-to-Station Protocol -Shamir's Three-Pass Protocol - IBM Secret-Key Management Protocol - MITRENET - Kerberos - IBM Common Cryptographic Architecture. **(8L)**

Text Books:

1. Schneier Bruce, "Applied Cryptography: Protocols, Algorithms, and Source Code in C", 2nd Edition, John Wiley & Sons, Inc, 1996.
2. Mao Wenbo, "Modern Cryptography Theory and Practice", Pearson Education, 2004.
3. KahateAtul, "Cryptography and Network Security", Tata McGrew Hill, 2003.

Reference Book:

1. Stallings William, "Cryptography & Network Security Principles and Practice", Pearson Education.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	3	2	2	2	1	1	1
CO2	3	1	1	3	3	2	1	1
CO3	3	3	1	1	2	1	1	1
CO4	1	2	1	3	3	1	2	2

CO5	2	2	2	3	3	2	3	3

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD5

COURSE INFORMATION SHEET

Course code: CA631
Course title:INTERNET OF THINGS(IoT)
Pre-requisite(s):
Co-requisite(s):
Credits:4 L:3 T:1 P:0
Class schedule per week: 04
Class: MCA
Semester / Level:V/6
Branch: MCA

Course Objectives
This course enables the students to:

1.	Understand the basic concept and the IoT Paradigm
2.	Know the state of art architecture for IoT applications
3.	Learn the available protocols used for IoT
4.	Design basic IoT Applications.
5.	Evaluate optimal IoT applications.

Course Outcomes
After the completion of this course, students will be able to:

1.	Identify the IoT Components and its capabilities
2.	Explain the architectural view of IoT under real world constraints
3.	Analyse the different Network and link layer protocols
4.	Evaluate and choose among the transport layer protocols
5.	Design an IoT application

SYLLABUS

Module I
IoT - An Architectural Overview
Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations. M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management. **(8L)**

Module II
IoT Architecture - State of the Art
Introduction, State of the art, Reference Model and architecture, IoT reference Model - IoT Reference Architecture; Introduction, Functional View, Information View, Deployment and Operational View **(8L)**

Module III
IoT Data Link Layer & Network Layer Protocols
PHY/MAC Layer (3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART,BluetoothLow Energy, Zigbee Smart Energy
Network Layer-IPv4, IPv6, 6LoWPAN **(8L)**

Module IV
Transport & Session Layer Protocols
Transport Layer (TCP, MPTCP, UDP,) Session Layer-HTTP, CoAP, XMPP, AMQP, MQTT. **(8L)**

Module V
Layer Protocols & Security
Service Layer -oneM2M, ETSI M2M
Security in IoT Protocols – MAC 802.15.4, 6LoWPAN, RPL, Application Layer protocols. **(8L)**

Text Books:

1. Holler Jan, TsiatsisVlasios, Mulligan Catherine, Avesand Stefan, Karnouskos Stamatis, Boyle David, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.
2. Waher Peter, "Learning Internet of Things", PACKT publishing, BIRMINGHAM-MUMBAI

Reference Books:

1. Reiter Bernd Scholz, Michahelles Florian, "Architecting the Internet of Things", Springer, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2.
2. Minoli Daniel, "Building the Internet of Things with IPv6 and MIPv6:".

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5

Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	2	2	2	1	2	1
CO2	3	2	3	3	2	2	1	1
CO3	3	3	1	1	2	1	1	1
CO4	2	2	1	3	3	1	2	1
CO5	3	3	3	2	2	1	3	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD5

COURSE INFORMATION SHEET

Course code: CA632
Course title: MOBILE COMPUTING
Pre-requisite(s): Basic Networking Fundamentals
Co-requisite(s):
Credits: 4 L:3 T:1 P:0
Class schedule per week: 04
Class: MCA
Semester / Level: V/6
Branch: MCA
Name of Teacher:

Course Objectives
This course enables the students:

A.	Understand basic mobile network concepts and its architectures.
B.	Know Protocols like mobile telephony and introduce to the concepts of bluetooths etc.
C.	Comprehend the GSM architectures and its features that support mobile communications.
D.	Understand the network management and Middleware services used in Ip and Mobile telephony
E.	Get accustomed to the concepts like GPRS, 3G, 4G networks

Course Outcomes
After the completion of this course, students will be:

1.	Identify the role of cellular networks in Mobile and Pervasive Computing
2.	Analyse about the basic architecture for a pervasive computing environment
3.	Assess the principles for routing and allocating the resources on the 3G-4G wireless network

4.	Evaluate mobile computing applications based on the paradigm of context aware computing
5.	To design and develop applications in mobile and pervasive computing environment

SYLLABUS

Module –I

Introduction: Mobility of bits and bytes, wireless the beginning, mobile computing, dialogue control, Networks, middleware and gateways, application and services, developing mobile computing applications, security in mobile computing, standard bodies. Mobile Computing Architecture: architecture for mobile computing, three tier architecture,

(8L)

Module –II

Mobile Computing through Telephony: evolution of telephony, multiple access procedures, mobile computing through telephone. Emerging Technologies: introduction, Bluetooth, radio frequency identification, wireless broadband, mobile IP, IPV6,.**(8L)**

Module –III

Global System for Mobile Communications GSM: introduction, GSM architecture , call routing in GSM, PLMN interface, GSM address and identifiers, network aspect in GSM, GSM frequency allocation, authenticity and security. Short Message Service SMS : Mobile computing over SMS, Short message services(SMS) **(8L)**

Module –IV

General Packet Radio Service GPRS:GPRS and packet data network, GPRS network architecture, GPRS network operation, data services in GPRS, applications for GPRS, limitations for GPRS, billing and charging in GPRS. Wireless Application Protocol WAP: introduction , WAP, MMS, GPRS applications.

CDMA and 3G

Client Programming: introduction, moving beyond the desktop, a peak under the hood: hardware overview, mobile phone, PDA, design constraints in application for handheld devices. **(8L)**

Module –V

Voice Over Internet Protocol and Convergence: VoIP, H 323 framework for VoIP 564, SIP, comparision between H.323 and SIP 570, Real time protocol, convergence technologies, call routing, voice over IP applications, IP multimedia subsystem, Mobile VoIP. **(8L)**

Text Book:

1. Talukedar Ashok, Ahmed Hasan, YavagalRoopa R "Mobile Computing Technology, Applications and Service Creation",Tata McGraw -Hill Education ,2010.

Reference Books:

1. Schiller Jochen H. "Mobile Communications", 2nd Edition, Addison wesley.
2. Kamal Raj "MobileComputing", 2nd Edition, Oxford University Press.
3. Behravanfar Reza "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, October 2004.
4. Adelstein Frank, Gupta Sandeep K.S., Richard III Golden G., Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-Hill Professional, 2005.
5. Hansmann Uwe, MerkLothar, Nicklous Martin S., Stober Thomas "Principles of Mobile Computing", 2nd Edition., Springer, 2003.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	2	3	2	3	1	1
CO2	2	3	3	2	2	3	1	1
CO3	2	2	1	2	2	2	1	1
CO4	2	2	1	3	3	1	2	1
CO5	3	3	2	2	2	1	3	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7
CO5	CD1,CD2,CD5

COURSE INFORMATION SHEET

Course code: CA634
Course title: Multimedia and Animation
Pre-requisite(s):
Co-requisite(s):
Credits: 4 L:3 T:1 P:0
Class schedule per week: 04
Class: MCA
Semester / Level: V/6
Branch: MCA

Course Objectives
This course enables the students:

A.	To understand what constitutes multimedia
B.	Understand the underlying concepts and mathematics of multimedia
C.	Get acquainted with the hardware and software that constitutes multimedia
D.	Know basic algorithms in the field of multimedia and animation
E.	Know file formats and their importance

Course Outcomes
After the completion of this course, students will be able to:

1.	Evaluate the uses of multimedia and different standards in graphics, video, audio, animation, CDROM and other hardware
2.	Apply the principles of multimedia development, including story-board techniques and develop a suitable story-board for a small multimedia project

3.	Implement the multimedia project using appropriate technology
4.	Describe and evaluate a variety of 3D principles and techniques
5.	Design and create concept artwork for a short animated project, including storyboards, turnaround artwork and technical drawings.

SYLLABUS

MODULE -I

Introduction, Multimedia Information Applications, Issues and Challenges, Semantic Models for Multimedia Information Systems, Multimedia Semantic Models
(8L)

MODULE -II

Multimedia database Searching, Image Segmentation, Video Parsing and Segmentation Approaches, Iconic-Based Grouping and Browsing Approaches, Knowledge-Based Event Modeling Approaches, Characteristics of Video Data Modeling, Motion Detection and Tracking Approaches, Object Recognition Approaches, Content-Based Retrieval. **(8L)**

MODULE -III

Multimedia Browsing, Video Browsing, Key Frame Selections **(8L)**

MODULE -IV

Augmented Transition Network Model (ATN), Spatial and Temporal Relations of Semantic Objects, Multimedia Presentations, Multimedia Database Searching, Multimedia Browsing, User Interactions and Loops
(8L)

MODULE -V

Object Composition Petri Net Model, Interval Based Conceptual Models **(8L)**

Text Book:

1. Chen S C, Kashyap R L, Ghafoor A. "Semantic Models for Multimedia Database Searching and Browsing", Kluwer Academic Publishers.

Reference Book:

1. Muneesawang P., Guan L. "Multimedia Database Retrieval a Human-Centered Approach", Springer Publication, 2006.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	50
Semester End Examination	50

Continuous Internal Assessment	% Distribution
3 Quizzes	30 % (3 × 10%)
Assignment (s)	10
Seminar before a committee	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars

CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	3	2	2	2	1	2	2
CO2	3	2	2	1	2	2	3	1
CO3	1	3	1	1	2	1	1	1
CO4	2	2	1	3	3	1	2	1
CO5	3	3	3	2	2	1	1	1

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1,CD2,CD3,CD6
CO2	CD1, CD6,CD3
CO3	CD6, CD7, CD3,CD1
CO4	CD1, CD3,CD6,CD7

COURSE INFORMATION SHEET

Course code: CA602
Course title: COMPUTER GRAPHICS LAB
Pre-requisite(s):
Co- requisite(s):
Credits:1.5 L: 0 T: 0 P:3
Class schedule per week: 3
Class: MCA
Semester / Level: V/6
Branch: MCA

Course Objectives

This course enables the students:

1.	To learn computer graphics by practical
2.	To Learn coding for various graphics tools.

3.	To learn the various theory by implementation using programming
4.	To identify the limitations of C Language for graphics related problem.
5.	To know the practical application of computer graphics.

Course Outcomes

After the completion of this course, students will be able:

CO1	To code programs efficiently.
CO2	To translate the graphics algorithm to programs.
CO3	To test and execute the graphical syntax and logical errors.
CO4	To apply programming to solve simple graphical problems using functions.
CO5	To write the C program efficiently for transformation problems.

SYLLABUS

List of Programs as Assignments:

Write programs using ***C language***

1. To get the background color.

2. To set the background color.

3. To plot a point of co-ordinate (100,100).

4. To draw a line using the line function.

5. To draw a line using the line function. Take the end co-ordinates from the user.

6. To draw a triangle using the polygon function.

7. To draw a polygon of ‘n’ edges using polygon function.

8. To draw a polygon of ‘n’ edges taken from the user using the polygon function.

9. To draw a circle using the circle function.

10. To draw a circle of radius ‘r’ taken from the user using the circle function.

11. To draw a line using DDA algorithm.

12. To draw a line using Bresenham’s line algorithm.

13. To draw a circle using midpoint circle algorithm.

14. To draw a line using Bresenham’s line algo, where end points are taken from the user.

15. To draw a line using DDA algo, where end points are taken from the user.

16. To draw ‘n’ concentric circles taken from user using midpoint algorithm.

17. To create a line and translate it.

18. To create a line and increase its size with a value taken from user.

19. To create an equilateral triangle.

20. To draw a line and rotate it with angle of 45.

21. To create a circle and translate it.

22. To create a circle and translate it with a value taken from user.

23. To create an equilateral triangle and rotate it with angle of 45.

24. To create an equilateral triangle and create reflection.

25. To scale a rectangle.

26. To shear a rectangle. Take the shear factor from the user.

27. To create an equilateral triangle and translate, rotate and scale it.

28. To draw a line with shear and translation.

29. Draw bar chart.

30. Draw pie chart.

Books recommended:

TEXT BOOK

1. Roger T. Stevens, Advanced Graphics Programming in C and C++, BPB Publication

2. Donald Hearn, M. Pauline Baker, Computer Graphics, C Version, Prentice Hall Publication

3. https://www.programmingsimplified.com/c/graphics.

COURSE OUTCOME (CO) ATTAINMENT ASSESSMENT TOOLS & EVALUATION PROCEDURE

Direct Assessment

Assessment Tool	% Contribution during CO Assessment
Continuous Internal Assessment	60
Semester End Examination	40

Continuous Internal Assessment	% Distribution
Day to day performance & Lab files	30
Quiz (es)	10
Viva	20

Semester End Examination	% Distribution
Examination Experiment Performance	30
Quiz	10

Assessment Components	CO1	CO2	CO3	CO4	CO5
Continuous Internal Assessment	✓	✓	✓	✓	✓
Semester End Examination	✓	✓	✓	✓	✓

Indirect Assessment –

1. Student Feedback on Faculty
2. Student Feedback on Course Outcome

Course Delivery Methods

CD1	Lecture by use of boards/LCD projectors/OHP projectors
CD2	Assignments/Seminars
CD3	Laboratory experiments/teaching aids
CD4	Industrial/guest lectures
CD5	Industrial visits/in-plant training
CD6	Self- learning such as use of NPTEL materials and internets
CD7	Simulation

MAPPING BETWEEN COURSE OUTCOMES AND PROGRAM OUTCOMES

Course Outcome	Program Outcomes							
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**
CO1	3	2	3	3	3	2	1	1
CO2	3	3	2	1	1	3	3	3
CO3	2	3	3	2	1	1	2	3
CO4	1	2	2	1	1	2	2	3
CO5	3	3	2	2	2	1	2	2

If satisfying and < 34% = 1, 34-66% = 2, > 66% = 3

MAPPING BETWEEN COURSE OUTCOMES AND COURSE DELIVERY METHOD

Course Outcomes	Course Delivery Method
CO1	CD1, CD2, CD6
CO2	CD1, CD6
CO3	CD1, CD2, CD3,
CO4	CD1, CD3,CD6
CO5	CD1,CD2

COURSE INFORMATION SHEET

Course code: CA604
Course title: SYSTEM SIMULATION AND MODELLING LAB
Pre-requisite(s):
Co- requisite(s):
Credits:1.5 L: 0 T: 0 P:3

Class schedule per week: 3
Class: MCA
Semester / Level: V/6
Branch: MCA
Name of Teacher:

Course Objectives

This course enables the students to:

1.	Introduction to 3D Studio Max
2.	2D Splines, Shapes & Compound Objects
3.	Simulation & Effects, Lighting & Camera, Texturing with Max
4.	Rendering with V-Ray

Course Outcomes

After the completion of this course, students will be able to:

CO1	Impart the fundamental knowledge on using various analytical tools like ANSYS, FLUENT, etc., for Engineering Simulation.
CO2	Use of these tools for any engineering and real time applications.
CO3	Acquire knowledge on utilizing these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their employment.
CO4	Create 3D object from 2D object
CO5	Develop a real life model using queuing system.

SYLLABUS

List of Programs as Assignments:

Lab Assignment No: 1

Objective:

Q1. Introduction to 3D Studio Max.

Q2. Exploring the Max Interface.

Lab Assignment No: 2

Objective:
Q1. Understanding 2D Splines & Shape
Q2. Convert 2D to 3D object using extrude, bevel, loft, terrain etc.

Lab Assignment No: 3

Objective:
Q1 Modeling with polygon objects
Q2.Building Simple & Complex Scene

Lab Assignment No: 4

Objective:
Q1. Creating key frames & Auto Key/Set Key
Q2. Animating with simple controllers.

Lab Assignment No: 5

Objective:
Q1. Simulation & Effects.
Q2. Bind to space warp objects.

Lab Assignment No: 6

Objective:
Q1. Configuring & Aiming Cameras
Q2. Using Camera Motion Blur & Depth of Field.

Lab Assignment No: 7

Objective:
Q1. Texturing with Max.
Q2. Create & Apply standard material

Lab Assignment No: 8

Objective:
Q1. Rendering with V-Ray.
Q2. Introduction to Scene

Lab Assignment No: 9

Objective:
Q1. Create & Assign Textures.
Q2. Basic Settings for Texturing.

Books recommended:

TEXT BOOKS

1. Beginning Blender: Open Source 3D Modeling, Animation, and Game Design By Lance Flavel**(T1)**
2. 3d'sMax5Fundamentals nside3dsmax7 By Ted Boardman **(T2)**

REFERENCE BOOKS

3. 3D Modeling and Animation By Michael G.**(R1)**

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Mapping between Objectives and Outcomes

Mapping of Course Outcomes onto Program Outcomes

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