



Department of Computer Applications

2 YEARS MCA PROGRAMME

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PART I

COURSE STRUCTURE

BRIDGE COURSE

A. Theory							
Sl.	Code	Subject	Contacts Periods/Week				Credit Points
			L	T	P	Total	
1	MCAP0001	Introduction to Programming	6	0	0	6	0
2	MCAP0002	Digital Logic and Computer Organization	6	0	0	6	0
3	MCAP0003	Fundamentals of Database Systems	6	0	0	6	0
Total Theory						18	0
B. Laboratory							
4	MCAP0011	Programming Lab	0	0	8	8	0
5	MCAP0012	Digital Logic Lab	0	0	8	8	0
Total Practical						16	0
Total of Semester						34	0

Bridge course will be of three weeks duration, to be offered prior to the commencement of 1st semester classes.

FIRST YEAR
FIRST SEMESTER

A. Theory							
Sl.	Code	Subject	Contacts Periods/Week				Credit Points
			L	T	P	Total	
1	MCAP1101	Object Oriented Programming with Java	3	1	0	4	4
2	MCAP1102	Programming with Python	3	1	0	4	4
3	MCAP1103	Artificial Intelligence	3	0	0	3	3
4	MATH1102	Mathematical Foundations	3	0	0	3	3
5	HMTS1102	Oral and Written Communication	3	0	0	3	3
Total Theory						17	17
B. Laboratory							
6	MCAP1111	Java Programming Lab	0	0	4	4	3
7	MCAP1112	Python Programming Lab	0	0	4	4	3
8	HMTS1112	Communication Lab	0	0	4	4	3
Total Practical						12	9
Total of Semester						29	26

SECOND SEMESTER

A. Theory							
Sl.	Code	Subject	Contacts Periods/Week				Credit Points
			L	T	P	Total	
1	MCAP1201	Data Structures and Algorithms	3	1	0	4	4
2	MCAP1202	Computer Communication Networks	3	1	0	4	4
3	MCAP1203	Soft Computing	3	0	0	3	3
4	MCAP1204	Operating Systems	3	0	0	3	3
5	MCAP1205	Information System Analysis and Design	3	0	0	3	3
Total Theory						17	17
B. Laboratory							
6	MCAP1211	Data Structures and Algorithms Lab	0	0	4	4	3
7	MCAP1212	Computer Network Lab	0	0	4	4	3
Total Practical						8	6
C. Sessional							
8	HMTS1221	Career Development and Management	0	0	3	3	2
Total Sessional						3	2
Total of Semester						28	25

SECOND YEAR
THIRD SEMESTER

A. Theory							
Sl.	Code	Subject	Contacts Periods/Week				Credit Points
			L	T	P	Total	
1	MCAP2101	Database Management Systems	3	1	0	4	4
2	MCAP2102	Web Technology	3	1	0	4	4
3	MATH2102	Introduction to Optimization	3	0	0	3	3
4	MCAP2150- MCAP2153	Elective I	3	0	0	3	3
	MCAP2150	Machine Learning					
	MCAP2151	Mobile Computing					
	MCAP2152 MCAP2153	Ecommerce and ERP Cloud Computing					
5	MCAP2160- MCAP2162, HMTS2163	Elective II	3	0	0	3	3
	MCAP2160	Cryptography and Network Security					
	MCAP2161	Automata Theory and Compiler Design					
	MCAP2162 HMTS2163	Natural Language Processing Managerial Economics					
Total Theory						17	17
B. Laboratory							
6	MCAP2111	DBMS Lab	0	0	4	4	3
7	MCAP2112	Web Technology Lab	0	0	4	4	3
Total Practical						8	6
C. Sessional							
8	MCAP2195	Minor Project and Seminar	0	0	4	4	3
Total Sessional						4	3
Total of Semester						29	26

FOURTH SEMESTER

A. Theory							
Sl.	Code	Subject	Contacts Periods/Week				Credit Points
			L	T	P	Total	
1	MCAP2201	Software Engineering	3	1	0	4	4
2	MCAP2202	Mobile Application Development and Implementation	3	0	0	3	3
3	MCAP2250- MCAP2254	Elective III	3	0	0	3	3
	MCAP2250 MCAP2251	Advanced Database Management Data Mining & KnowledgeDiscovery					
	MCAP2252	Secure Software Design and Enterprise Computing					
	MCAP2253	Internet of Things					
	MCAP2254	Blockchain Technology & Applications					
4	MCAP2260- MCAP2263, MATH2261	Elective IV	3	0	0	3	3
	MCAP2260 MCAP2261 MCAP2262 MCAP2263 MATH 2261	Image Processing Computer Graphics andMultimedia Data Science Software Project Management Probability, Statistics and Queuing Theory					
Total Theory						13	13
B. Laboratory							
5	MCAP2211	Software Engineering Lab	0	0	4	4	3
Total Practical						4	3
C. Sessional							
6	MCAP2295	Major Project and Seminar	0	0	12	12	9
Total Sessional						12	9
Total of Semester						29	25



PART II

DETAILED SYLLABUS

BRIDGE COURSE

Paper Name: INTRODUCTION TO PROGRAMMING					
Paper Code: MCAP0001					
Contact hrs per week:	L	T	P	Total	Credit Point
	6	0	0	6	0

Problem Solving Method: Algorithm, Flowchart, Problem-Solving Methodology- Tools,Pseudocode. [1L]

Overview of C language: C Standards, Structure of a C Program, C Librariesand StepsofCompilation of a C Program. [1L]

Expressions: Basic Data Types, Variables, Type Qualifiers, Storage Class Specifiers,Variable Scopes, Constants, Operators, Operator Precedence, Expression Evaluation, Type Conversion in Expressions, Type Casting. [2L]

Console I/O: Reading and Writing Characters, Reading and Writing Strings, FormattedConsole I/O. [1L]

Control Statements: Selection Statements (if, switch-case), Iteration Statements (for loop,while loop, do-while loop), Jumping Statements (return, goto, break, exit, continue). [3L]

Function: Functions and Modular Programming, General Form, Function Prototypes,Library Functions, Parameter Passing Mechanisms, Storage Classes, Recursive function. [3L]

Arrays and Strings: Single Dimension Arrays, Two Dimension Arrays, MultidimensionalArrays, Strings, Arrays of Strings, String Library Functions. [3L]

Pointer: Pointers and Memory Addressing. Pointer Variables, Pointer Arithmetic, PointerExpressions, Pointers and Arrays, Functions and Pointers, Dynamic Memory Allocation, Command Line Arguments. [4L]

Text Books:

1. Programming with C - Gottfried, TMH.
2. Programming in C - Balagurusamy, Tata McGraw Hill.
3. Programming in C – ReemaThareja, Oxford University Press.

Reference Books:

1. C Programming Made Easy - Raja Ram, SCITECH.
2. The C Programming Language - Kernighan Ritchie, PHI.

Paper Name: DIGITAL LOGIC AND COMPUTER ORGANIZATION					
Paper Code : MCAP0002					
Contact hrs per week	L	T	P	Total	Credit Point
	6	0	0	6	0

Boolean Algebra and Logic Gates: Logic gates- truth tables and circuits; Representation in SOP and POS forms; Minimization of logic expressions by algebraic method, K-map method.

[2L]

Combinational Circuits: Adder and Subtractor circuits and its applications, Adder-Subtractor Composite circuit. Circuits of Encoder, Decoder, Multiplexer, De-Multiplexer and Parity Generator.

[6L]

Sequential Circuits: Basic memory element - S-R, J-K, D and T flip flops, Master-Slave flip flop. Registers and working functionalities of different shift registers.

[4L]

Basic Computer Organization: Introduction to basic structures and operational concepts, Instruction formats, Instruction execution, sequencing, Addressing modes – concepts, fetching and storing word from/in main memory.

[2L]

Memory: Memory – Basic concepts, RAM, ROM – different types. Cache memory- Performance (memory interleaving, mapping functions hit rate etc.), Memory hierarchy. DMA.

[3L]

Pipelining: Pipelining concepts, vector processing, Hazards of pipelining.

[1L]

Text Books:

1. Digital Logic and Computer Design - M. Morris Mano, Pearson.
2. Computer System Architecture - Morris Mano, PHI.
3. Digital Logic Design – Mansaf Alam, Bashir Alam, PHI.

Reference Books:

1. Computer Organization – C. Hamacher, Z. Vranesik, S. Zaky, McGraw Hill.
2. Computer Architecture and Organization – John P. Hayes, McGraw Hill.
3. Digital Design: Basic Concepts and Principles - Mohammad A. Karim, CRC Press.

Paper Name: FUNDAMENTALS OF DATABASE SYSTEMS					
Paper Code : MCAP0003					
Contact hrs per week	L	T	P	Total	Credit Point
	6	0	0	6	0

Concepts & Overview of Database System: Introduction to Data, Knowledge, Database. Data Processing vs. Data Management Systems. File Oriented Approach, Limitation of file-based approach over Database System. Database Oriented Approach to Data Management. Introduction to DBMS, Characteristics of DBMS, Advantages and Disadvantages of a DBMS. DBMS architecture.

[4L]

Data Models: Overview of Data Models, Traditional models, Data abstraction through three-level architecture, hierarchical model, network model and relational model, ER Models.

[2L]

Database Administrator, Database Users: Database administration, Privilege and Role of DBA, administration roles, Database Users.

[2L]

Database Languages: Instance and schema, Data dictionary, Data independence, Concept of DDL, DML, DCL, Overview of Database Languages.

[2L]

Relational Model: Overview of relational databases -Structure of relational databases, Domains, Relations. Definitions and properties, keys, Integrity rules.

[5L]

Types of Database System: Relational Database, Object Oriented Database, Object relational Database, Temporal Database, Grid Database, Mobile Database, Green Database, Cloud Database.

[3L]

Text Books:

1. Data Base System Concepts, Silverchatz, Korth&Sudarshan, MH.
2. Data Base Management Systems, Majumder& Bhattacharyya, TMH
3. Data Base Management System, A.K. Pujari, ISTE/EXCEL

Reference Books:

1. Fundamentals of Data Base Mgmt. System, Vig&Walia, ISTE/EXCEL
2. Data Base Management Systems, Leon, VIKAS
3. Data Base Management Systems, V.K Jain, Wiley Dreamtech

Paper Name: PROGRAMMING LAB					
Paper Code: MCAP0001					
Contact hrs per week:	L	T	P	Total	Credit Point
	0	0	8	8	0

Software to be used: GNU C Compiler (GCC) with LINUX
NB: Cygwin (Windows based) may be used in place of LINUX

Problems related to the following topics:

1. LINUX commands and LINUX based editors.
2. Basic Problem Solving and Control Structures.
3. Array (1-d, 2-d).
4. Functions.
5. Dynamic Memory Allocation.
6. String Handling.

Paper Name: DIGITAL LOGIC LAB					
Paper Code : MCAP0012					
	L	T	P	Total	Credit Point
Contact hrs per week	0	0	8	8	0

Problems related to the following topics:

1. Realization of Basic Logic gates.
2. Half adder, Full adder.
3. Adder-subtractor Composite circuit.
4. Implementation of Boolean Function using 2:1 MUX and 4:1 MUX.
5. Realization of SR and D flip flop using NAND gates.
6. Realization of JK and T flip flop using NAND gates.

Syllabus of 1st Semester

Paper Name: OBJECT ORIENTED PROGRAMMING WITH JAVA					
Paper Code: MCAP1101					
Contact hrs per week:	L	T	P	Total	Credit Point
	3	1	0	4	4

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand the OOPs concepts.
2. Solve real world problems using OOP techniques.
3. Understand the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes.
4. Understand the use of packages and interface.
5. Develop and understand exception handling, multithreaded applications with synchronization.
6. Understand the use of collection framework

Module I [10L]

Introduction to Object Oriented Programming

Genesis of Object Oriented Programming. Problems with Procedural Programming, Object Oriented Concepts – Objects & Classes, Abstraction, Encapsulation, Message Passing, Access Specifier, Relationships, Aggregation, Links & Associations, Generalization & Specialization, Inheritance, Abstract Classes, Meta-Class, Grouping Constructs. Comparison of Procedural & OOP.

Introduction to Java

Introduction and Overview, Virtual machines - concept and hierarchy of virtual machines. Basic Language Constructs, Arrays. String Class, String Methods, String Arrays, Command Line Arguments, StringBuffer Class, StringBuffer Methods.

Module II [10L]

Classes and Objects

Defining a Class, Creating Objects, Assigning Object Reference Variables, Introducing Methods, Array of Objects, Constructors, Method Overloading, Passing and Returning Objects, “this” Keyword, Static Members, Introducing Access Control, Inner and Nested Classes.

Inheritance

Inheritance and Code Reusability, Types of Inheritance, Dealing with “super”, Multilevel Inheritance, Method Overriding, “final” Keyword, Object Class, Abstract Classes.

Module III [10L]

Interface

Defining Interfaces, Implementing Interfaces, Extending Interfaces, Interfaces and Multiple Inheritance.

Package

Using Packages, Java API, User Defined Packages, Classpath, Access Control.

Exception Handling

Exception and Exception Handling, Exception Types, Built-in Exceptions, “throw”, “throws”, “finally”, Creating User Defined Exceptions, Chained and Unchained Exceptions.

Module IV [10L]

Multithreading

Multitasking & Multithreading, Java and Multithreading, Creating Threads, Life Cycle of a Thread, Thread Methods, Thread Priorities, Synchronization and Deadlock.

Excerpts from java.util and java.lang

Wrapper Classes, Runtime Class, System Class, Object Cloning, Garbage Collection, String Tokenizer, Collections API.

Advanced Topics

Enumerations, Autoboxing, Annotations, Generics, Lambda Expressions.

Text Books:

1. JAVA: The Complete Reference – Herbert Schildt, TMH.
2. Core Java I and II – Horstmann and Cornell, Oracle Corporation.

Reference Books:

1. Object Oriented Modeling & Design, James R. Rum Baugh, PHI.
2. The Java Programming Language – James Gosling, Addison Wesley.
3. Java – How to Program – Deitel and Deitel, PHI.

A Programmer’s Guide to Java SCJP Certification - Khalid A. Mughal and Rolf W. Rasmussen, Addison Wesley.

Paper Name: PROGRAMMING WITH PYTHON					
Paper Code: MCAP1102					
Contact hrs per week:	L	T	P	Total	Credit Point
	3	1	0	4	4

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand and comprehend the concept of python programming.
2. Apply knowledge in real life applications.
3. Understand the concept of object-oriented programming.
4. Create application using data using concept of file.
5. Use standards program constructs.
6. Understand and apply python library in mathematical problem solving.

Module I [10L]

Introduction: What is Python? Why Python? Installing Python, Python Syntax, Comments, Writing a program using Python.

Expression: Variables and Values, Built-in Data Types, Numeric data type and Type Casting, Boolean Expression Evaluation, String - String Literals, String Assignment, Multiline Strings, Slicing, Negative Indexing, Check String, String Concatenation, String Format, Escape Character, String Methods; Operators, Expression Evaluation.

Console I/O: Printing Information, User Input.

Collections: Lists, Tuple, Set, Dictionary.

Module II [10L]

Control Statement: Statements Execution, Conditions and If Statements, Indentation, If-Else Statements, Nested If Statements, Short Hand If and If-Else, pass Statement, While Loop, For Loop, Nesting Loops, Controlling Loops using Break and Continue, Else Statement, Range Statement and Pass Statement in Loop.

Functions: Creating a Function, Calling a Function, Arguments, Arbitrary Arguments, Arbitrary Keyword Arguments, Default Parameter Value, List as an Argument, Return Values, pass Statement, Recursive Function, Lambda Function.

Module III [10L]

Classes and Objects: Create a Class, Create Object, __Init__() Function, Methods, Self Parameter, Modification and Deletion of Object Parameter, Deletion of Object, Pass Statement, Inheritance and Polymorphism, Iterator, Scope, Module, Built-In Math Function, Math Module, Module datetime and Date Objects, RegEx Module and RegEx Functions, Exception Handling.

Module IV [10L]

File Handling: Kinds of Files, Creating Files, Opening Files, Reading Files, Writing Files, Delete Files and Folder, Simple APIs.

Python Library:

NumPy - Installation of NumPy, Import NumPy, NumPy Creating Arrays, Array Indexing, Array Slicing, Data Types, Copy vs View, Array Shape and Reshape, Array Iterating, Splitting and Joining Array, Sorting Arrays, Filtering Arrays, Random Numbers, Universal Functions(ufuncs), Mean, Median, Mode, Standard Deviation, Percentiles, Random Data Distributions.

matplotlib - Scatter Plot, Histogram.

Text Books:

1. Python: The Complete Reference, Martin C. Brown, McGraw-Hill Education
2. Python for Everybody: Exploring Data in Python 3, Charles Russell Severance, Sue Blumenberg, CreateSpace Independent

Reference Books:

1. Let Us Python, Yashavant Kanetkar, BPB
2. Practical Programming: An Introduction to Computer Science Using Python 3.6, Paul Gries, Jennifer Campbell, Jason Montojo, SPD
3. Python Programming: An Introduction to Computer Science, John M. Zelle, Franklin, Beedle & Associates
4. Learning with Python: How to think like a Computer Scientist, Allen Downey, Jeffrey Elkner, Chris Meyers, Dreamtech press
5. Learning Python, Mark Lutz, O'Reilly

Paper Name: ARTIFICIAL INTELLIGENCE					
Paper Code:MCAP1103					
Contact hrs per week:	L	T	P	Total	Credit Point
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand the historical perspective of human endeavor to know about the nature of intelligence and the related mathematical models.
2. Understand the role of intelligent agents to solve various real time problems.
3. Understand different forms of learning models.
4. Understand knowledge representation using mathematical logic.
5. Analyze the working principle of an expert system.
6. Analyze uncertainty using non-monotonic reasoning, probabilistic reasoning, and use of certainty factors.

Module I [10L]

Introduction

Introduction to AI - definition of AI, typical AI problems, practical impact of AI, approaches to AI, limits of AI today, AI history.

Intelligent Agents

Definitions of a rational agent, reflex, model-based, goal-based, and utility-based agents, agent environment.

Problem Solving using Search (Single agent)

Categorization of Search as Blind and Heuristic. Concepts of State space search.

Module II [10L]

Problem Solving using Search (Multi agents)

Adversarial Search, Game Tree and Alpha-Beta pruning.

Constraint satisfaction problems (CSP)

Representation of CSP, solution of CSP, Various Types.

Knowledge Representation and Logic (Propositional Logic)

Knowledge representation and reasoning, inference, rules of inference, using inference rules to prove a Query/Goal/Theorem, soundness and completeness.

Module III [10L]

Knowledge Representation and Logic (First Order Logic)

First Order Logic, unification, semantics, soundness, completeness, consistency, satisfiability; Inference in First Order Logic – resolution, proof as search, proof strategies, non-monotonic reasoning.

Knowledge Representation and Logic (Rule based Systems)

Rule Based Systems, Horn Clause Logic, Backward Chaining, Forward chaining, Various

Knowledge representation formalisms, Expert systems.

Module IV [10L]

Planning

Introduction to planning, logic based planning, planning systems - representation of states and goals, representation of action.

Reasoning with Uncertainty (Probabilistic reasoning)

Reasoning with uncertain information- Probabilistic reasoning, review of probability theory; Probabilistic inference rules; Bayesian Networks - semantics of Bayesian networks, learning of Bayesian Network parameters, inferencing in Bayesian Networks.

Text Books:

1. Artificial Intelligence - A Modern Approach, S. Russell and P. Norvig, Pearson Education.
2. Introduction to Artificial Intelligence and Expert Systems - Dan W. Patterson, PHI.

Reference Books:

1. Artificial Intelligence and Soft Computing Behavioral and Cognitive Modeling of the Human Brain - Amit Konar, CRC Press.
2. Artificial Intelligence - Elaine Rich and Kelvin Knight, TMH.

Paper Name: MATHEMATICAL FOUNDATIONS					
Paper Code: MATH1102					
Contact hrs per week:	L	T	P	Total	Credit Point
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand the mathematical fundamentals which are prerequisites for a variety of courses like data mining, computer security, software engineering, operating systems, machine learning etc.
2. Analyze probability distributions required to quantify phenomenon whose true value is uncertain.
3. Interpret the problems that can be formulated in terms of graphs and trees.
4. Demonstrate the knowledge of probabilistic approaches to solve wide range of engineering problem.
5. Employ statistical methods to make inferences on results obtained from an experiment.
6. Develop the understanding of the mathematical and logical basis to many modern techniques like machine learning, programming language design and concurrency.

Module I [10L]

Graph Theory: Graph, Digraph, Weighted graph, Connected and disconnected graphs, Complement of a graph, Regular graph, Complete graph, Sub-graph, Walk, Path, Circuit, Euler Graph, Hamiltonian Graph, Cut sets and cut vertices, Matrix representation of a graph, Adjacency and incidence matrices of a graph, Graph isomorphism, Bipartite graph. Definition and properties of a Tree, Binary tree and its properties, Spanning tree.

Module II [10L]

Probability and Statistics I: Basic Probability: Sample Space, Events, Classical Definition, Addition and Multiplication Rule, Conditional Probability. Axiomatic definition of Probability and related problems. Bayes' Theorem and related problems. Random variables, single variable discrete and continuous distributions, Expectation and Variance.

Module III: [10L]

Probability and Statistics II: Special Distributions: Binomial and Normal Distribution. Moment generating and Characteristic functions. Measures of Central Tendency: Mean, Median, Mode. Measures of Dispersion. Covariance and Correlation Coefficient. Linear Regression equations.

Module IV: [10L]

Combinatorial Mathematics: Pigeon Hole Principle. Permutations and Combinations. Binomial Coefficients. Recurrence Relations and Generating Functions. Properties of Fibonacci

Numbers. Principle of Inclusion and Exclusion. Polya's Theory of Counting, Ramsey's Theorem.

Text Books:

1. Discrete Mathematics & Its Applications, K H Rosen, McGrawHill
2. Discrete Mathematics, T. Veerarajan, TMH

Reference Books:

1. Introduction to Graph Theory, D G West, Prentice-Hall of India
2. Discrete Mathematics for Computer Scientists and Engineers, J. L. Mot, A Kandel and T. P. Baker, PHI
3. Introduction to Probability and Statistics for Engineers and Scientists, S. Ross, Elsevier
4. Fundamentals of Mathematical Statistics, S.C.Gupta and V.K.Kapoor, Sultan Chand and Sons

Paper Name: ORAL AND WRITTEN COMMUNICATION					
Paper Code: HTMS1102					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Acquire competence in using English language to communicate.
2. Be aware of the four essential skills of language usage-listening, speaking, reading and writing.
3. Be adept at using various modes of written communication at work.
4. Attain the skills to face formal interview sessions.

Module I [10L]

Communication Skill : Definition, nature & attributes of Communication, Process of Communication, Models or Theories of Communication, Types of Communication, Levels or Channels of Communication, Barriers to Communication.

Module II [10L]

Business Communication: Scope & Importance, Writing Formal Business Letters, Writing Reports, Organizational Communication: Agenda & minutes of a meeting, notice, memo, circular, Project Proposal, Technical Report Writing, Organizing e-mail messages, E-mail etiquette, Tips for e-mail effectiveness.

Module III [10L]

Language through Literature: Modes of literary and non-literary expressions, Excerpts from literary texts (prose, verse and drama), Using language for communication at various cultural and social settings, Descriptive, narrative and expository writing, Writing with a purpose, Writing essays/articles – logical organization of thoughts.

Module IV [10L]

Communication skills at Work: Communication and its role in the workplace, Benefits of effective communication in the workplace, Common obstacles to effective communication.

Approaches and Communication techniques for multiple needs at workplace: persuading, convincing, responding, resolving conflict, delivering bad news, making positive connections.

Text Books:

1. Theories of Communication: A Short Introduction - Armand Matterlart and Michele Matterlart, Sage Publications Ltd.
2. Professional Writing Skills, Chan - Janis Fisher and Diane Lutovich. San Anselmo, CA: Advanced Communication Designs.
3. Business English - Hauppauge, Geffner, Andrew P., New York: Barron's Educational Series.

Reference Books:

1. Writing and Speaking at Work: A Practical Guide for Business Communication - Edward P.Bailey, Prentice-Hall.
2. Business and Administrative Communication - Kitty O. Locker, McGraw-Hill/ Irw
3. Intercultural Business Communication - Lillian Chaney and Jeanette Martin, Prentice Hall.

Paper Name: OBJECT ORIENTED PROGRAMMING LAB					
Paper Code: MCAP1111					
Contact hrs per week:	L	T	P	Total	Credit Point
	0	0	4	4	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
2. Be able to use the Java SDK environment to create, debug and run simple Java programs.
3. Implement classical problems using java programming.
4. Implement problems related to inheritance, polymorphism, interfaces, packages, multithreading and collections framework.
5. Build software development skills using java programming for real world applications.
6. Implement backend of an application.

Programs related to the following topics:

1. Language Features
2. Arrays in Java and String Handling
3. Classes and Objects
4. Inheritance
5. Interface and Package
6. Exception Handling
7. Multithreading
8. Event Handling
9. java.util and java.lang

Paper Name: PYTHON PROGRAMMING LAB					
Paper Code: MCAP 1112					
Contact hrs per week:	L	T	P	Total	Credit Point
	0	0	4	4	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Interpret, understand and debug syntax errors reported by the python compiler.
2. Apply procedural programming knowledge to solve arithmetic and logical problems.
3. Design, coding and testing Python programs with a basic understanding of top-down design.
4. Apply object-oriented programming concepts to develop dynamic interactive python applications.
5. Create applications to read from and write into files.
6. Understand and use python libraries in real life problems.

Programs related to the following topics:

1. Windows based open-source Individual Distribution.
2. Basic Problem Solving.
3. Control Structures.
4. List, Tuple, Dictionary.
5. Functions.
6. String Handling.
7. Object Oriented Features.
8. File Handling.
9. Simple APIs and Python Lib

Paper Name: COMMUNICATION LAB					
Paper Code: HMTS 1112					
Contact hrs per week:	L	T	P	Total	Credit Points
	0	0	4	4	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Acquire the techniques to become an effective listener.
2. Acquire the skill to become an effortless speaker.
3. Organize and present information for specific audience.
4. Communicate to make a positive impact in professional and personal environment.
5. Engage in research and prepare authentic, formal, official documents.
6. Acquire reading skills for specific purpose.

Module I

Formal verbal communication:

- Introduction to formal verbal communication, Interpersonal Skills & Public Speaking: Building Positive Relationships, Focusing on Solving Problems, Time Management, Dealing with Criticism: Offering Constructive Criticism, Responding to Criticism – Managing Conflict: Approaches to Conflict, Resolving Conflict.
- Conversational skills in the business scenario: One-to-one and Group communication, Gender and Culture Sensitivity, Etiquette, Sample Business Conversation, Telephonic Conversation

Module II

Presentation skills:

- Speech Purposes - General: Informative Speeches, Persuasive Speeches, Entertaining Speeches, Methods of Speaking: Speaking from a Manuscript, Speaking from Memory, Impromptu Delivery, Extemporaneous Delivery, Analyzing the Audience, Nonverbal Dimensions of Presentation.
- Organizing the Presentation: the Message Statement, Organizing the Presentation: Organizing the Speech to Inform, The Conclusion, Supporting Your Ideas – Visual Aids: Designing and Presenting Visual Aids, Selecting the Right Medium, Post- presentation Discussion

Module III

Group Discussion:

Introduction to Group Communication, Factors in Group Communication, Status – Group Decision Making: Reflective Thinking, Brainstorming, The Planning Process, Strategies for Successful GDs, Role of Social Awareness (Newspapers, Magazines, Journals, TV News, Social Media), Body Language, Logical Argument, Practice GDs

Module IV

Job Application and Personal Interview:

- Job Application Letter: Responding to Advertisements and Forced Applications, Qualities of Well-Written Application Letters: The You-Attitude, Length, Knowledge of Job Requirement, Reader-

Benefit Information, Organization, Style, Mechanics – Letter Plan: Opening Section, Middle Section, Closing Section.

- Resume and CV: Difference, Content of the Resume – Formulating Career Plans: Self Analysis, Career Analysis, Job Analysis, Matching Personal Needs with Job Profile – Planning your Resume – Structuring the Resume: Chronological Resume, The Functional Resume, Combination Chronological and Functional Resume – Content of the Resume: Heading, Career Goal or Objectives, Education, Work Experience, Summary of Job Skills/Key Qualifications, Activities, Honors and Achievements, Personal Profile, Special Interests, References.
- Interviewing: Types of Interviews, Format for Interviews: One-to-one and Panel Interviews, Employment Interviews, Frequently Asked Questions, Dress Code, Etiquette, Questions for the Interviewer, Simulated Interviews

Syllabus of 2nd semester:

Paper Name: DATA STRUCTURES AND ALGORITHMS					
Paper Code: MCAP1201					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	1	0	4	4

Course outcomes:

After successfully completing this course, the students will be able to:

1. Define the basic data structures and their operations.
2. Evaluate algorithms in terms of time and memory complexity of basic operations.
3. Understand the significance and context of application of different algorithm design techniques.
4. Understand the significance and utility of different data structures and the context of their application.
5. Evaluate solutions of a problem with different data structures and thereby understand how to select suitable data structures for a solution.
6. Create or design an algorithm to aid in the solution of a real world problem.

Module I [10L]

Introduction: Datatype and data structure, Abstract data type, Classification of data structures, Concepts of algorithm design techniques – Divide and conquer, Greedy, Dynamic Programming, Backtracking, Branch and Bound – Examples, Concepts of algorithm analysis - performance measurement and analysis, time and space complexity, introduction to order functions.

Array: Array as a data structure, representation of sparse matrix and polynomials.

Linked List: Single, Circular and Double linked list, Applications.

Module II [8L]

Stack and Queue: Implementation using array and linked list, Applications, Multiple stacks and queue.

Recursion: Principles, types, examples, comparison with iterative methods.

Module III [10L]

Trees: Terminologies, Binary trees – properties, traversal, threads; Heaps and priority queue, Binary Search Trees, Height Balanced trees, m-way Search trees.

Module IV [12L]

Graphs: Representations, Graph search algorithms, Spanning tree algorithms, Shortest path algorithms.

Searching and sorting: Searching - linear, binary, hashing. Sorting - Insertion, Selection, Quick, Merge, Heap, Radix.

Text Books:

1. Classic Data Structures –DebasisSamanta, PHI Learning.

2. Fundamentals of Computer Algorithms - Horowitz, Sahni, Orient Longman

Reference Books:

1. Data Structures, Seymour Lipschutz, McGraw Hill Education
2. Introduction to Algorithms - Cormen et al, PHI Learning
3. Data Structures and Algorithms in Java - Goodrich, Tammasia, Goldwasser, Wiley
4. Data Structures and Algorithms in Python - Goodrich, Tammasia, Goldwasser, Wiley

Paper Name: COMPUTER COMMUNICATION NETWORKS					
Paper Code: MCAP1202					
Contact hrs per week	L	T	P	Total	Credit Point
	3	1	0	4	4

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Learn different aspects of data communication networks, hardware, software and components of a network and their interrelations.
2. Understand the purpose of layered architecture and different protocols.
3. Understand the different LAN protocols and selection of appropriate protocols.
4. Analyze the performance of the different routing protocols.
5. Understand the concept of internetworking, congestion control mechanisms.
6. Learn about quality of service issues.

Module I [10L]

Overview of Data Communication & Networking

Introduction: Data Communication Systems, Networks, Protocols & Standards, the Internet Layered Tasks: Utility of Layering, ISO/OSI Reference Model, TCP/IP Reference Model, Comparison between OSI and TCP/IP

Connecting Devices: Repeater, Hub, Bridge, Switch, Router, Gateway

Switching: Overview of – Circuit Switching, Message Switching, Packet Switching, Virtual Circuit Switching

Physical Layer

Signals: Data & Signals, Data Rate Limits, Transmission Impairments

Digital Transmission: Line Coding, Sampling, Transmission Mode

Analog Transmission: Modulation of Digital Data, Modulation of Analog Signals

Multiplexing: FDM, TDM, WDM

Transmission Media: Guided Media, Unguided Media

Module II [10L]

Data Link Layer

Framing: Character Stuffing, Bit Stuffing

Error Detection & Correction: Types of Error – Single Bit Error, Error Detection, Error Correction

Flow Control: Stop – And – Wait ARQ, Sliding Window Protocols

Data Link Layer Protocols: HDLC, PPP

Medium Access Sub layer

Random Access: ALOHA, Slotted ALOHA, CSMA/CD, CSMA/CA

Controlled Access: Reservation, Polling, Token Passing

LAN: Ethernet (Traditional, Fast and Gigabit), FDDI, DQDB

Module III [10L]

Network Layer

Internetworking, Addressing and Routing: Internetworking, Addressing (Internet Address, Classful Addressing, Subnetting), Routing (Static and Dynamic Routing, Distance Vector Routing, Link State Routing)

Network Layer Protocols: ARP, RARP, IP, ICMP and IGMP, IPv6

Module IV [10L]

Transport Layer Process-to-Process Delivery, UDP, TCP: Process to Process Delivery, User Datagram Protocol and Transmission Control Protocol

Congestion Control & Quality of Service: Data Traffic, Congestion and Congestion Control, Quality of Service (QOS), Techniques to improve QOS – Leaky Bucket and Token Bucket Algorithms

Application Layer Application layer protocols: DNS, Telnet, FTP, SMTP, HTTP, WWW

Text Books:

1. Data Communications & Networking – B.A. Forouzan, TMH.
2. Computer Networks - Andrew S. Tanenbaum, Pearson Education.
3. Data and Computer Communication - William Stallings, PHI.

Reference Books:

1. High speed Networks and Internets - William Stallings, Pearson Education.
2. Cryptography and Network Security - William Stallings, PHI.
3. Computer Networking: A Top Down Approach - Kurose & Ross, Pearson Education.

Paper Name: SOFT COMPUTING					
Paper Code: MCAP 1203					
Contact hrs per week	L	T	P	Total	Credit Point
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand soft computing concepts, technologies and their role in problem solving.
2. Analyze the genetic algorithms and their applications to solve single-objective and multi-objective optimization problems.
3. Understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations.
4. Understand the knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic.
5. Understand the need for approximate analysis and computation methods and use the tenets of rough set theory in developing applications.
6. Effectively use of evolutionary algorithms.

Module I [10L]

Introduction

Introduction to soft computing, Different tools and techniques, Usefulness and applications.

Genetic algorithm (GA)

Basic concepts, Working principle, Encoding, Fitness function, Genetic modeling: Inheritance, Selection, Cross over, Mutation, Bitwise operator, Convergence of GA, Overview of Multi-Objective Genetic Algorithm (MOGA).

Module II [10L]

Neural Network

Structure and function of biological neuron, Artificial neuron, Definition of Artificial Neural Network (ANN), Taxonomy of neural net, Difference between ANN and human brain, Characteristics and applications of ANN, Single layer network, Multilayer Perceptron(MLP), Linear separability, Different activation functions, Back propagation algorithm, Basic concept of convolution and recurrent neural network, Applications of neural networks.

Module III [10L]

Fuzzy sets and Fuzzy logic systems

Overview of classical set theory, Fuzzy sets and Fuzzy relations, Fuzzy set operations, Properties of Fuzzy sets, Cardinality, Properties of Fuzzy relations.

Membership functions

Features of membership functions, Standard forms and boundaries, Standard Fuzzification methods.

Fuzzy to Crisp conversions

Lambda cuts for Fuzzy sets, Fuzzy relations, Defuzzification methods, Overview of classical predicate logic, Fuzzy logic, Approximate reasoning and Fuzzy implication.

Fuzzy rule based systems:

Linguistic hedges, Fuzzy rule based system–Aggregation of Fuzzy rules.

Module IV [10L]**Rough Set**

Introduction to Rough sets, Decision table, Indiscernibility relations and set approximation, Reducts & Core, Rough approximation, Decision matrix, Application of Rough set.

Evolutionary Algorithm

Introduction, Key principles of swarm, Overview and application of - Ant colony optimization (ACO), Particle swarm optimization (PSO), Artificial bee colony optimization (ABC)

Text Books:

1. Fuzzy logic with Engineering Applications - Timothy J. Ross, John Wiley and Sons.
2. Neural Networks, Fuzzy Logic and Genetic Algorithms - S.Rajasekaran and G.A.V.Pai, PHI.
3. Soft Computing and Its Applications, Volume One: A Unified Engineering Concept, Volume 1 – Kumar S. Ray, CRC Press.

Reference Books:

1. Genetic Algorithms in search, Optimization & Machine Learning - David E. Goldberg, Pearson India.
2. Artificial Neural Networks - B. Yegnanarayana, PHI.
3. Soft computing - Dilip K. Pratihar, Alpha Science International.

Paper Name: OPERATING SYSTEMS					
Paper Code: MCAP1204					
Contact hrs per week	L	T	P	Total	Credit Point
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Analyze the structure of OS and basic architectural components involved in OS design.
2. Analyze and design the applications to run in parallel either using process or thread models of different OS
3. Analyze the various device and resource management techniques for timesharing systems.
4. Understand the Mutual exclusion, Deadlock detection and agreement protocols of operating system
5. Interpret the mechanisms adopted for file sharing in distributed Applications
6. Conceptualize the components involved in designing a contemporary OS

Module I [10L]

Introduction

Introduction to Operating Systems, Concept of batch-processing, single and multi- programming, single and multi-processing, multi-tasking, real time, distributed and parallel processing.

Process and Scheduling

Concept of process, state diagram, process control block, Scheduling-short, medium and long term scheduling.

CPU Scheduling criteria, types of scheduling, non-preemptive and preemptive scheduling algorithms like: First Come First Serve (FCFS), Shortest Job First/Next (SJF/N), Shortest Remaining Time Next (SRTN), Round Robin (RR), Highest Response Ratio Next (HRRN), Priority based scheduling, Multilevel queue scheduling, Multilevel feedback queue scheduling.

Threads

Concept, process vs thread, kernel and user threads, multi-threading models.

Module II [10L]

Inter-process Communication

Shared memory approach, message passing, FIFO, concept of semaphore, critical region, monitor.

Process Synchronization

Concepts, race condition, mutual exclusion, critical section problem and its solutions; synchronization tools - semaphore, semaphore with queue, monitor; discussion of synchronization problems like producer-consumer, readers-writers, dining philosophers, sleeping-barber.

Module III [10L]

Deadlock

Characterization, Prevention, avoidance, detection, recovery.

Memory Management

Address space and address translation; memory partitioning - static and dynamic, different types of fragmentation, swapping, paging, segmentation, virtual memory concepts, demand paging, performance, page replacement algorithms FIFO, LRU, Optimal page replacement, variants of LRU; frame allocation, thrashing, working set strategy.

Module IV[10L]

Disk Management

Disk structure, disk scheduling algorithms FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK; disk formatting, boot block, bad blocks.

File Systems

File and operations on it, file organization and access; file allocation; directory structures, file allocation methods contiguous, linked, indexed; free space management - bit vector, linked list, grouping.

I/O Management

I/O hardware, polling, interrupts, DMA, application I/O interface block and character devices, network devices, clocks and timers, blocking and non-blocking I/O; kernel I/O subsystem scheduling, buffering, caching, spooling, error handling.

Protection and Security

Concepts of domain, Access matrix and its implementation, access control. Security concepts, program threats, system threats, threat monitoring, cryptography as security tool, user authentication.

Text Books:

1. Operating System Concepts - Silberschatz, Galvin, Gagne, Wiley.
2. Operating Systems - Dietel, Dietel, Choffnes, Prentice Hall.
3. Operating Systems and Systems Programming, Balakrishna Prasad, Scitech.

Reference Books:

1. Operating Systems Design and Implementation - Andrew S. Tanenbaum, Prentice Hall
2. Operating Systems Internals and Design Principles - Stallings, Pearson.
3. Operating Systems: A Concept-Based Approach, D. Dhamdhare, TMH.
4. Operating Systems: Concept and Design, Milan Milenkovic, TMH.

Paper Name: INFORMATION SYSTEM ANALYSIS AND DESIGN					
Paper Code: MCAP1205					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand the idea of information system in lieu of the modern abstraction of data.
2. Analyze various phases of system development life cycle.
3. Gather data to analyze and specify the requirements of a system.
4. Design system components and environments.
5. Analyze the feasibility of a project.
6. Deliver various types of system documentation.

Module I [10L]

Data and Information: Types of information: operational, tactical, strategic and statutory. Why do we need information systems? Requirement of information at different levels of management, Requirement of information for various functions. Quality of information.

Systems Analysis and Design Life Cycle: System definition and concepts, system environments and boundaries. Real time and distributed systems, basic principles of successful systems. Role and attributes of a systems analyst. Requirements determination, requirements specifications, feasibility analysis, final specifications, hardware and software study, system design, system implementation, system evaluation, system modification. Model - Waterfall model, incremental and evolutionary process models; specialized Model – The Unified Process, agile process, and agile models.

Module II [10L]

Information gathering: Strategies and methods. System requirements specification.

Feasibility analysis: Deciding project goals, examining alternative solutions, cost–benefit analysis, quantifications of costs and benefits, payback period, system proposal preparation for managements, parts and documentation of a proposal, tools for prototype creation.

Data flow diagrams: Rules and conventions, levels of DFDs, logical and physical DFDs, Developing DFDs. Software tools to create DFDs. Case study.

Module III [10L]

Structured systems analysis and design: Procedure specifications in structured english, Data dictionary, Decision tree, Decision tables for complex logical specifications, Specification oriented design vs. Procedure oriented design. Case study.

Data oriented systems design: Entity relationship model, E-R diagrams, Entity and Entity Instances, Attributes, Entity Relationships, Cardinality of Relationships, Strong and Weak Entity, Generalization, Specialization, Aggregation, Developing an ER Diagram, Entity Integrity and Primary Key. Case study.

Coding practices: Coding techniques, requirements of coding schemes, error detection of codes.

Module IV [10L]

Data input methods: Input Design, validating input data, input data controls, interactive data input.

Designing outputs: Designing output reports- screen design, graphical user interfaces, interactive I/O on terminals.

Form design: Classification of forms, requirements of form design, Types of forms, Layout considerations, Form control.

System control: Need for controls, objectives of controls, techniques used in controls, Gantt chart.

System audit and security: Audit of Computer System Usage. Types of Threats to Computer System and Control Measures, Threat and Risk Analysis, Disaster Recovery and Contingency Planning, Viruses.

Text Books:

1. Analysis and Design of Information Systems, V. Rajaraman, PHI.
2. Systems Analysis and Design - Kendall, Kenneth E and Julie E. Kendall, 7th Edition, PHI.
2. Systems Analysis & Design - Alan Dennis, Barbara H. Wixom and Roberta M Roth, 4th Edition, Wiley & Sons.

Reference Books:

1. System and Design Methods - Jeffrey, L. Whitten and Lonnie D. Bentley, 6th Edition, TMH.
2. Modern Systems Analysis and Design - Jeffrey A. Hooper, Joey F. George and Joseph S. Valacich, 5th Edition, Pearson Education.
3. Systems Analysis and Design Techniques, Methodologies, Approaches, and Architectures, Roger H.L.Chinan, KengSiau, and Bill C. Hardgrave, 1st Edition, Prentice Hall of India.
4. Software Engineering: A Practitioner's Approach - Roger. S. Pressman, 7th Edition, McGraw Hill.

Paper Name: DATA STRUCTURES AND ALGORITHMS LAB					
Paper Code: MCAP1211					
Contact hrs per week	L	T	P	Total	Credit Points
	0	0	4	4	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Demonstrate the concepts of Stack, Queue and Linked List and various operations on them.
2. Suggest appropriate linear / non-linear data structure operations for solving a given problem
3. Write algorithms to implement different data structures and their operations.
4. Solve the faults / errors that may appear due to wrong choice of data structure.
5. Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
6. Design programs based on different searching and sorting techniques.

Problems related to the following topics:

1. Sparse matrix and polynomials representation using arrays
2. Linked list implementation and operations
3. Stack and Queue implementation using array and linked list, applications
4. Different operations on Binarysearch tree
5. Graph traversal, Spanning tree algorithms, Shortest path algorithms
6. Different searching and sorting algorithms.

Paper Name: COMPUTER NETWORK LAB					
Paper Code: MCAP1212					
Contact hrs per week	L	T	P	Total	Credit Point
	0	0	4	4	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand the TCP/IP configuration for Windows and Linux.
2. Implement device sharing on network.
3. Learn the major software and hardware technologies used on computer networks
4. Learn the terminology and concepts of network management in Linux platform by understanding shell commands and implementing the same.
5. Understand the concepts of protocols, network interfaces, and design/performance issues through programs.

Problems related to the following topics:

UNIX Fundamentals

1. Basic UNIX Commands
2. Writing Shell Scripts

Network Programming on the following (To be implemented in Java/C/C++)

1. IPC: a) Pipes b) FIFO
2. File transfer using message queue form of IPC
3. TCP sockets (like date and time server & client, echo server & client, etc.)
4. UDP sockets (like simple DNS)
5. Raw sockets (like packet capturing and filtering)
6. Sliding window protocol and cyclic redundancy check
7. Routing protocols
8. Study of TCP/UDP performance
9. TCP client and server application to transfer file
10. UDP client and server application to transfer a file
11. RPC

Testbed Development and Simulators

1. Creating a LAN
2. Use of Network Simulators for Network Modeling (basic ideas/ demonstration only)

Reference Books:

1. Advance UNIX Programming - Richard Stevens, Pearson Education.
2. Advance UNIX Programming - N.B. Venkateswarlu, BS Publication.

Subject: CAREER DEVELOPMENT AND MANAGEMENT					
Paper Code: HMTS 1221					
Contact hrs per week	L	T	P	Total	Credit Point
	0	0	3	3	2

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Employ the technique of SWOT analysis to decide goals and plans.
2. Be able to map their skills according to the basic job profile.
3. Upgrade and enhance generic and specific skills.
4. Be aware of the dynamics of communication under diverse cultural setup.
5. Be aware of the start-up eco system in India & acquire tools to take up entrepreneurship as a career opportunity.
6. Achieve work-life balance by managing both organizational and personal crisis.

Module I Professional Growth

Self-Growth: Anger, stress and time management-Theories and application, SWOT analysis.

Skill identification and Skill up gradation- (generic and specific), Local and global skills, Knowledge sources such as MOOC, NPTEL

Career Planning-Skill mapping to job profile, Basic and add-on qualifications, Career growth, Self-appraisal, Lifelong learning

Assessment - Activity (20 marks)

Module II Professional Communication

Impression Management

Employability Quotient

Cross-cultural communication

Leadership & Team Playing: Theories, Styles, Stages

Motivation, Negotiation Skills, Conflict Management

Planning & Envisioning: Initiative and Innovation in the Work Environment

Assessment- Written (30 marks)

Module III Entrepreneurship

The start-up ecosystem in India- Why entrepreneurship? Indian tech start-up landscape, Stand-up India policies, funding agencies, market development, trends and best practices

E-Commerce- India as a growing E-commerce market, Possibilities of growth, funding, niche retailers

Make in India- New processes, Investments, Focus sectors, Makers of Make in India, Opportunities and Policies

Assessment- Project (30 marks)

Module IV Working and Living Happily

Managing crisis- Organisational and personal crisis, Analysing crisis, Turnaround strategies, learning from crisis as opportunity

Work-life balance- Performance-expectation management, Personal and professional goal- mapping

Understanding happiness- Components, Conflicts, Happiness Index

Assessment: Activity/case (20 marks)

Reference Books:

1. Basic Managerial Skill for All by E. H. McGrath.SJ. Pub: PHI, New Delhi.
2. The Start-up Equation by Steven Fisher and Jae-Nae Duane. Pub: McGraw Hill Education (India) Pvt. Ltd. New Delhi.
3. Live Happily, Work Happily by Siddhartha Ganguli. Pub: Allied Publishers Pvt.Ltd. New Delhi.
4. Crisis Management: Planning for the Inevitable by Steven Fink. Pub: iUniverseInc.USA.
5. Influencer: The New Science of Leading Change by Joseph Grenny&Kerey Patterson. Pub:McGraw Hill Education , USA.
6. Soft Skills: An Integrated Approach to Maximise Personality by Gajendra Singh Chauhan and Sangeeta Sharma, Wiley, 2016

Syllabus of 3rd semester:

Paper Name: DATABASE MANAGEMENT SYSTEMS					
Paper Code: MCAP2101					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Apply relational algebra to interpret data in relational format.
2. Analyze the functional dependencies and design of the database.
3. Apply SQL to access data in relational databases.
4. Perform PL/SQL programming using concept of cursor management, error handling, package and triggers.
5. Understand the concept of a database transaction.
6. Learn concurrency control and its role in maintaining the database's integrity.
7. Understand the concept of storage for various forms of data.
8. Develop the concept of different levels of indexing to optimize query processing.

Module I [10L]

Relational Data Model

Concept of relations, Relational Algebra Operators: Selection, Projection, Union, Intersection, Set operations, Set difference, Cross product, Rename, Assignment, Various types of joins, Division.

Relational Database Design

Functional Dependency (FD) –Definition, Trivial and Non- Trivial FD, Closure of Set of FD, Closure Of Attribute Sets, Irreducible Set of FD, Canonical Cover, Normalization – 1NF, 2NF, 3NF, BCNF, Decomposition using FD, Lossless Decomposition, Dependency Preservation.

Multi-valued Dependency and 4NF, Project-Join Decomposition and 5NF.

Module II [10L]

Structured Query Language (SQL)

Introduction to SQL, DDL, DML, DCL, Basic Structure, Basic Queries, Set operations, Aggregate Functions, Null Values, Domain Constraints, Referential Integrity Constraints, Assertions, Views, Joining Database Tables, Commit, Rollback.

Advanced SQL

Sub queries and Correlated Queries, SQL Built in Functions - Numeric, Date, String Functions, Updatable Views.

Module III [10L]

Introduction to Procedural Language/Structured Query Language (PL/SQL)

PL/SQL block structure, Variables, Control Structure and iteration, Implicit and Explicit Cursors, Stored procedures and functions, PL/SQL packages, Triggers, Locks.

Module IV [10L]

Concepts of Transaction and Concurrency Control

Transaction Concept and State. Executions, Serializability, Recoverability.

Concurrency Control Techniques: Lock based Protocols.

Storage structure

Sequential and indexed file organization, B+ tree - creation, insertion & deletion.

Indexing

Primary, Secondary & Multi Level.

Text Books:

1. Database System Concepts - Korth, Silberschatz, S. Sudarshan, TMH.
2. Fundamentals of Database Systems - Elmsari and Navathe, Addison-Wesley.

Reference Books:

1. An Introduction to Database Systems - Date C. J, Addison-Wesley.
2. SQL-PL/SQL - Ivan Bayross, BPB.
3. Database Systems: The Complete Book- Hector Garcia-Molina, Jeffrey Ullman, Jennifer Widom, Pearson

Paper Name: WEB TECHNOLOGY					
Paper Code: MCAP2102					
Contact hrs per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand the concept of Web Technologies.
2. Combine the ideas of HTML, CSS, and Java Script to build Web pages.
3. Analyze the use of XML in Advanced Web Technologies.
4. Prepare a well formed /valid XML document, schema to store and transfer data.
5. Recognize and understand the importance of Client Side Scripting Language with Java Scripts.
6. Create interactive web pages by Using PHP.
7. Able to write a server side programming using PHP with MySQL to store the data sent from client, process it and store it on database.

Module I [10L]

Introduction

A brief history of the Internet, current trends and emerging technologies, internet protocols and applications, Concept of WWW; Features, typical design elements, applications, opportunities and challenges of Web 1.0, Web 2.0. Main features of Web 3.0, opportunities and challenges in its implementation.

Web Browsers & Servers

Functionality of a browser, main components. Web Servers: Analysis of the components of servers from both a hardware and software perspective with introduction to XAMP software and alternative solutions.

Web Design& Development

Techniques useful in the design of web projects including site maps, wireframes, storyboarding. Introduction to development models and best practices. Development tools – frameworks, templates. Examples of IDEs for web development.

HTML

Markup languages, page layout, text layout, navigation, graphics, tables, forms, canvas.

Module II [10L]

Cascading Style sheets

Need for CSS, basic syntax and structure, layout formatting, font and text decoration, responsive styling.

Extensible Markup Language (XML)

XML basics, elements and attributes, namespace, validation, DTD, schema, parsing, XPATH search, XSLT transformation.

Module III [10L]

HTTP

Message, request, response, methods, status codes.

Client side scripting with JavaScript

Basic syntax, variables, operators, conditionals and loops, functions, events and error handling, timer, properties and methods of DOM, arrays; working with numbers, date and string; form validation.

Module IV [10L]

Server side scripting with PHP

Basic syntax of PHP, decision and looping, arrays, functions, browser control and detection, string processing and regular expressions, form processing, files, cookies and sessions.

PHP & MySQL

Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, updating and deleting data and tables, PHP myadmin and database bugs.

Text Books:

1. Web Technologies – Uttam Roy, Oxford.
2. Learning PHP, MySQL & JavaScript: With JQuery, CSS & HTML5 – Robin Nixon, Shroff Publishers.

Reference Books:

1. HTML & CSS: Design and Build Web Sites - Jon Duckett, John Wiley & Sons.
2. PHP 6 and MySQL 5 for Dynamic Web Sites - Larry Ullman, Peachpit Press.
3. Web Technologies (Black Book) -Kogent Learning Solutions Inc, Dreamtech Press.
4. Internet Technology & Web Design – Satish Jain, BPB Publications

Paper Name: INTRODUCTION TO OPTIMIZATION					
Paper Code: MATH2102					
Contact hours per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to

1. Represent real-world optimization problems by mathematical models and solve them by various techniques.
2. Categorize Transportation and Assignment problems.
3. Apply the way in which Game Theoretic Models can be made useful to a variety of real-world scenarios in economics and in other areas.
4. Understand the limitations of simplex method and have realistic approach towards practical problems using Integer Linear Programming Problem.
5. Understand the significance of using PERT and CPM techniques for project management.
6. Solve some specific problems for scheduling jobs on machines.

Module I [10L]

Linear Programming Problem (LPP)-I:

Formulation of an LPP; Graphical Method of solution of an LPP; Convex Combination and Convex Set; Canonical and Standard form of an LPP; Basic Solution of a system of linear equations; Simplex Method; Big-M Method; Concept of Duality; Mathematical formulation of duals.

Module II [10L]

Linear Programming Problem (LPP)-II:

Transportation Problems (TP); Representation of a Transportation Problems as LPP; Methods of finding initial basic feasible solution of TP: North-West Corner Rule, Matrix Minima Method, Vogel's Approximation Method; Optimality test of the basic feasible solution; Assignment Problems; Hungarian Method.

Integer Linear Programming:

Concepts, Formulation, Solution and Applications (Branch & Bound method).

Module III [10L]

Game Theory:

Introduction; Strategies; The Minimax and Maximin Criterion; Existence of Saddle Point; Two person zero sum games; Games with a saddle Point – Pure Strategies; Games without a Saddle Point – Mixed Strategies; Symmetric Games; Dominance Principle; Graphical Method of Solution; Algebraic Method of Solution.

Module IV [10L]

Network Optimizations:

PERT/ CPM – Introduction, Significance of use, Network components and precedence relationship (AOA and AON diagram), Critical path analysis- Forward pass method, Backward pass method, Float(slack) of an Activity and Event.

Sequencing Model:

Introduction, Notation, Terminology and Assumption. Processing of n jobs through two machines, Processing of n jobs through three machines, Processing of n jobs through m machines, Processing of two jobs through m machines.

Text Books:

1. Linear Programming and Game Theory by J. G. Chakraborty and P. R. Ghosh, Moulik Library.
2. Operations Research, Theory and Applications by J K Sharma, Laxmi Publications India Ltd.

Reference Books:

1. Operations Research by KantiSwarup, P. K. Gupta and Man Mohan, S. Chand and Sons.
2. Operations Research by T. Veerarajan, University Press.

Paper Name: MACHINE LEARNING					
Paper Code:MCAP2150					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Learn the basics of machine learning paradigm.
2. Understand various machine learning algorithms.
3. Understand complexity and limitations of Machine Learning algorithms.
4. Mathematically Analyze various machine learning approaches and paradigms
5. Analyze various machine learning techniques to get an insight of when to apply a particular machine learning approach.
6. Apply Machine Learning algorithms in practice and implementing their own using real-world data.

Module I [10L]

Introduction:

Basic Concept of Learning, Example of Learning, Components of Learning, Simple Model of Learning, Different Types of Learning;

Regression:

Input Representation, Linear Classification, Linear and Logistic Regression, Nonlinear Transformation, Likelihood measure, Gradient Descent. Implementation using Tools.

Module II [10L]

Training and Testing:

From Training to Testing, Dichotomies, Growth Function, Break Points.

Evaluation Metrics:

Learn about metrics such as accuracy, precision, and recall used to measure the performance of your models.

The VC Dimension:

The definition, VC Dimension of Perceptron's, Interpreting the VC Dimension, Utility of VC Dimension.

Bias-Variance Tradeoff:

Bias and Variance, Learning Curves.

Module III [10L]

Naive Bayes:

Learn the Bayes rule, and how to apply it to predicting data using the Naive Bayes algorithm, Train models using Bayesian Learning, Use Bayesian Inference to create Bayesian Networks of several variables, Implementation using Tools.

Support Vector Machines (SVM):

Margin, Maximum Margin Linear Separators, Quadratic Programming Solution, Support Vectors, Kernels for learning non-linear functions, Implementation using Tools.

Module IV [10L]

Neural Model:

Recapitulation of Neural Network Model and Backpropagation algorithm; Introduction to Radial Basis Function, Convolution Neural Network and Deep Neural Network, Implementation using Tools.

Deep Learning:

The basics of Deep Learning, Softmax Function, One-Hot encoding, Cross Entropy, Classification using Deep Learning, Implementation using Tools.

Overfitting:

Introduction to Overfitting, Dealing with Overfitting, Concept of Regularization, Implementation using Tools.

Text Books:

3. Computational Intelligence Principles, Techniques and Applications, Konar, Springer, 2012.
4. Machine Learning, First Edition, T. Mitchell, McGraw-Hill, 1997

Reference Books:

1. Neural Networks and Learning Machines, Third Edition, S. Haykin, PHI Learning, 2009.
2. Pattern Recognition and Machine Learning, Christopher M. Bishop, Springer, 2010.
3. Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, Francis Bach, MIT Press, 2017.

Paper Name: MOBILE COMPUTING					
Paper Code: MCAP 2151					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand concepts of Mobile Communication.
2. Analyse next generation Mobile Communication System.
3. Understand network and transport layers of Mobile Communication.
4. Analyse various protocols of all layers for mobile and ad hoc wireless communication networks.
5. Understand IP and TCP layers of Mobile Communication.

Module I [10L]

Introduction

Introduction to mobile computing, Mobile communication vs. wireless communication, Mobile computing applications, Characteristics of mobile computing, Structure of mobile computing application.

Wireless MAC Protocols

Wireless MAC issues: Motivation for a specialized MAC (Hidden and exposed station problem, Near-far station), Channel assignment scheme (static and dynamic), Random assignment schemes, Reservation based schemes.

Module II [10L]

Mobile Network Layer

Mobile IP (Goals, Assumptions, Entities and terminology), IP packet delivery, Agent advertisement and discovery, Registration, Route optimizations.

Mobile Transport Layer

Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast Retransmit/Fast Recovery, Transmission /Time-out Freezing, Selective Retransmission, Transaction Oriented TCP.

Module III [10L]

Mobile Telecommunication Systems

Global System for Mobile Communication (GSM), General Packet Radio Service (GPRS), Universal Mobile Telecommunication System (UMTS), Long Term Evolution (LTE).

Module IV [10L]

Mobile Ad-Hoc Networks

Ad-Hoc basic concepts, Characteristics, Applications, Design issues, Routing, Essential of traditional routing protocols, popular routing protocols, Security issues in MANETs.

Text Books:

1. Fundamentals of Mobile Computing – P. K. Pattnaik, R. Mall, PHI Learning Pvt. Ltd.
2. Mobile Communications – J. H. Schiller, Pearson Education.

Reference Books:

1. Principles of Mobile Computing – U. Hansmann, L. Merk, M. S. Nicklons and T. Stober, Springer. 81

2. Introduction to Wireless and Mobile systems – D. P. Agarwal, Qing and An Zeng, Thomson Asia Pvt Ltd.
3. Mobile Cellular Telecommunications-Analog and Digital Systems – William.C.Y.Lee, Tata McGraw Hill Edition.
4. AdHoc Mobile Wireless Networks – C. K. Toh, Pearson Education.

Paper Name: ECOMMERCE AND ERP					
Paper Code: MCAP 2152					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Define and differentiate various types of E-commerce.
2. Describe Hardware and Software Technologies for E-commerce.
3. Explain payment systems for E-commerce.
4. Understand legal and moral issues in the digital age.
5. Understand an Enterprise and Resource Management Perspective.
6. Understand Information System perspective and Key Managerial issues.

Module I [10L]

Introduction to E-Commerce

Definition, Scope, Advantages and disadvantages of e-commerce, Electronic Commerce applications. E-Commerce Organization model based on transaction type, Model based on Transaction Party.

E strategy: Overview, Strategic methods for developing E-commerce Management Call Center. Electronic payment systems: Digital payment systems; First virtual Internet payment system; Cyber cash model.

Module II [10L]

E-Payment Mechanism

Payment through card system, Electronic Data Interchange (EDI): Concepts, Benefits and applications; EDI model, EDI protocols (UN EDI FACT / GTDI, ANSI X 12), Data encryption (DES / RSA).

Risk of e-commerce: Overview, Security for e-commerce, Security standards, Firewall, Cryptography, Key management, Password systems, Digital certificates, Digital signatures.

Module III [10L]

Enterprise Resource Planning (ERP)

Introductory concepts: Scope, Benefits, Importance of ERP in the E-Business era. Supply Chain Management: Role of ERP in SCM, ERP features and capabilities. Overview of commercial software, Re-engineering work processes for IT applications, Business process redesign, Knowledge engineering and data warehouse, Advantages & disadvantages of ERP.

Module IV [10L]

ERP Business Modules

Introduction to basic modules of ERP system. Resource management in global scenario. Workflows in ERP, ERP and Corporate Portal, ERP implementation: ERP Life Cycle Model, Information systems planning, Critical Success Factors of ERP implementation, Extended ERP applications: Customer Relationship Management, Supply Chain Management, Product Life Cycle Management. Case Study: ERP Asan Integrated System.

Text Books:

1. Electronic Commerce - Peter Loshin, John R. Vacca, Charles River Media.
2. Concepts in Enterprise Resource Planning - Ellen Monk, Bret Wagner, CENGAGE Learning India.

Reference Books:

1. E-Commerce - K.K. Bajaj, D. Nag, McGraw-Hill Education.
2. E-Commerce An Indian Perspective - P.T. Joseph, PHI Publication.
3. Electronic Commerce-Technology and Application- Bhaskar Bharat, McGraw-Hill Education.
4. Enterprise Resource Planning - Mary Sumner, PHI Learning India Pvt. Ltd.

Course Name: CLOUD COMPUTING					
Course Code: MCAP2153					
Contact Hours per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Appreciate the benefits and limitations of cloud-based computing environments.
2. Understand the underlying principles of cloud virtualization, cloud storage, cloud security.
3. Analyze the suitability and/or applicability of various cloud computing models, platforms, services, solution offerings and tools from some industry leaders.
4. Gain insight into various distributed computing issues (like performance, scalability, availability, reliability) in light of distributed file systems (such as HDFS, GFS).
5. Identify security and privacy issues in cloud computing.
6. Apply Knowledge to provide solution for real life problems.

Module I [10L]

Basics of Cloud Computing

Defining a Cloud, Cloud Types – NIST Cloud Reference Model, Cloud Cube Model, Deployment Models – Public, Private, Hybrid, and Community Clouds, Service Models – Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS), Characteristics of Cloud Computing, Benefits and Limitations of Cloud Computing.

Module 2 [10L]

Cloud Services and/or Applications:

IaaS – Basic Concept and Characteristics, Virtual Machine Instances / Images, examples of IaaS solutions, PaaS – Basic Concept and Characteristics, Tools and Development Environment with examples, SaaS – Basic Concept and Characteristics, Open SaaS and SOA, examples of SaaS solutions, Identity as a Service (IDaaS).

Module 3 [10L]

Cloud Solution Offerings:

Concepts of Abstraction and Virtualization; Virtualization: Taxonomy of Virtualization Techniques; Hypervisors: Machine Reference Model for Virtualization.
 Solution Offerings from Industry Leaders; Amazon: some AWS Components and Services – Compute (EC2), Storage [Simple Storage Service (S3), Elastic Block Store (EBS), Simple Queue Service (SQS)], Database (Relational, NoSQL, SimpleDB), Content Distribution (CloudFront), Deployment (Elastic Beanstalk)
 Google: quick look at Google Applications Portfolio – AdWords, Analytics, overview of GWT, a few Google APIs, some key services of GAE.

Module 4 [10L]

Cloud Storage and Security:

Cloud-based Storage: Block Devices and File Devices, Managed Storage and Unmanaged Storage, File Systems – GFS and HDFS.
 Cloud Security: Security Concerns, Security Boundary, Security Service Boundary, Security Mapping Overview,

Data Security – Storage Access, Storage Location, Tenancy, Encryption, Auditing, Compliance, Identity Management (awareness of Identity Protocol Standards).

Textbooks

1. Cloud Computing Bible, Barrie Sosinsky, Wiley India Pvt. Ltd, 2012.
2. Mastering Cloud Computing, RajkumarBuyya, Christian Vecchiola, S. ThamaraiSelvi, McGraw Hill, 2013.
3. Cloud Computing: Theory and Practice, Dan Marinescu, Morgan Kaufmann, 2014.
4. Cloud Computing: A Hands-on Approach, ABahga and V Madisetti, 2014.
5. Cloud Computing: A Practical Approach for Learning and Implementation, A Srinivasan and J Suresh, Pearson, 2014.
6. Cloud Computing, U S Pande and KavitaChoudhary, S Chand, 2014.
7. Cloud Computing for Dummies, J Hurwitz, M Kaufman, F Halper, R Bloor, John Wiley & Sons, 2014.
8. Cloud Computing, Kris Jamsa, Jones & Bartlett Learning, 2015.

Reference Books

1. The NIST Definition of Cloud Computing: Recommendations of the National Institute of Standards and Technology, Peter Mell and Timothy Grance, National Institute of Standards and Technology Special Publication 800-145, 2011.
2. Introduction to Cloud Computing Architecture: White Paper (1st Edition), Sun Microsystems Inc., 2009.
3. A Survey on Open-source Cloud Computing Solutions, PatríciaTakako Endo, GlaucoEstácioGonçalves, Judith Kelner, DjamelSadok, VIII Workshop on Clouds, Grids and Applications at UFPE, Brazil.
4. GFS: Evolution on Fast-Forward – Kirk McKusick (BSD/BFFs) interviews Sean Quinlan (former GFS Tech Leader), CACM, 2009-2010.
5. The Google File System (GFS), Sanjay Ghemawat, Howard Gobiuff, Shun-Tak Leung, 2011.
6. The Hadoop Distributed File System: Architecture and Design, DhrubaBorthakur, Apache Software Foundation, 2007.

Paper Name: CRYPTOGRAPHY AND NETWORK SECURITY					
Paper Code: MCAP2160					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Describe network security services and mechanisms.
2. Acquire knowledge on standard algorithms used to provide confidentiality, integrity and authenticity of data
3. Understand symmetric and asymmetric key cryptography.
4. Understand the various key distribution and management schemes.
5. Understand various network security applications, IPSec, Firewall, IDS, Web security, Email security, and Malicious software etc.
6. Design security applications in the field of Information technology.

Module I [10L]

Introduction to Security

Security Goals, Threats, Vulnerabilities and Attacks, Types of Attacks, Security Services and Mechanisms.

Mathematical Foundation

Number theory, Congruencies, Modular Arithmetic, Chinese Remainder Theorem, Fermat and Euler's Theorem, Finite Fields, Discrete Logarithm.

Module II [10L]

Symmetric Key Encryption

Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers, Simple DES, DES Analysis, Double and Triple DES, RC4.

Module III [10L]

Asymmetric Key Encryption and Hash Functions

Diffie-Hellman Key Exchange, RSA, ElGamal Public Key Encryption, SHA4, SHA5, MD5, Digital Signature.

Module IV [10L]

Network Security Applications

Authentication Applications: Kerberos, X509, Public Key Infrastructure.
Electronic Mail Security – PGP, S/MIME.
IP and Web Security – IPSec, SSL, TLS, SET.

System Security

Intruders, Malicious Software, Viruses, Worms, Bots, Rootkits, Firewalls, Security Standards.

Wireless Network Security

Authentication and Authorization in Wireless LANs, Data Protection in Wireless LANs.

Text Books:

1. Cryptography and Network Security: Principles and Practice – William Stallings, Pearson Education India.

2. Cryptography and Network Security – Forouzan&Mukhopadhyay, McGraw Hill Education.

Reference Books:

1. Cryptography and Network Security: Principals and Practice – AtulKahate, Tata MCGraw Hill.
2. Cryptography: Theory and Practice – D.R. Stinson, CRC Press.
3. Applied Cryptography – B. Schneier, Wiley.
4. Network Security: Private Communication in a Public World by – Charlie Kaufman, Radia Perlman and Mike Speciner, Prentice Hall India.

Paper Name: AUTOMATA THEORY AND COMPILER DESIGN					
Paper Code: MCAP2161					
Contact hrs per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand the overall hierarchy of formal instructions from source code to machine code.
2. Able to apply different lemma in regards of CFG.
3. Analyze the Chomsky hierarchy of formal grammar that is suitable in abstracting the formal languages.
4. Understand the Normal Forms and Automata abstraction behind the language theory.
5. Combine the ideas of both analysis and synthesis in culminating the final low level binary instructions.
6. Able to frame a context free grammar that can combine the hierarchical features of a language.

Module I [10L]

Overview: Strings, Alphabet, Language, Operations, Finite state machine, definitions, finite automaton model, acceptance of strings, and languages, deterministic finite automaton and non-deterministic finite automaton, transition diagrams and Language recognizers.

Finite Automata: NFA with ϵ transitions - Significance, acceptance of languages. Conversions and Equivalence : NFA to DFA conversion, Minimisation of FSM, equivalence between two FSM's, Finite Automata with output- Moore and Melay machines.

Module II [10L]

Compilation Basics

Analysis of the source program, Different phases of Compilation. One /Two Pass Compilers.

Lexical Analysis

The role of the lexical analyzer, Tokens, Patterns, Lexemes, Input buffering. Specifications of a token, Token Recognition, Lexical Analyzer Generator (Lex).

Language and Grammar

Chomsky Classification of Grammar, Context free grammars. Chomsky normal form, Greibach normal form, Pumping Lemma for Context Free Languages.

Module III [10L]

Syntax Analysis

The role of a parser, Top down Parsing, Nonrecursive Predictive parsing (LL), Bottom up parsing, Handles, Viable prefixes, Operator precedence parsing, LR parsers (SLR, LALR), Parser generators (YACC). Error Recovery strategies for different parsing techniques.

Syntax Directed Translation

Syntax director definitions, Construction of syntax trees, Bottom-up evaluation of S attributed definitions, L attributed definitions, Bottom-up evaluation of inherited attributes.

Module IV [10L]

Run Time Environment

Run time environments Source language issues (Activation trees, Control stack, scope of declaration, Binding of names), Storage organization (Subdivision of run-time memory, Activation records), Storage allocation strategies, Parameter passing (call by value, call by reference, copy restore, call by name), Symbol tables, dynamic storage allocation techniques.

Intermediate Code Generation

Intermediate languages, Graphical representation, Three-address code, Implementation of three address statements (Quadruples, Triples, Indirect triples).

Code Optimization & Final Code Generation

Code optimization Introduction, Basic blocks & flow graphs, Optimization of basic blocks, Principle sources of optimization, Loops in flow graph, Peephole optimization. Code generations Issues in the design of code generator, A simple code generator, Register allocation & assignment.

Text Books:

1. Theory of Computer Science – Automata languages and computation -Mishra and Chandrashekar, 2nd edition, PHI
2. Compiler Design -Aho, Ullman, Sethi& Lam, Pearson
3. Compiler Design -O.G. Kakde, University Science Press

Reference Books:

1. Introduction to Computer Theory, Daniel I.A. Cohen, John Wiley
2. Engineering a Compiler -Keith Cooper & Linda Torczon, Morgan Kaufmann
3. Compiler Design -SantanuChattopadhyay, PHI

Paper Name: NATURAL LANGUAGE PROCESSING					
Paper Code: MCAP2162					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Analyze NLP models and algorithms using both the traditional symbolic and the more recent statistical approaches.
2. Distinguish POS tagging and context free grammar for English language.
3. Understand semantics and pragmatics of English language for processing.
4. Identify the areas of ambiguity in machine translation.
5. Understand the role of Information extraction & retrieval from corpus.
6. Code basic Python scripts to carry out natural language processing tasks.

Module I [10L]

Introduction

Human languages, models, ambiguity, processing paradigms; Phases in natural language processing, applications. Linguistics resources- Introduction to corpus, Regular expressions, Finite State Automaton, word recognition, lexicon. Morphology, acquisition models.

Module II [10L]

Word Level Analysis

N-grams, Word classes, Part of Speech tagging, Hiddenmarkov & maximum entropy Models, Transformation based tagging (TBL), named entities, multi word expressions.

Syntactic Analysis

A survey on natural language grammars with emphasis on English language, lexeme, phonemes, phrases and idioms, word order, agreement, tense, aspect and mood and agreement, Context Free Grammar, spoken language syntax. Parsing- Unification, probabilistic parsing.

Module III [10L]

Semantics & Pragmatics

Meaning representation, semantic analysis, lexical semantics, WordNet Word Sense Disambiguation- Selection restriction, machine learning approaches, dictionary based approaches. Discourse- Reference resolution, constraints on co-reference, algorithm for pronoun resolution, text coherence, discourse structure.

Module IV [10L]

Applications of NLP

Spell-checking, Basics of Information Retrieval & Information Extraction, Question Answering & Summarization, Conversation Analysis, Machine Translation Overview, Overview of Deep learning framework in Natural Language Processing.

Text Books:

1. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition - Jurafsky, Martin, Pearson
2. Natural Language Understanding – James Allen, Pearson.

Reference Books:

1. Natural Language Processing with Python: Analysing Text with the Natural Language Toolkit - Steven Bird, Ewan Klein, Edward Loper, O' Reilly.
2. Natural Language Processing and Information Retrieval - Tanveer Siddiqui, Oxford.

Paper Name: MANAGERIAL ECONOMICS					
Paper Code: HMTS2163					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course outcomes

After successfully completing this course, the students will be able to:

1. Understand the role of managers in firms
2. Understand the internal and external decisions to be made by managers
3. Analyze the demand and supply conditions and assess the position of a company
4. Design competition strategies, including costing, pricing, product differentiation, and market environment according to the natures of products and the structures of the markets.
5. Analyze real-world business problems with a systematic theoretical framework.
6. Make optimal business decisions by integrating the concepts of economics, mathematics and statistics.

Module I [8L]

INTRODUCTION: Nature and Scope of Managerial Economics, Fundamental Concepts used in Managerial Economics, Methods of Economic Analysis for Managerial Decision Making, Objectives of a firm- Profit Maximization Vs Wealth Maximization.

Module II [11L]

CONSUMER BEHAVIOR AND DEMAND ANALYSIS: The theory of consumer behavior, Concept of utility, Marginal utility Analysis, Consumer surplus, Indifference curve analysis. Concept of demand, Law of demand, Demand determinants, Elasticity of demand, Measurement of elasticity of demand, Measurement of Elasticity of demand- Demand forecasting.

Module III [11L]

PRODUCTION ANALYSIS: Laws of Production, The production function, ISO cost and ISO quant curves, Equilibrium of the firm and industry, Choice of optimal combination of factors of production, Choice of optimal expansion path, The law of supply, Derivation of supply curve Market analysis, Pricing under various competitive situations.

Module-IV [8L]

National income analysis/ Measurement/ Growth rates Indian economy, Planning and development in India, Development strategies, Five Year Plans, Poverty, Food & Population problems. Breakeven Analysis.

TEXTBOOKS

1. Managerial Economics by R.L. Varshney, K.L. Maheshwari, Sultan Chand & Sons
2. Indian Economy by V.K. Puri, S.K. Misra, Himalaya Publishing House

REFERENCEBOOKS

1. ManagerialEconomics by JoelDean, Prentice-Hall
2. ManagerialEconomics by P.L.Mehta,Sultan Chand & Sons
3. ManagerialEconomics Trevett, Wiley
4. ManagerialEconomicsbyPetersen, Pearson

Paper Name : DBMS LAB					
Paper Code: MCAP2111					
Contact hrs per week:	L	T	P	Total	Credit Points
	0	0	4	4	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Apply the RDBMS concepts to create various schema and instances in terms of tables.
2. Populate the relation of tables with proper restriction through keys.
3. Retrieve specific data from table/s through subquery.
4. Filter data from joining various tables.
5. Use proper data control language to restrict the accessibility of data.
6. Gather knowledge about the PL/SQL structure.
7. Familiarize with PL/SQL programming including stored procedures, stored functions.
8. Able to create triggers, cursors, packages using PL/SQL.
9. Able to execute various advance SQL queries related to Transaction Processing.
10. Understand the techniques relating to concurrency in multi-user database environments by applying different type of LOCK.

Problems related to the following topics:

Topic 1: Database Creation

- Creating a Database
- Creating a Table
- Specifying Relational Data Types
- Specifying Constraints
- Creating Indexes

Topic 2: Table and Record Handling

- INSERT statement
- Using SELECT and INSERT together
- DELETE, UPDATE, TRUNCATE statements
- DROP, ALTER statements

Topic 3: Retrieving Data from a Database

- The SELECT statement
- Using the WHERE clause
- Using Logical Operators in the WHERE clause
- Using IN, BETWEEN, LIKE , ORDER BY, GROUP BY and HAVING

Topic 4: Clause

- Using Aggregate Functions
- Combining Tables Using JOINS
- Subqueries

Topic 5: Database Management

- Creating Views
- Creating Column Aliases
- Creating Database Users

- Using GRANT and REVOKE

Topic 6: PL/SQL overview

- Structure of PL/SQL block.
- Using PL/SQL variables, taking user input and displaying the output.
- PL/SQL Control structures(Conditional control, Iterative control, Sequential control)
- Built-in PL/SQL functions
- PL/SQL composite datatype (Tables, ROWTYPE)
- Subprograms
 - Procedures
 - Functions
- Cursor Management
 - Implicit Cursor
 - Explicit Cursor
 - Cursor for-loop
- Database Triggers
- Error Handling
- Packages

Topic 7: Transaction management

- Transaction with COMMIT, ROLLBACK, SAVEPOINT
- Locking with pair of user
- Locking with multiuser

Paper Name: WEB TECHNOLOGY LAB					
Paper Code: MCAP2112					
Contact hrs per week	L	T	P	Total	Credit Points
	0	0	4	4	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Develop the web pages using HTML.
2. Combine the styles to web pages using CSS.
3. Apply JavaScript validations in the Forms.
4. Retrieve data from XML Files Using Parsers.
5. Connect a server side program using PHP with Database Connectivity MySQL to perform insert, update and delete operations on DBMS table.

HTML

1. Web page design using tables, header, footer and menu.
2. Creating a form with support for redirection to other page(s).
3. Designing CSS with Bootstrap features to allow for responsive web content.

JAVASCRIPT

1. Create dynamic web pages by modifying features of HTML tags.
2. Validate the fields of a form.
3. Create simple animations.

XML

1. How to write a XML document.
2. How to validate XML document.

PHP

1. Writing methods to implement GET and POST requests.
2. Implementing cookies and sessions.
3. Writing PHP and HTML in open source environment.

DATABASE CONNECTIVITY

1. Connecting to database in web server.
2. Query processing to retrieve data from database and update tables.

Syllabus of 4th semester:

Paper Name	SOFTWARE ENGINEERING				
Paper Code	MCAP2201				
Contact hrs Per week	L	T	P	Total	Credit Points
	3	1	0	4	4

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Exemplify the software engineering process, systems and security
2. Explain software engineering process by identifying the requirements and system modelling.
3. Design, develop and implement software based on requirement.
4. Illustrate the evolution process, reuse and testing for developing a quality software for customer.
5. Describe the software management, project management, and planning and configuration management.

Module I [8L]

Introduction: Professional software development, software engineering ethics. **Socio-technical systems:** Complex systems, System engineering, System procurement, System development, System operation. **Dependability and Security:** Dependability properties, Availability and reliability, Safety, Security. **Software Process:** Software process model, process activities, coping with change, The rational unified process. **Product Life Cycle:** Product life cycle stages, Product life cycle case study.

Module II [12L]

Requirements Engineering: Functional and Non Functional requirements, the software requirements document, Requirements specification, Requirements engineering processes, Requirements elicitation and analysis. Requirements validation, Requirements management.

Estimation and Scheduling of Software Projects: Software Sizing, LOC and FP based Estimations; Estimating Cost and Effort, Estimation Models, Constructive Cost Model(COCOMO), Project Scheduling and Staffing; Time-line Charts.

System Modelling: Context models, Interaction models, Structural models, Behavioural models, Model

Module III [10L]

Software Design and Development: Architectural Design: Architectural design decisions, Architectural views, Architectural patterns, Application architectures.

Design and implementation: Object oriented design using UML, Design patterns, implementation issues, Open source development.

Agile software development: Agile methods, Plan driven and agile development, Extreme programming, Agile project management, scaling agile methods.

Module IV [10L]

Software Testing: Verification and Validation; Error, Fault, Bug and Failure, Unit and Integration Testing, White-box and Black-box Testing, Basis Path Testing, Control Structure Testing, Deriving Test Cases, Alpha and Beta Testing; Regression Testing, Performance Testing, Stress Testing.

Software Configuration Management: Change Control and Version Control; Software Reuse,

Software Re-engineering, Reverse Engineering

Software Quality: McCall's Quality Factors, ISO 9126 Quality Factors, Quality Control, Quality Assurance. Risk Management, Risk Mitigation, Monitoring and Management (RMMM), Software Reliability.

Text Books:

1. Software Engineering: A Practitioner's Approach by Roger S. Pressman, 7th Edition, McGraw Hill, 2010.
2. Software Engineering, Ian Sommerville 8th Edition, Pearson, 2012.

Reference Books:

1. Software Engineering Theory and Practice by Shari Lawrence Pfleeger, Joanne M. Atlee, Pearson Education, 2009.
2. Software Engineering Fundamentals by Ali Behforooz, Frederick J. Hudson, Oxford University Press, 2006.
3. An Integrated approach to Software Engineering, 2nd Ed by P. Jalote, Narosa Publications, 1997.
4. Software Engineering by James Peter, W. Pedrycz, Wiley India Pvt. Ltd, 2007.

Paper Name: MOBILE APPLICATION DEVELOPMENT AND IMPLEMENTATION					
Paper Code: MCAP 2202					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Identify various concepts of mobile programming that make it unique from programming for other platforms,
2. Critique mobile applications on their design pros and cons,
3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,
4. Program mobile applications for the Android operating system that use basic and advanced phone features, and
5. Deploy applications to the Android marketplace for distribution.

Module I [10L]

Introduction

Introduction to Mobile Computing, Basic Concept of Android Development Environment.

Issues in Developing Mobile Applications

Mobile Software Engineering, Frameworks and Tools

User Interface

Overview of UI Development, Android User, VUIs and Mobile Apps, Multichannel and Multimodal UIs

Module II [10L]

Intents and Services

Android Intents and Services, Characteristics of Mobile Applications, Successful Deployment

Storing and Retrieving Data

Synchronization and Replication of Mobile Data, Android Storing and Retrieving Data, Working with Content Provider

Module III [10L]

Communications via Network and the Web

State Machine, Correct Communications Model, Android Networking and Web

Telephony

Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony

Notifications and Alarms

Performance and Memory Management, Android Notifications and Alarms

Module IV [10L]

Graphics

Performance and Multithreading, Graphics and UI Performance, Android Graphics

Multimedia

Mobile Agents and Peer-to-Peer Architecture, Android Multimedia

Location

Mobility and Location Based Services, Android Location Services

Sensors

How Sensors work, Motion, Position and Environmental sensors

Security

Android Security Model, Security Model of the Windows Phone, More on Security

Text Books:

1. Lauren Darcey and Shane Conder, “Android Wireless Application Development”, Pearson Education, 2nd ed. (2011)
2. Neil Smyth. Android Studio Development Essentials - Android 7 Edition: Learn to Develop Android 7 Apps with Android Studio 2.2. July, 2016. CreateSpace Independent Publishing Platform.

Reference Books:

1. Reto Meier, “Professional Android 2 Application Development”, Wiley India Pvt Ltd
2. Mark L Murphy, “Beginning Android”, Wiley India Pvt Ltd
3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

Paper Code: MCAP2250					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand and describe the concept of a database transaction, its properties and how database transactions are managed.
2. Learn concurrency control and its role in maintaining the database's integrity.
3. Understand database recovery management and its use to maintain database integrity.
4. Describe about RDBMS architecture
5. Evaluate the method of query processing and optimization.
6. Apply the knowledge of distributed database management.
7. Understand and use the Non-relational database (e.g. NoSQL, MongoDB).

Module I [10L]

Transaction Processing

Transaction Concept and State, Implementation of Atomicity and Durability.

Concurrency Control

Executions, Serializability, Recoverability, Implementation of Isolation.

Concurrency Control Techniques: Lock based Protocols, Timestamp based Protocols, Validation based Protocols.

Multiple Granularity, Multiversion Schemes, Deadlock Handling.

Module II [10L]

Recovery Management

Failure Classification, Storage Structure, Recovery and Atomicity, Log-based Recovery, Shadow Paging, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, Advanced Recovery Techniques.

Case Study: RDBMS Architecture

Memory Structures, Background Processes, Disk Utilization Structures, Starting and Stopping the Database Instance, Creating a Database.

Module III [10L]

Query Processing and Optimization

Different steps of processing a high-level query, Notation for Query Trees and Query Graphs, Translating SQL into relational algebra, Query Optimizer Concepts, Measures of Query Cost, Different Query Algorithms used (no details), Concepts of Materialization and Pipelining, Heuristic Optimization of Query Trees, Statistical Information for Cost Estimation, Steps used for Cost-Based Optimization.

Introduction to Distributed Database Management System

Distributed DBMS Architecture, Distributed Query Processing, Distributed Concurrency Control.

Module IV [10L]

NoSQL

Introduction, importance, history, RDBMS vsNoSQL, CAP Theorem (Brewer’s Theorem), The BASE, ACID vs BASE, advantages and disadvantages of NoSQL. NoSQL Categories - Key-value stores, Column-oriented, Graph, Document oriented.

Introduction to MongoDB

Features, Databases, Schemas and Collections, MongoDB and transactions, MongoDB and caching, Introduction to mongo Shell, Data Types, Databases, Documents, Collections , MongoDB Connections, Query and Projection Operators, Update Operators , Aggregation Pipeline Operators, MongoDB count() cursor method, Database Commands, MongoDB -, INSERT, UPDATE, DELETE, INDEX

Text Books:

1. Database System Concepts – A.Silberschatz, Henry F. Korth, S. Sudarshan, TMH.
2. An Introduction to Database Systems - C.J. Date, Pearson.

Reference Books:

1. Fundamentals of Database Systems–RamezElmasri, Shamkant B. Navathe, Pearson.
2. Database Systems: The Complete Book - Jeffrey D. Ullman, Jennifer Widom, PHI.
3. Distributed Databases Principles and Systems - Ceri, Pelagatti, TMH.
4. NoSQL for Mere Mortals - Dan Sullivan, Pearson
5. MongoDB: The Definitive Guide - Kristina Chodorow, O’Reilly.

Paper Name: DATA MINING & KNOWLEDGE DISCOVERY
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Paper Code:MCAP2251

Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Describe basic concept of data mining and related models.
2. Store and use data for online processing
3. Preprocess the data for mining applications
4. Apply the association rules for mining the data
5. Design and deploy appropriate classification techniques
6. Cluster the high dimensional data for better data organization
7. Implement the data mining algorithms for real-world data.

Module I [9L]

Introduction: Overview of Data mining - definition, Data mining functionalities, Issues and challenges, Knowledge discovery process, Data preprocessing,

PCA: Introduction to PCA, Reduce the dimensionality of the data using Principal Component Analysis

Association Rules: Market basket analysis, Apriori algorithm, FP – tree growth algorithm, generalized association rule.

Module II [9L]

Classification Techniques I: Decision tree, pre-pruning, post-pruning, Rule-based classification. K-nearest Neighbor, Bayes' classifier,

Module III [9L]

Classification Techniques II: Artificial Neural Network, Support Vector Machine.

Classification Techniques using Tools.

Module IV [9L]

Clustering Techniques: Clustering paradigm, K-means, Fuzzy C-means, Hierarchical clustering, DBSCAN.

Clustering Techniques using Tools

Text Books:

5. Introduction to Data Mining - Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Publishers.
6. Data Mining: Concepts and Techniques - Jiawei Han and Micheline Kamber, Elsevier.

Reference Books:

4. Mining Text Data. Charu C. Aggarwal and ChengXiangZhai, Springer, 2012.

5. Data Mining Techniques - K. Pujari, Universities Press.
6. Data Warehousing, Data Mining and OLAP - Alex Berson and Stephen J Smith, TMH.
7. Introduction to Data Mining and Knowledge Discovery-Herbert A. Edelstein, Two Crows Corporation

Paper Name: SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING
Paper Code: MCAP2252

Contact hrs per week	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. To fix software flaws and bugs in various software.
2. To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic
3. Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
4. Methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.

Module I [8L]

Secure Software Design: Identify software vulnerabilities and perform software security analysis, Master security programming practices, Master fundamental software security design concepts.

Module II[12L]

Enterprise Application Development: Describe the nature and scope of enterprise software applications, Design distributed tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solutions.

Module III[10L]

Enterprise Systems Administration: Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).

Module IV[10L]

Obtain the ability to manage and troubleshoot a network running multiple services, understand the requirements of an enterprise network and how to go about managing them. Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum Vulnerabilities and flaws.

Case study of DNS server, DHCP configuration and SQL injection attack.

Text Books:

1. Secure Software Design, Theodor Richardson, Charles N Thies, Jones & Bartlett, 2012.
2. Enterprise Software Security, Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Addison Wesley, 1st Edition, 2014.

References Books:

1. Architecting Applications for the Enterprise: Dino Esposito and Andrea Saltarello, Microsoft Press.
2. Enterprise Applications Administration: Jeremy Faircloth; Morgan Kaufmann publishers;
3. RedHat Linux Networking & System Administration: Terry Collings and Kurt Wall; Wiley Publishing;
4. SQL Injection Attacks and Defense: Justin Clarke; Elsevier Publishing;

Paper Code: MCAP2253					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Understand the basics of Internet of things and protocols
2. Learn about the middleware for Internet of things
3. Understand protocols and architecture of Internet of things
4. Enumerate and overcome the challenges in Internet of things
5. Design Internet of things applications in different domain and be able to analyze their performance
6. Understand the concepts of web of things

Module I [10L]

Introduction to IoT: Defining IoT, Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, IoT Levels and Deployment Templates.

IoT& M2M: Machine to Machine, Difference between IoT and M2M, Software Defined Network, Network Function Virtualization.

Module II [10L]

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

IoT Architecture: IoT Open source architecture (OIC), OIC Architecture & Design Principles, IoT Devices and Deployment Models, IoTivity: An Open source IoT Stack, Overview, IoTivity Stack Architecture, Resource Model and Abstraction.

Module III [10L]

Challenges in IoT: Design Challenges, Development Challenges, Security Challenges, Other Challenges.

Developing IoTs: IoT Design Methodology, IoT Physical Devices and Endpoints, IoT Physical Servers and Cloud Offerings, Case Study on IoT Systems.

Module IV [10L]

Domain Specific Applications of IoT: Home Automation, Smart City Applications, Environment Applications, Healthcare Applications.

Web of Things: Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT, Platform Middleware for WoT, Unified Multitier WoT Architecture, WoT Portals and Business Intelligence.

Text Books:

1. Internet of Things: A Hands-On Approach - Vijay Madiseti, Arshdeep Bahga.
2. The Internet of Things in the Cloud: A Middleware Perspective - Honbo Zhou, CRC Press.

Reference Books:

1. Architecting the Internet of Things - Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), Springer.
2. The Internet of Things – Key Applications and Protocols - Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley.

Paper Code: MCAP2254					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Familiarize the functional/operational aspects of cryptocurrency ecosystem.
2. Explain design principles of Bitcoin and Ethereum.
3. Identify major research challenges and technical gaps existing between theory and practice in cryptocurrency domain.
4. Interact with a blockchain system by sending and reading transactions.
5. Design, build, and deploy a distributed application.
6. Evaluate security, privacy, and efficiency of a given blockchain system.
7. Utilize ideas from blockchain technology into real life applications.

Module I [10L]

Cryptographic for Blockchain Technology:

Hashing, Signature Schemes, Encryption Schemes and Elliptic Curve Cryptography.

Blockchain Basics:

Introduction, Advantage over Conventional Distributed Database, Blockchain Network, Mining Mechanism, Distributed Consensus, Gas Limit, Transactions and Fee, Anonymity, Reward, Chain Policy, Life of Blockchain Application, Soft & Hard Fork, Private and Public Blockchain.

Module II [10L]

Distributed Consensus:

The Consensus Problem, Asynchronous Byzantine Agreement, AAP protocol and its Analysis, Nakamoto Consensus on Permissionless, Nameless, Peer-to-Peer Network, Abstract Models for Blockchain, Garay Model, RLA Model, Proof of Work (PoW) as Random Oracle, Formal Treatment of Consistency, Liveness and Fairness, Proof of Stake (PoS) based Chains, Hybrid Models (PoW + PoS).

Module III [10L]

Cryptocurrency:

Bitcoin - Wallet, Blocks, Merkle Tree, Hardness of Mining, Transaction Verifiability, Anonymity, Forks, Double Spending, Mathematical Analysis of Properties of Bitcoin.

Ethereum - Ethereum Virtual Machine (EVM), Wallets for Ethereum, Solidity, Smart Contracts, Some Attacks on Smart Contracts.

Module IV [10L]

Cryptocurrency Regulation:

Stakeholders, Roots of Bit Coin, Legal Aspects, Crypto Currency Exchange, Black Market and Global Economy.

Blockchain Applications:

Uses of Blockchain in Internet of Things, E-Governance, Land Registration, Medical Record

Management System, Domain Name Service and Future of Blockchain.

Text Books:

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction - Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton University Press.
2. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks - Imran Bashir, Packt Publishing Ltd.

Reference Books:

1. Mastering Bitcoin: Unlocking Digital Cryptocurrencies - Antonopoulos, O'Reilly.
2. The Science of the Blockchain- Wattenhofer, CreateSpace Independent Publishing Platform.
3. Blockchain Technology Explained: The Ultimate Beginner's Guide AboutBlockchain Wallet, Mining, Bitcoin, Ethereum, Litecoin, Zcash, Monero, Ripple, Dash, IOTA and Smart Contracts - Alan T. Norman, CreateSpace Independent Publishing Platform.
4. Bitcoin: A Peer-to-Peer Electronic Cash System - Satoshi Nakamoto, <https://bitcoin.org/bitcoin.pdf>.
5. ETHEREUM: A Secure Decentralized Transaction Ledger - Dr. Gavin Wood, Yellow Paper, 2014.

Paper Name: IMAGE PROCESSING					
Paper Code: MCAP 2260					
Contact hrs per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Apply knowledge of mathematics for image understanding and analysis.
2. Understand and describe the basic concepts of image processing.
3. Learn and apply the image enhancement techniques, image restoration procedures, image compression procedures for real world image data.
4. Implement image segmentation and representation techniques.
5. Conduct independent study and analysis of image processing problems and techniques.

Module I [8L]

Introduction: Overview of image processing, Application area of image processing, Digital image representation, Fundamental steps in image processing, Components of an image processing system. Sampling and quantization.

Basic relationship between pixels –

Neighbours, Adjacency, Connectivity, Regions, Boundaries and distance measures.

Introduction to Fourier transform and Discrete Fourier transform, Properties of 2D Discrete Fourier transform

Module II [12L]

Image Enhancement: Spatial domain image enhancement techniques: Basic intensity transformations – Negative, Log, Power-law, Piecewise linear transformations, Histogram based techniques (histogram equalization, histogram matching). Spatial filtering: Smoothing (linear and non-linear), Sharpening (Gradient and Laplacian), Unsharp masking and highboost filtering.

Enhancement in the frequency domain – Basics of filtering in frequency domain, Smoothing and sharpening filters: Ideal, Butterworth, Gaussian. Homomorphic filtering. Selective filtering.

Module III [10L]

Image Restoration: Model of image degradation/restoration process, Noise models, Image restoration in presence of noise only – Spatial filtering, Periodic noise reduction by frequency domain filtering – Band reject and bandpass filtering. Inverse filtering, Least mean square error filtering, Constrained least squares filtering.

Image Compression:

Fundamentals- Redundancy, Measuring image information, Fidelity criteria,

Image compression models. Compression methods: Huffman coding, Arithmetic coding, LZW coding, Run length

coding, Bit plane coding, Predictive coding.

ModuleIV [10L]

Image Segmentation: Detection of discontinuities, Edge, Line and point detection. Edge linking and boundary detection - Local processing, Global processing via Hough transform. Thresholding – Global, Optimum, Multiple and variable. Region based segmentation: Growing, Splitting and merging.

Image Representation: Representation: Chain codes, Polygonal approximation. Boundary descriptors. Regional descriptors

Text Books:

1. Digital Image Processing - Gonzalez, Woods, Pearson.
2. Fundamentals of Digital Image Processing - Jain, Pearson.

Reference Books:

1. Principles of Digital Image Processing: Advanced Methods – Burger, Burge, Springer.
2. Digital Image Processing and Analysis - Chanda, Majumder, PHI.
3. Image Processing Principles and Applications – Acharya and Ray, Wiley.
4. Image Processing, Analysis & Machine Vision - Sonka, Hlavac, Boyle, Cengage Learning

Paper Name: COMPUTER GRAPHICS AND MULTIMEDIA					
Paper Code: MCAP2261					
Contact hrs. per week:	L	T	P	Total	Credit Points
	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Visualize the application areas of computer graphics concepts in the development of real world applications.
2. Understand the basics of color model and image representation.
3. Develop the concept of affine transformation in 2D & 3D.
4. Analyze the steps to map from real world coordinates to device specific coordinates.
5. Understand Multimedia document architecture, importance of synchronization and specific applications of Multimedia.
6. Identify the individual media ingredients to develop an integrated multimedia project.

Module I [10L]

Introduction

Basics of computer graphics, real world usage of computer graphics, display technologies, raster-scan systems, video controller, random-scan display processor, graphics input devices, graphics software and standard.

Graphics Primitives

Scan converting points.

Scan converting lines – DDA algorithm, Bresenham’s algorithm, Midpoint algorithm.

Scan converting circles – Midpoint algorithm.

Scan converting ellipse – Midpoint algorithm.

Fill area primitives–boundary-fill and flood-fill, scan-line polygon fill.

Module II [10L]

Affine Transformation (2D &3D)

Translation, rotation and scaling, homogeneous coordinates and matrix representation, composite transformations, reflection and shearing, Projections - perspective and parallel projections

Viewing and Clipping

Viewing pipeline and coordinates system, window-to-viewport transformation, point clipping.

Line clipping algorithms - Cohen-Sutherland, Midpoint subdivision, Cyrus-Beck algorithms.

Polygon clipping – Sutherland Hodgeman algorithm, Weiler Atherton algorithm.

Module III [10L]

Curves and Surfaces

Polygon surfaces, curved lines and surfaces, parametric cubic curves – Hermite curves, Bezier curves, B-Splines.

Visible Surface Detection

Classification of visible surface detection algorithms, back face detection, z-Buffer algorithm, scan-line algorithms, area subdivision algorithm, octree algorithms, visible-surface ray tracing.

Illumination and Shading

Illumination methods (ambient, diffused and specular reflection), constant and interpolated shading methods (Gouraud, Phong).

Module IV [10L]

Introduction to Multimedia

History of Multimedia, Properties of a Multimedia System, Multimedia Building Blocks, Types of Media.

Compression Techniques

Lossy and Lossless Compressions, RLE, Huffman Encoding, LZW Encoding Techniques, Quantization; JPEG, MPEG compression techniques.

Document Architecture and Content Management

Content Design and Development, General Design Principles Hypertext: Concept, Open Document Architecture (ODA), Multimedia and Hypermedia Coding Expert Group (MHEG).

Multimedia Interactive Applications

Educational applications and authoring, Industrial applications, Multimedia archives and digital libraries.

Text Books:

1. Computer Graphics C Version - D. Hearn and P. Baker, Pearson Education.
2. Computer Graphics - Xiang and Plastock, Schaum Outline Series.
3. Principles of Multimedia, Ranjan Parekh, Tata McGraw-Hill Education

Reference Books:

1. Procedural Elements of Computer Graphics - Rogers, TMH.
2. Introduction to Computer Graphics & Multimedia – Mukhopadhyay and Chattopadhyay, Vikas Publishing House.
3. Multimedia Systems Design, Prabhat K. Andleigh & Kiran Thakrar, PHI.

Paper Name: DATA SCIENCE					
Paper Code:MCAP2262					
Contact hrs per week:	L	T	P	Total	Credit Point
	3	0	0	0	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Learn and understand how data is collected, managed and stored
2. Understand and describe the key concepts in data science and popular techniques used by data scientists.
3. Build skills in data management;
4. Demonstrate proficiency with statistical analysis of data;
5. Develop ability to build and assess data-based models;
6. Apply the concepts and algorithms to real-world data;

Module I [10L]

Introduction: About Data Science, Need of Data Science, Different Sectors Using Data Science.

Data Acquisition: Gather information from different sources, Internal systems and External systems, Web APIs, Open Data Sources, Data APIs, Web Scrapping, Relational Database access (queries) to process/access data,.

Data Pre-processing and Preparation: Data cleansing, Data editing, Data reduction, Data wrangling, Implementation using Tools.

Module II [10L]

Exploratory Data Analysis (EDA): Structured Data, Rectangular Data, Location, Variability, Data Distribution, Binary and Categorical Data, Correlation, Multiple Variables, Implementation using Tools.

Sampling Distributions: Random Sampling, Bias, Sampling Distribution and Central Limit Theorem (CLT), Bootstrap, Confidence Interval; Different Distributions – Binomial / Poisson / Exponential / Normal / Student's t / Long-Tailed, Implementation using Tools;

Module III [10L]

Applications of ML Algorithms using Tools

Regression: Simple Linear, Multiple Linear, Non-Linear; Prediction using Regression.

Classification: K Nearest Neighbors (k-NN), Naive Bayes Classification, SVM.

Unsupervised Learning: K-Means Clustering, Hierarchical Clustering, DBSCAN

Module IV [10L]

Data Visualization: Science of Visualization, Visualization Periodic Table.

Concepts of measurement: scales of measurement, Design of data collection formats,

Principles of data visualization: different methods of presenting data, Concepts of Size, Shape, Color,

Various Visualization types: Bubble charts, Geo-maps (Chloropleths), Gauge charts, Tree map, Heat map, Motion charts, Force Directed Charts etc., Data Visualization using Tools.

Text Books:

1. Introducing Data Science; Davy Cielen, Arno D Meysman and Mohamed Ali; Dreamtech Press
2. Machine Learning, First Edition, T. Mitchell, McGraw-Hill, 1997

Reference Books:

1. Practical Statistics for Data Scientists; Peter Bruce and Andrew Bruce; O'Reilly Media Inc.
2. Doing Data Science; Cathy O'Neil and Rachel Schutt; O'Reilly Media Inc.
3. A First Course in Probability 8th ed.; Sheldon Ross; Pearson Education Inc.

Mining of Massive Datasets v2.1; Jure Leskovek, AnandRajaraman and Jeffrey Ullman; Cambridge University Press.

Paper Name:SOFTWARE PROJECT MANAGEMENT					
Paper Code:MCAP2263					
Contact hrs	L	T	P	Total	Credit Points
Per week	3	0	0	3	3

Course Outcomes:

After successfully completing this course, the students will be able to:

1. Identify project planning objectives, along with various cost/effort estimation models.
2. Organize & schedule project activities to compute critical path for risk analysis.
3. Monitor and control project activities.
4. Formulate testing objectives and test plan to ensure good software quality under SEI-CMM.
5. Configure changes and manage risks using project management tools.

Module-I: [10L]

Introduction and Software Project Planning

Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scopedocument, Project Management Cycle, SPM Objectives, Management Spectrum, SPMFramework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan,Structure of a Software Project Management Plan, Software project estimation, Estimationmethods, Estimation models, Decision process.

Module -II: [10L]

Project Organization and Scheduling

Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities andTasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule,Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques,Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

Module-III: [10L]

Project Monitoring and Control

Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators:Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV),Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of EarnedValue Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Desk checks, Walkthroughs, Code Reviews, Pair Programming.

Module-IV: [10L]

Project Management and Project Management Tools

Software Configuration Management: Software Configuration Items and tasks, Baselines, Planfor Change, Change Control, Change Requests Management, Version Control, RiskManagement: Risks and risk types, Risk Breakdown Structure (RBS), Risk ManagementProcess: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost BenefitAnalysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools,MS-Project.

Text Books:

1. Software Project Management, M. Cotterell, Tata McGraw-Hill Publication.
2. Software Project Management, Royce, Pearson Education

Reference Books:

1. Software Project Management, Kieron Conway, Dreamtech Press
2. Software Project Management, S. A. Kelkar, PHI Publication.
3. Software Project Management by Bob Hughes and Mike Cotterell, Tata McGraw-Hill Edition 2004.
4. Software Engineering Project Management Edited by Richard H Thayer, Wiley-IEEE, ComputerSociety Press, 2004.

Paper Name: PROBABILITY, STATISTICS AND QUEUING THEORY					
Paper Code: MATH 2261					
Contact hours per week:	L	T	P	Total	Credit Points
	4	0	0	4	4

Course Outcomes:

After successfully completing this course, the students will be able to

1. Formulate predictive models to tackle situations where deterministic algorithms are intractable.
2. Quantifies the amount of uncertainty involved in the value of a random variable or the outcome of a random process.
3. Assess data-based models.
4. Apply tools of formal inference.
5. Analyze the variety of performance measures of a queuing system.
6. Make distinction between several queuing models and derive performance measures for each of them.

MODULE I SINGLE AND BIVARIATE PROBABILITY DISTRIBUTIONS [10L]

- Review of basic probability
- Special Type of distribution : Exponential family of distributions, Poisson Distribution
- Normal approximation to Binomial and Poisson Distribution
- Markov's inequality, Chebyshev's inequality and Central Limit Theorem
- Joint distribution using joint probability mass/density function
- Finding marginal pmf/pdf from joint distribution
- Multiplicative property of joint pmf/pdf in case of independent random variables

MODULE II MARKOV CHAIN AND STATISTICS –I [10L]

Markov Chain:

- Introduction
- Chapman-Kolmogorov equations
- Classification of states
- Some applications: Gambler's Ruin Problem

Statistics- I

- Measures of Central tendency: Moments, skewness and Kurtosis
- Curve fitting: Method of Least squares; Straight line and parabolas
- Spearman's Rank Correlation coefficient

MODULE III STATISTICSII [10L]

- Population and Samples
- The sampling distribution of mean (σ known)
- The sampling distribution of mean (σ unknown)
- Point and Interval estimation, Maximum Likelihood Estimation
- Tests of Hypotheses, Null Hypotheses and Tests of Hypotheses with simple examples

MODULE-IV Queuing Theory [10L]

- Introduction, Basic definitions and notations
- Structure of a Queuing system
- Axiomatic derivation of the arrival & departure distributions for Poisson Queue

- Single server Queuing Models: M/M/1 (Limited and Unlimited Queue)
- Multi-server Queuing Model: M/M/s (Limited and Unlimited Queue)

Text Books:

1. Introduction to Probability Models, *S.M.Ross*, Elsevier
2. Fundamentals of Mathematical Statistics, *S.C.Gupta and V.K.Kapoor*, Sultan Chand and Sons
3. Operations Research: Theory and Applications - J K Sharma, MacMillan.

Reference Books:

1. Probability and Statistics for Engineers , Richard A Johnson, Pearson Education
2. An Introduction to Probability theory and its applications Vol-I, W. Feller, John Wiley and Sons
3. Operation Research – KantiSwarup, Gupta P K, Man Mohan, Sultan Chand & Sons

Paper Name	SOFTWARE ENGINEERING LAB				
Paper Code	MCAP3111				
Contact hrs	L	T	P	Total	Credit Points
Per week	0	0	4	4	3

Problems related to:

1. Identifying requirements from problem statements
2. Estimation of project metrics
3. Modeling UML Use Case Diagrams and capturing Use Case scenarios
4. E-R modeling from the problem statements
5. Modeling Data Flow Diagrams
6. Identifying domain classes from the problem statements
7. Statechart and Activity Modeling
8. Modeling UML Class Diagrams and Sequence Diagrams
9. Estimation of Test Coverage Metrics and Structural Complexity
10. Designing test suites using tools