



**Department of Computer Applications  
2 YEARS MCA PROGRAMME**

**Document Release Month & Year: July 2023**

**(Applicable from 2023 admitted batch)**



## **PART I COURSE STRUCTURE**

## FIRST SEMESTER

<b>A. Theory</b>							
Sl.	Paper Code	Paper Name	Contacts Periods/Week				Credit Points
			L	T	P	Total	
1	MCA1101	Object Oriented Programming with Java	3	1	0	4	4
2	MCA1102	Programming with Python	3	1	0	4	4
3	MCA1103	Artificial Intelligence	4	0	0	4	3
4	MCA1104	Mathematical Foundations	4	0	0	4	3
5	MCA1105	Information System Analysis and Design	4	0	0	4	3
<b>Total Theory</b>						<b>20</b>	<b>17</b>
<b>B. Laboratory</b>							
6	MCA1151	Java Programming Lab	0	0	4	4	2
7	MCA1152	Python Programming Lab	0	0	4	4	2
<b>Total Practical</b>						<b>8</b>	<b>4</b>
<b>Total of Semester</b>						<b>28</b>	<b>21</b>

A six weeks online Bridge Course to be conducted for non Computer Science/Computer Applications/Information Technology background students according to the detailed syllabus.

**SECOND SEMESTER**

<b>A. Theory</b>							
Sl.	Paper Code	Paper Name	Contacts Periods/Week				Credit Points
			L	T	P	Total	
1	MCA1201	Data Structures	4	0	0	4	3
2	MCA1202	Computer Communication Networks	4	0	0	4	3
3	MCA1203	Database Management Systems	4	0	0	4	3
4	MCA1204	Operating Systems	4	0	0	4	3
5	MCA1231- MCA1234	Elective I	4	0	0	4	3
	MCA1231	Soft Computing					
	MCA1232	Cryptography and Network Security					
	MCA1233	Data Mining and Knowledge Discovery					
	MCA1234	Ecommerce					
<b>Total Theory</b>						<b>20</b>	<b>15</b>
<b>B. Laboratory</b>							
6	MCA1251	Data Structures Lab	0	0	4	4	2
7	MCA1252	Computer Network Lab	0	0	4	4	2
8	MCA1253	DBMS Lab	0	0	4	4	2
<b>Total Practical</b>						<b>12</b>	<b>6</b>
<b>C. Sessional</b>							
9	HUM1221	Career Development and Management	0	0	3	3	2
<b>Total Sessional</b>						<b>3</b>	<b>2</b>
<b>Total of Semester</b>						<b>35</b>	<b>23</b>

### THIRD SEMESTER

<b>A. Theory</b>							
Sl.	Paper Code	Paper Name	Contacts Periods/We				Credit Points
			L	T	P	Total	
1	MCA2101	Software Engineering	4	0	0	4	3
2	MCA2102	Web Technology	4	0	0	4	3
3	MTH2102	Introduction to Optimization	4	0	0	4	3
4	MCA2131- MCA2134	Elective II	4	0	0	4	3
	MCA2131	Machine Learning					
	MCA2132	Blockchain Technology and Applications					
	MCA2133	Android Application Development					
	MCA2134	Enterprise Resource Planning					
5	MCA2141- MCA2144	Elective III	4	0	0	4	3
	MCA2141	Automata Theory and Compiler Design					
	MCA2142	Cloud Computing					
	MCA2143	Data Science					
	MCA2144	Management Information System					
<b>Total Theory</b>						<b>20</b>	<b>15</b>
<b>B. Laboratory</b>							
6	MCA2151	Software Engineering Lab	0	0	4	4	2
7	MCA2152	Web Technology Lab	0	0	4	4	2
<b>Total Practical</b>						<b>8</b>	<b>4</b>
<b>C. Sessional</b>							
8	MCA2195	Minor Project	0	0	4	4	2
<b>Total Sessional</b>						<b>4</b>	<b>2</b>
<b>Total of Semester</b>						<b>32</b>	<b>21</b>

## FOURTH SEMESTER

<b>A. Theory</b>							
Sl.	Paper Code	Paper Name	Contacts Periods/Week				Credit Points
			L	T	P	Total	
1	MCA2221	<p>Open Elective</p> <p>[1] Open Electives from the NPTEL/SWAYAM Platform.</p> <p>[2] While opting for a course for pursuing the Open Elective, a student needs to ensure that:</p> <p>i) The course must not be covered in previous semesters of the program.</p> <p>ii) Date of Exam and publication of result should be within the tenure of the MCA 4<sup>th</sup> Semester i.e. January to June of every Year.</p> <p>[3] Student must submit the course details at the beginning of the 4<sup>th</sup> semester, which is to be approved by the Departmental Academic Committee.</p>	-	-	-	-	3
<b>Total Theory</b>						-	<b>3</b>
<b>B. Sessional</b>							
2	MCA2297	Comprehensive Viva-voce	-	-	-	-	2
3	MCA2295	Major Project	0	0	28	28	10
<b>Total Sessional</b>						<b>28</b>	<b>12</b>
<b>Total of Semester</b>						<b>28</b>	<b>15</b>



## **PART II DETAILED SYLLABUS**

## BRIDGE COURSE

<b>Paper Name: INTRODUCTION TO PROGRAMMING</b>					
<b>Paper Code: MCA0001</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>

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

**Overview of C language:** C Standards, Structure of a C Program, C Libraries and Steps of Compilation 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, Formatted Console 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, Multidimensional Arrays, Strings, Arrays of Strings, String Library Functions. **[3L]**

**Pointer:** Pointers and Memory Addressing. Pointer Variables, Pointer Arithmetic, Pointer Expressions, 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.

### **Reference Books:**

1. C Programming Made Easy - Raja Ram, SCITECH.
2. The C Programming Language - Kernighan Ritchie, PHI.
3. Programming in C – ReemaThareja, Oxford University Press.



<b>Paper Name: DIGITAL LOGIC AND COMPUTER ORGANIZATION</b>					
<b>Paper Code: MCA0002</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>

**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** – 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.

#### **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.
4. Digital Logic Design – MansafAlam, Bashir Alam, PHI

<b>Paper Name: FUNDAMENTALS OF DATABASE SYSTEMS</b>					
<b>Paper Code: MCA0003</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>0</b>

**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.

**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.
4. Data Base Management System - A.K. Pujari, ISTE/EXCEL.

## Syllabus of 1<sup>st</sup> Semester

<b>Paper Name: OBJECT ORIENTED PROGRAMMING WITH JAVA</b>					
<b>Paper Code: MCA1101</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### Course Outcomes:

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

- MCA1101.1 Recall the basic concepts of object oriented programming.
- MCA1101.2 Identify the Java language features and programming constructs.
- MCA1101.3 Demonstrate the concepts of classes, objects, constructors, method overloading, access control, inheritance and polymorphism.
- MCA1101.4 Examine the use of packages and interface.
- MCA1101.5 Apply the concepts of multithreading and exception handling to develop efficient and error free codes.
- MCA1101.6 Evaluate the application using of collection framework, file handling generics to solve real life problem.

### **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, java.lang and java.io**

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

#### **Advanced Topics**

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

<b>Paper Name: PROGRAMMING WITH PYTHON</b>					
<b>Paper Code: MCA1102</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>4</b>

### Course Outcomes:

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

- MCA1102.1 Develop simple Python programs using Python statements and expressions.
- MCA1102.2 Demonstrate use of lists, tuples, sets and dictionaries to represent compound data.
- MCA1102.3 Explain control flow and functions in Python for solving problems.
- MCA1102.4 Articulate object-oriented programming concepts such as encapsulation, inheritance and polymorphism as used in Python.
- MCA1102.5 Illustrate the commonly used operations involving file systems handling in Python.
- MCA1102.6 Explore Python libraries like NumPy, Matplotlib and Pandas for mathematical functions, visualization, and data access.

### **Module I [10L]**

**Introduction:** What is Python? Why Python? Installing Python, Python Syntax, Comments, Writing a program using Python, Applications Basics of Python Programming.

**Expression:** Variables and Values, Built-in Data Types, Numeric data type and Type Casting, String data type, Boolean data type, Operators, Expression Evaluation.

**Console I/O:** Printing Information, User Input.

**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.

### **Module II [10L]**

**Collections:** Lists, Tuple, Set, Dictionary, Sequences, Comprehensions.

**String** - String Literals, String Assignment, Multiline Strings, Slicing, Negative Indexing, Check String, String Concatenation, String Format, Escape Character, String Methods.

**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, Aggregation in Python, Exception Handling.

**Introduction to Module and Package:** Module, Built-In Math Function, Math Module, Module datetime and Date Objects, RegEx Module and RegEx Functions, Create Package, Access Package.

### **Module IV [10L]**

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

#### **Python Library:**

NumPy, Matplotlib, Pandas.

#### **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.

<b>Paper Name: ARTIFICIAL INTELLIGENCE</b>					
<b>Paper Code: MCA1103</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA1103.1 Describe the role of agents and how it is related to environment and the way of performing it.
- MCA1103.2 Formalize the problem using searching algorithms (Uninformed, Informed, Heuristic, Adversarial Search etc) as a state space, graph.
- MCA1103.3 Solve complex problems based on the intelligent behavior of humans using propositional and first-order predicate logic
- MCA1103.4 Design AI machine and developing applications for real world problems using different learning techniques mentioned in syllabus.
- MCA1103.5 Recommend various logical techniques to perform logic based planning and it's representation of action.
- MCA1103.6 Apply the concept of Probabilistic Reasoning, Inference and Bayesian Networks to solve the real world problem.

### **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, inference 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.
3. Artificial Intelligence, Stuart Russell, Pearson publication
4. Super intelligence - Nick Bostrom by Audible Studios on Brilliance audio.



<b>Paper Name: MATHEMATICAL FOUNDATIONS</b>					
<b>Paper Code: MCA1104</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA1104.1 Recall basic graph theory - types, components, representation, isomorphism, tree.
- MCA1104.2 Identify combinatorial methods like - Pigeon hole principle, permutations and combinations, binomial coefficients, recurrence relations and generating functions, counting theorems.
- MCA1104.3 Interpret basic statistical methods like construction of frequency distribution, measures of central tendency, dispersion, moment generating function, linear correlation and regression.
- MCA1104.4 Analyze probabilistic approaches to solve wide range of engineering problems.
- MCA1104.5 Appraise probability distributions required to quantify phenomenon whose true value is uncertain.
- MCA1104.6 Construct statistical methods to make inferences on results obtained from an experiment.

### **Module I [8L]**

#### **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, graph isomorphism, bipartite graph, definition and properties of a tree.

### **Module II [8L]**

#### **Linear Algebra:**

Euclidean vector spaces. Linearly dependant and Independant vectors, Basis, Norms, Distance and Similarity.

Eigenvalues, eigenvectors and eigenvector decomposition, singular value decomposition.

Solving systems of equations with matrices.

Mathematical operations with matrices, Matrix inverses and determinants.

### **Module III [12L]**

#### **Statistics and Probability:**

Concept of frequency distribution, measures of central tendency, dispersion, moment generating function, linear correlation and regression.

Random experiment, sample space, random events, probability of events, conditional probability, independent events, Bayes' theorem.

Random variable, probability mass function, probability density function, distributions: binomial, Poisson and normal, expectation and variance, moment reproductive property of binomial, Poisson and normal distribution (proof not required).

#### **Module IV [12L]**

##### **Statistical Estimation and Testing of Hypothesis:**

Population, sample; statistic, estimation of parameters (consistent and unbiased), sampling distribution of sample mean and sample variance (proof not required), point estimation.

Overview of Testing of Hypothesis, Type I and Type II errors.

##### **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.

<b>Paper Name: INFORMATION SYSTEM ANALYSIS AND DESIGN</b>					
<b>Paper Code: MCA1105</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA1105.1 Define and Describe concepts of system and what it means to develop and implement an information system.
- MCA1105.2 Perform evaluation of methodologies and select appropriate methodologies.
- MCA1105.3 Write clear and concise system requirements and convert them into technical specification.
- MCA1105.4 Elaborate design of system components and environments.
- MCA1105.5 Create user interface from data input and output and data representing common business situations.
- MCA1105.6 Analyse security and risk of an information system.

### **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 system 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, PHI.

### **Reference Books:**

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

<b>Paper Name: JAVA PROGRAMMING LAB</b>					
<b>Paper Code: MCA1151</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**Course Outcomes:**

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

- MCA1151.1 Reproduce fundamentals of object-oriented programming in Java, including defining classes, invoking methods, using class libraries, etc.
- MCA1151.2 Identify the Java SDK environment to create, debug and run simple Java programs.
- MCA1151.3 Illustrate classical problems using java programming.
- MCA1151.4 Experiment with problems related to inheritance, polymorphism, interfaces, packages, multithreading, file handling, collections framework.
- MCA1151.5 Construct the generic programming.
- MCA1151.6 Create java program for real world applications.

**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. java.util, java.lang, java.io

<b>Paper Name: PYTHON PROGRAMMING LAB</b>					
<b>Paper Code: MCA1152</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**Course Outcomes:**

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

- MCA1152.1 Interpret and debug syntax errors reported by the python compiler.
- MCA1152.2 Apply procedural programming knowledge to solve arithmetic and logical problems.
- MCA1152.3 Design, code and test Python programs with a basic understanding of top-down design.
- MCA1152.4 Apply object-oriented programming concepts to develop dynamic interactive python applications.
- MCA1152.5 Create applications to read from and write into files.
- MCA1152.6 Design a program using python libraries to solve 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

## Syllabus of 2<sup>nd</sup> Semester

<b>Paper Name: DATA STRUCTURES</b>					
<b>Paper Code: MCA1201</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### Course outcomes:

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

- MCA1201.1 Analyze the asymptotic performance of algorithms.
- MCA1201.2 Define basic linear data structure operation using array, linked list, stack, and queue.
- MCA1201.3 Demonstrate Non linear data structure operations involving graphs, trees and heaps.
- MCA1201.4 Apply algorithms for solving problems like sorting, searching, insertion and deletion of data, hashing.
- MCA1201.5 Solve a problem using dynamic programming, greedy technique algorithms, brute force and divide-and-conquer technique algorithms.
- MCA1201.6 Compare the performance of alternative approaches to problem solving using different data structures covered in this course, with respect to their efficiency.

### **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 – Debasis Samanta, PHI Learning.
2. Data Structures and Algorithms Made Easy in Java - Narasimha Karumanchi, CareerMonk Publications.

#### **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.



<b>Paper Name: COMPUTER COMMUNICATION NETWORKS</b>					
<b>Paper Code: MCA1202</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA1202.1 Recall basic data communication and networking concepts like communication modes, topology, protocols, standards, layered tasks, reference models, connecting devices, switching.
- MCA1202.2 Identify signals, digital and analog transmission, multiplexing, transmission media.
- MCA1202.3 Interpret different framing, error correction, error detection, flow control and channel access protocols.
- MCA1202.4 Examine the working principle of different routing and addressing schemes, different network layer protocols.
- MCA1202.5 Evaluate different process to process delivery, congestion control and quality of service protocols.
- MCA1202.6 Design network applications using different application layer protocols.

### **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.

### **Reference Books:**

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

<b>Paper Name: DATABASE MANAGEMENT SYSTEMS</b>					
<b>Paper Code: MCA1203</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA1203.1 Apply relational algebra, functional dependencies, normalization techniques and design the database.
- MCA1203.2 Apply SQL queries to access data in relational database.
- MCA1203.3 Perform PL/SQL programming using concept of cursor management, error handling, package and triggers.
- MCA1203.4 Apply the concept of a database transaction, control and its role in maintaining the database's integrity and the concept of different levels of indexing to optimize query processing.
- MCA1203.5 Familiarize the students with a good formal foundation on the relational model.
- MCA1203.6 Recognize the importance of database analysis and design in the implementation of any real life Database application and different operations on it.

### **Module I [10L]**

#### **Relational Data Model**

Concept of relations, Relational Algebra Operators: Selection, Projection, Union, Intersection, Set operations, Setdifference, 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, Decompositionusing 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 protocol. 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.
4. Fundamental of Relational Databases - Ramon A Mata, Pauline K Cushman, Schaum's Outlines.

<b>Paper Name: OPERATING SYSTEMS</b>					
<b>Paper Code: MCA1204</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### Course Outcomes:

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

- MCA1204.1 Discuss how operating systems are used in various computing environments.
- MCA1204.2 Identify the components of a process and thread and illustrate how they are represented and scheduled in an operating system.
- MCA1204.3 Demonstrate different hardware and software techniques to solve critical section problem.
- MCA1204.4 Evaluate approaches for deadlock detection and recovery from deadlock.
- MCA1204.5 Analyze the various device and resource management techniques for timesharing systems.
- MCA1204.6 Conceptualize the components involved in designing a contemporary OS.

### **Module I [10L]**

#### **Introduction**

Introduction to Operating Systems, Concept of multi-programming and multitasking, Dual mode and multi mode operations, Distributed systems, Mobile computing, Client-server computing, Peer-to-peer computing, Cloud-computing, Real-time embedded systems.

#### **Process and Scheduling**

Concept of process, Process states, Process control block, Process Creation and termination, CPU Scheduling - short, medium and long term scheduling. Scheduling criteria, Scheduling algorithms - First Come First Serve, Shortest-Job-First, Round Robin, Priority based scheduling, Multilevel feedback queue scheduling.

#### **Threads**

Overview – Motivation and Benefits, Types of parallelism, Multi-threading models.

### **Module II [10L]**

#### **Inter-process Communication**

Shared-memory systems, Message-passing systems.

#### **Process Synchronization**

Race condition, Critical-Section problem and its solutions, Hardware support for synchronization, Mutex locks, Semaphores, Monitors; Discussion of Classical problems of

synchronization like the Bounded-Buffer problem, Readers-Writers problem, Dining-Philosopher's problem, Sleeping Barber problem.

### **Module III [10L]**

#### **Deadlock**

System model, Characterization, Prevention, Avoidance, Detection, Recovery.

#### **Memory Management**

Logical vs. Physical address space, Contiguous memory allocation, Paging, Segmentation, Swapping, Demand paging, Page replacement algorithms - FIFO, Optimal, LRU; Frame allocation, Thrashing, Working-set model.

### **Module IV [10L]**

#### **Disk Management**

Overview of disk structure, Disk scheduling algorithms - FCFS, SSTF, SCAN, C-SCAN, LOOK, C-LOOK.

#### **File Systems**

File attributes, File operations, File access methods, Directory structures, File allocation methods, Free space management.

#### **I/O Management**

I/O hardware, Memory-mapped I/O, Interrupts, Direct Memory Access, Application I/O interface - block and character devices, blocking and non-blocking I/O; Kernel I/O subsystem - Buffering, Caching, Spooling.

#### **Protection and Security**

Concepts of domain of protection, Access matrix, Access control. Security concepts - Program threats, System threats, Cryptography as security tool, User authentication.

#### **Text Books:**

1. Operating System Concepts - Silberschatz, Galvin, Gagne, Wiley.
2. Operating Systems Design and Implementation - Andrew S. Tanenbaum, Prentice Hall

#### **Reference Books:**

1. Operating Systems - Dietel, Dietel, Choffnes, 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.

<b>Paper Name: SOFT COMPUTING</b>					
<b>Paper Code: MCA1231</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA1231.1 Identify different soft computing concepts and technologies to solve real-time problems.
- MCA1231.2 Analyze genetic algorithms to solve single and multi-objective optimization problems.
- MCA1231.3 Identify different neural network architectures, algorithms, applications and their limitations.
- MCA1231.4 Relate the partial knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic.
- MCA1231.5 Substantiate the need for approximate analysis using rough set.
- MCA1231.6 Compare between various evolutionary algorithms and apply them suitably.

### **Module I [10L]**

#### **Introduction:**

Introduction to soft computing, different tools and techniques, contrasting features with Hard Computing, lineage with NP Completeness.

#### **Genetic algorithm (GA):**

Basic concepts, working principle, encoding, fitness function, genetic modeling: inheritance, selection, cross-over, mutation, overview of multi-objective genetic algorithm (MOGA).

### **Module II [10L]**

#### **Artificial Neural Network (ANN) :**

Structure and function of biological neuron, artificial neuron, definition of artificial neural network (ANN), taxonomy of neural net, characteristics and applications of ANN, Single layer network, multilayer perceptron (MLP), linear separability, Different activation functions, pattern association, back propagation algorithm, Kohonen's Self-organizing Map (SOM)

### **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, 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 systems.

**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), applications to real time problems.

**Text Books:**

1. Principles of soft computing - S. N. Sivanandam and S. N. Deepa, Wiley India.
2. Introduction to - S. Roy, U. Chakraborty, Pearson.

**Reference Books:**

1. Genetic Algorithms in search, Optimization & Machine Learning - David E. Goldberg, Pearson India.
2. Fundamentals of Neural Networks – Laurence Fausett, Pearson.
3. Fuzzy logic with Engineering Applications - Timothy J. Ross, John Wiley and Sons.
4. Multi-Objective Optimization using Evolutionary Algorithms - Kalyanmoy Deb, Wiley.



<b>Paper Name: CRYPTOGRAPHY AND NETWORK SECURITY</b>					
<b>Paper Code: MCA1232</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA1232.1 Recall the security goals, threats, vulnerabilities and attacks, types of attacks, security services and mechanisms.
- MCA1232.2 Apply different mathematical concepts for formulating cryptographic algorithms.
- MCA1232.3 Identify different symmetric key cryptographic algorithms.
- MCA1232.4 Examine different asymmetric key cryptographic algorithms and hash functions.
- MCA1232.5 Evaluate different authentication, e-mail, IP, web and system security applications.
- MCA1232.6 Appraise wireless network security.

### **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: Principals 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 – Atul Kahate, 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.

<b>Paper Name: DATA MINING AND KNOWLEDGE DISCOVERY</b>					
<b>Paper Code: MCA1233</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA1233.1 Describe basic concepts of data mining and related models.
- MCA1233.2 Explore data analysis by dimensionality reduction as well as information compression using PCA.
- MCA1233.3 Identify patterns using association rule mining.
- MCA1233.4 Deploy appropriate classification techniques to fit the data.
- MCA1233.5 Cluster the high dimensional data for better data organization.
- MCA1233.6 Implement the data mining algorithms for real world data.

### **Module I [10L]**

**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 [10L]**

**Ensemble Methods:** Bagging, Boosting.

**Classification Techniques I:** Decision tree, pre-pruning, post-pruning, Rule-based classification, Random Forests, K-nearest Neighbor.

### **Module III [10L]**

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

### **Module IV [10L]**

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

### **Text Books:**

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

**Reference Books:**

1. Mining Text Data. Charu C. Aggarwal and Cheng Xiang Zhai, Springer.
2. Data Mining Techniques - K. Pujari, Universities Press.
3. Data Warehousing, Data Mining and OLAP - Alex Berson and Stephen J Smith, TMH.
4. Introduction to Data Mining and Knowledge Discovery - Herbert A. Edelstein, Two Crows Corporation.

<b>Paper Name: ECOMMERCE</b>					
<b>Paper Code: MCA1234</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA1234.1 Elaborate the anatomy, framework of e-commerce.
- MCA1234.2 Identify the importance of cyber security and cyber laws for e-commerce applications.
- MCA1234.3 Analyse the impact of e-commerce on business model and enterprise strategy
- MCA1234.4 Use electronic payment systems like e-cheque, e-cash, credit and debit cards and smart cards
- MCA1234.5 Explain EDI, its applications in business, legal, security and privacy issues and its relation to electronic commerce
- MCA1234.6 Analyse the difference between mobile and electronic-commerce, types of mobile commerce services, technologies and its framework

### **Module I [10L]**

#### **Introduction of Electronic Commerce**

Electronic Commerce Framework, Electronic Commerce and Media Convergence, The anatomy of E Commerce Applications, Electronic Commerce Consumer Applications, Electronic Commerce Organization Applications. Market forces influencing the I-Way, Components of the I-Way, Network Access Equipment, The Last Mile: Local Roads and Access Ramps, Global Information Distribution Networks, Public Policy issues shaping the I Way.

### **Module II [10L]**

#### **Electronic Commerce Framework**

Architectural Framework for Electronic Commerce, Information Technology Act, definition, important terms under information technology legislation 2008, certifying authority, cyber regulations appellate tribunal, offences and penalties, Security and the Web, Consumer-Oriented Applications, Mercantile models from the Consumer's perspective, mercantile models from the merchant's perspective.

### **Module III [10L]**

#### **Electronic Payment Systems and EDI**

Types of Electronic Payment systems, Digital token based electronic payment systems, Smart

Cards and Electronic Payment Systems, Credit card based electronic Payment Systems, Risk and Electronic Payment Systems, Risk and Electronic Payment Systems, Designing Electronic Payment Systems. Electronic Data Interchange, EDI Applications in business, EDI: Legal, Security and Privacy issues, EDI and electronic Commerce.

#### **Module IV [10L]**

##### **M-Commerce**

Introduction, Infrastructure of M-Commerce, Types of Mobile Commerce Services, Technologies of Wireless Business, Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non-Internet Applications in M-Commerce, Wireless/Wired Commerce Comparisons.

Mobile Communication Networks: A Framework for the study of Mobile Commerce, NTT DoCoMo's I-Mode, Wireless Devices For Mobile Commerce, Towards A Classification Framework for Mobile Location Based Services, Wireless Personal And Local Area Networks, The Impact Of Technology Advances On Strategy Formulation In Mobile Communications Networks.

##### **Text Books:**

1. E-Commerce - A Managerial Perspective, Joseph.P.J. , Prentice Hall.
2. M-Commerce Crash Course - Louis.P.J, McGraw, Hill Companies.

##### **References:**

1. Mobile Commerce: Opportunities, Applications, and Technologies of Wireless Business - Paul May, Cambridge University Press.
2. Frontiers of Electronic Commerce - Ravi Kalakota, Andrew Winston, Pearson Education.
3. E-Commerce Essentials - Dr. K Abirami Devi & Dr. M Alagammai, Margham Publication.
4. E-commerce Business, Technology, Society - Kenneth C. Loudon, Karol Traver, Prentice Hall Publication.

<b>Paper Name: DATA STRUCTURES LAB</b>					
<b>Paper Code: MCA1251</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**Course Outcomes:**

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

- MCA1251.1 Demonstrate the concepts of Stack, Queue and Linked List and various operations on them.
- MCA1251.2 Suggest appropriate linear / non-linear data structure operations for solving a given problem.
- MCA1251.3 Write algorithms to implement different data structures and their operations.
- MCA1251.4 Solve the faults / errors that may appear due to wrong choice of data structure.
- MCA1251.5 Assess how the choice of data structures and algorithm design methods impacts the performance of programs.
- MCA1251.6 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 Binary search tree
5. Graph traversal, Spanning tree algorithms, Shortest path algorithms
6. Different searching and sorting algorithms.

<b>Paper Name: COMPUTER NETWORK LAB</b>					
<b>Paper Code: MCA1252</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

### **Course Outcomes:**

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

- MCA1252.1 Recall basic UNIX commands.
- MCA1252.2 Apply TCP and UDP sockets for client-server programming.
- MCA1252.3 Examine the different network routing protocols.
- MCA1252.4 Evaluate different error and flow control protocols.
- MCA1252.5 Design shell programming.
- MCA1252.6 Create a local area network and model different types of networks using network simulators.

### **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.



<b>Paper Name: DBMS LAB</b>					
<b>Paper Code: MCA1253</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**Course Outcomes:**

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

- MCA1253.1 Apply the RDBMS concepts to create various schema and instances in terms of tables and applying the key concepts, will be able to retrieve specific data from table/s through sub queries.
- MCA1253.2 Filter data from joining various tables.
- MCA1253.3 Use proper data control language to restrict the accessibility of data.
- MCA1253.4 Familiarize with PL/SQL programming including stored procedures, stored functions.
- MCA1253.5 Able to create triggers, cursors, packages using PL/SQL.
- MCA1253.6 Able to execute various advance SQL queries related to Transaction Processing and apply different types 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

- Sub queries

### **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 data type (Tables, ROWTYPE)
- Subprograms
  - Procedures
  - Functions
- Cursor Management
  - Implicit Cursor
  - Explicit Cursor
- Database Triggers
- Error Handling
- Packages

### **Topic 7: Transaction management**

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

<b>Paper Name: CAREER DEVELOPMENT AND MANAGEMENT</b>					
<b>Paper Code: HUM1221</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>0</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

### **Course Outcomes:**

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

- HUM1221.1 Employ the technique of SWOT analysis to decide goals and plans.
- HUM1221.2 Be able to map their skills according to the basic job profile.
- HUM1221.3 Upgrade and enhance generic and specific skills.
- HUM1221.4 Be aware of the dynamics of communication under diverse cultural setup.
- HUM1221.5 Be aware of the start-up eco system in India& acquire tools to take up entrepreneurship as a career opportunity.
- HUM1221.6 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 40

Assessment: Activity/case (20 marks)

##### **Reference Books:**

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

## Syllabus of 3<sup>rd</sup> Semester

<b>Paper Name: SOFTWARE ENGINEERING</b>					
<b>Paper Code: MCA2101</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### Course Outcomes:

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

- MCA2101.1 Exemplify the software engineering process, systems and security
- MCA2101.2 Explain software engineering process by identifying the requirements and system modelling.
- MCA2101.3 Design, develop and implement software based on requirement.
- MCA2101.4 Illustrate the evolution process, reuse and testing for developing quality software for customer.
- MCA2101.5 Describe the software management, project management, and planning and configuration management.
- MCA2101.6 Inspect emerging quality standards to build Software products.

### **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 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 - Roger S. Pressman, McGraw Hill.
2. Software Engineering - Ian Sommerville, Pearson.

#### **Reference Books:**

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

<b>Paper Name: WEB TECHNOLOGY</b>					
<b>Paper Code: MCA2102</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA2102.1 Identify the main components and functionality of the web, web browsers and servers.
- MCA2102.2 Apply techniques useful in the design and development of web projects including those like site maps, wireframes, storyboarding.
- MCA2102.3 Develop simple web pages using HTML5 and Cascading Style Sheets.
- MCA2102.4 Integrate JavaScript with HTML pages to create dynamic effects.
- MCA2102.5 Represent web data using XML.
- MCA2102.6 Create dynamic, database-driven web applications using PHP and MySQL.

### **Module I [10L]**

#### **Introduction**

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

#### **Web Browsers & Servers**

Browsers: Functionality, 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.

## **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, creating tables, inserting data, altering tables, queries, updating and deleting data and tables, PHP myadmin.

### **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.



<b>Paper Name: INTRODUCTION TO OPTIMIZATION</b>					
<b>Paper Code: MTH2102</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### Course Outcomes:

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

- MTH2102.1 Represent real-world optimization problems by mathematical models and solve them by various techniques.
- MTH2102.2 Categorize Transportation and Assignment problems.
- MTH2102.3 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.
- MTH2102.4 Understand the limitations of simplex method and have realistic approach towards practical problems using Integer Linear Programming Problem.
- MTH2102.5 Understand the significance of using PERT and CPM techniques for project management.
- MTH2102.6 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 - J. G. Chakraborty and P. R. Ghosh, Moulik Library.
2. Operations Research, Theory and Applications - J K Sharma, Laxmi Publications India Ltd.

##### **Reference Books:**

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

<b>Paper Name: MACHINE LEARNING</b>					
<b>Paper Code: MCA2131</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

**Course Outcomes:**

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

- MCA2131.1 Review the basics of machine learning paradigm and categorize between different types of learning.
- MCA2131.2 Apply linear or logistic regression for suitable dataset.
- MCA2131.3 Relate the generic Computational Learning Theory with real-time problems and measure the relative strength of different learning models.
- MCA2131.4 Predict data using the Naive Bayes algorithm.
- MCA2131.5 Classify data points using SVM.
- MCA2131.6 Construct neural networks and Deep learning models for classification problems.

**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.

**Overfitting:**

Introduction to Overfitting, Dealing with Overfitting, Concept of Regularization.

**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.

**Support Vector Machines (SVM):**

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

**Module IV [10L]****Neural Model:**

Recapitulation of basic model of Artificial Neural Network (ANN), Activation Function, Loss Function, Optimizer and Backpropagation algorithm, Introduction to Radial Basis Function.

**Deep Learning:**

The basics of Deep Learning, Deep Neural Network, Softmax Function, One-Hot encoding, Cross Entropy, Classification using Deep Learning techniques, Convolution Neural Network, Recurrent Neural Network, LSTM.

**Text Books:**

1. Computational Intelligence Principles - Techniques and Applications, Konar, Springer.
2. Machine Learning - T. Mitchell, McGraw-Hill.

**Reference Books:**

1. Fundamentals of Neural Networks – Laurence Fausett, Pearson.
2. Neural Networks and Learning Machines, Third Edition, S. Haykin, PHI Learning.
3. Pattern Recognition and Machine Learning - Christopher M. Bishop, Springer.
4. Deep Learning - Ian Goodfellow, Yoshua Bengio, Aaron Courville, Francis Bach, MIT Press.

<b>Paper Name: BLOCKCHAIN TECHNOLOGY AND APPLICATIONS</b>					
<b>Paper Code: MCA2132</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA2132.1 Recall basic cryptographic mechanisms like encryption, hashing and digital signature required for Blockchain.
- MCA2132.2 Summarize blockchain network, mining mechanism, distributed consensus, transactions, anonymity, reward, fork, private and public Blockchain.
- MCA2132.3 Demonstrate different distributed consensus models like proof of work (PoW) and proof of stake (PoS).
- MCA2132.4 Examine the working principle of cryptocurrencies like Bitcoin and Ethereum.
- MCA2132.5 Evaluate the current cryptocurrency regulations, legal aspects, cryptocurrency exchange, black market and global economy.
- MCA2132.6 Create blockchain applications in the domain of internet of things, e-governance, land registration, medical record management, domain name service, etc.

### **Module I [10L]**

#### **Cryptography 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 About Blockchain Wallet, Mining, Bitcoin, Ethereum, Litecoin, Zcash, Monero, Ripple, Dash, IOTA and Smart Contracts - Alan T. Norman, CreateSpace Independent Publishing Platform.
4. ETHEREUM: A Secure Decentralized Transaction Ledger - Dr. Gavin Wood, Yellow Paper.

<b>Paper Name: ANDROID APPLICATION DEVELOPEMENT</b>					
<b>Paper Code: MCA2133</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA2133.1 Identify various concepts of programming mobile applications that make it unique from programming for other platforms.
- MCA2133.2 Illustrate the various graphics and multimedia techniques used in android devices.
- MCA2133.3 Compare different ways of providing connectivity in android devices.
- MCA2133.4 Categorize the different types of notifications, alarms, sensors and location data gathering techniques in android devices.
- MCA2133.5 Demonstrate the interaction between different android components such as activities, services, broadcast receivers, and content providers.
- MCA2133.6 Develop applications for android mobiles.

### **Module I [10L]**

#### **Introduction**

Application fundamentals – App components, the manifest file, app resources. Development Frameworks and Tools.

#### **Devices**

Device compatibility, Introduction to Wear OS, Android TV, Android Auto and ChromeOS.

#### **Activities**

The concept of activities, the activity lifecycle, activity state changes, tasks and the back stack.

#### **User Interface**

Layouts, components, UI events, styles and themes.

### **Module II [10L]**

#### **Intents and Services**

Intent types, building an intent, intent resolution. Services overview, types of service, managing lifecycle of a service.

#### **Permissions**

Permissions on Android, Workflow for using permissions, Types of permissions, best practices.

## **Content Providers**

Overview, accessing a provider, retrieving data from a provider, creating a content provider.

## **Module III [10L]**

### **Connectivity**

Connecting to network, manage network usage, reading network state. Overview of Bluetooth, NFC, Wifi, VPN. The Android Telecom Framework.

### **Notifications and Alarms**

Notification – appearance on a device, anatomy, actions. Creating a notification. Scheduling alarms – inexact and exact, best practices.

## **Module IV [10L]**

### **Graphics and Multimedia**

Displaying graphics and videos, animations and transitions. Android multimedia.

### **Sensors and Location**

Sensor's overview, Motion, Position and Environmental sensors. Android Location Services.

### **Security**

App security best practices, mitigating security risks in an app, SDK best practices for user safety,

### **Text Books:**

1. Android for Absolute Beginners - Grant Allen, Apress.
2. Head First Android Development: A Brain-Friendly Guide – Dawn Griffiths, David Griffiths, Shroff/O'Reilly.

### **Reference Books:**

1. Android Application Development All-In-One for Dummies - Barry Burd and John Paul Mueller, Wiley.
2. Android Development with Android Studio – T. Mills, Hack Book Works.
3. Flutter for Beginners: An introductory guide to building cross-platform mobile applications with Flutter 2.5 and Dart - Thomas Bailey, Alessandro Biessek, Packt Publishing.
4. Beginning Flutter with Dart - Sanjib Sinha, Kindle edition.



<b>Paper Name: ENTERPRISE RESOURCE PLANNING</b>					
<b>Paper Code: MCA2134</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

**Course Outcomes:**

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

- MCA2134.1 Explain the basic concepts of ERP.
- MCA2134.2 Identify different technologies used in ERP.
- MCA2134.3 Apply the concepts of ERP Manufacturing Perspective and ERP Modules.
- MCA2134.4 Discuss the benefits of ERP.
- MCA2134.5 Implement the ERP life cycle.
- MCA2134.6 Apply different tools used in ERP.

**Module I [10L]**

**Introduction to ERP**

Enterprise – An Overview Integrated Management Information, Business Process, Introduction to ERP, Basic ERP Concepts, Risk of ERP, Benefit of ERP. Business Modeling, Integrated Data Model.

**ERP and Technology**

Business Process Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM),Customer Relationship Management(CRM), MIS -Management Information System,DSS - Decision Support System,EIS - Executive Information System. Advanced Technology and ERP.

**Module II [10L]**

**ERP Manufacturing Perspective and ERP Modules**

MRP - Material Requirement Planning, BOM - Bill Of Material, MRP - Manufacturing Resource Planning, DRP – Distributed Requirement Planning, PDM - Product Data Management. Finance, Plant Maintenance, Quality Management, Materials Management.

**Module III [10L]**

**Benefits of ERP**

Reduction of Lead-Time, On-time Shipment, Reduction in Cycle Time, Improved Resource Utilization, Better Customer Satisfaction, Improved Supplier Performance, Increased Flexibility, Reduced Quality, Costs, Improved Information Accuracy and Design making Capability.

## **ERP Life cycle**

Pre-evaluation Screening, Package Evaluation, Project Planning Phase, Gap Analysis, Reengineering, Configuration, Implementation Team Training, Testing, Going Live, End-user Training, Post implementation (Maintenance mode).

## **Module IV [10L]**

### **E-Commerce to Ebusiness**

E-Business structural transformation, Flexible Business Design, Customer Experience, Create the new techno enterprise, New generation e-business leaders, memo to CEO, Empower your customer, Integrate Sales and Service, Integrated Enterprise applications. Enterprise resource planning the E-business Backbone Enterprise architecture, planning, ERP usage in Real world, ERP Implementation, Future of ERP applications, EProcurement, E- Governance, Developing the E-Business Design. JD Edwards-Enterprise One. Microsoft Dynamics-CRM Module.

### **Text Books:**

1. Enterprise Resource Planning - Alexis Leon, Tata McGraw Hill.
2. Enterprise Resource Planning - Ravi Shankar & S. Jaiswal, Galgotia.

### **References:**

1. Guide to Planning ERP Application, Annetta Clewto and Dane Franklin, McGraw-Hill.
2. The SAP R/3 Handbook, Jose Antonio, McGraw – Hill
3. E-Business Network Resource planning using SAP R/3 Baan and PeopleSoft: A Practical Roadmap For Success - Dr. Ravi Kalakota.
4. Enterprise Resource Planning Diversified - Alexis Leon, TMH.

<b>Paper Name: AUTOMATA THEORY AND COMPILER DESIGN</b>					
<b>Paper Code: MCA2141</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA2141.1 Recognize the context of language from the perspective of Finite Automata Theory.
- MCA2141.2 Combine the ideas of both analysis and synthesis in the context of Compilation.
- MCA2141.3 Analyze the Chomsky hierarchy of formal grammar and identify the normal forms.
- MCA2141.4 Classify between top-down and bottom-up parsing and the related recovery strategies.
- MCA2141.5 Characterize the run-time environment and differentiate between intermediate forms of code.
- MCA2141.6 Apply code optimization techniques which will finally led to machine code generation.

### **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  $\epsilon$  transitions - Significance, acceptance of languages. Conversions and Equivalence : NFA to DFA conversion, Minimization 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, Non-recursive 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. Compiler Design - Aho, Ullman, Sethi& Lam, Pearson.
2. Compiler Design - O.G. Kakde, University Science Press.

#### **Reference Books:**

1. Theory of Computer Science – Automata languages and computation - Mishra and Chandrashekar, PHI.
2. Introduction to Computer Theory - Daniel I.A. Cohen, Wiley.
3. Engineering a Compiler - Keith Cooper & Linda Torczon, Morgan Kaufmann.
4. Compiler Design – Santanu Chattopadhyay, PHI.

<b>Paper Name: CLOUD COMPUTING</b>					
<b>Paper Code: MCA2142</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA2142.1 Recall basic cloud computing concepts like cloud models, service models, characteristics, benefits and limitations of cloud computing.
- MCA2142.2 Differentiate among IaaS, PaaS, SaaS and IDaaS.
- MCA2142.3 Interpret different concepts of abstraction and virtualization.
- MCA2142.4 Examine the solution offerings from industry leaders like Amazon and Google.
- MCA2142.5 Evaluate different cloud-based storage, cloud security and data security.
- MCA2142.6 Design cloud applications for different real life scenarios.

### **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), Software as a Service (SaaS), Container as a service (CaaS), Characteristics of Cloud Computing, Benefits and Limitations of Cloud Computing.

### **Module II [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), CaaS.

### **Module III [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.

Azure

## **Module IV [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.
2. Mastering Cloud Computing - Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, McGraw Hill.

### **Reference Books:**

1. Introduction to Cloud Computing Architecture: White Paper, Sun Microsystems Inc.
2. GFS: Evolution on Fast-Forward – Kirk McKusick (BSD/BFFs) interviews Sean Quinlan (former GFS Tech Leader), CACM.
3. The Google File System (GFS) - Sanjay Ghemawat, Howard Gobioff, Shun-Tak Leung.
4. The Hadoop Distributed File System: Architecture and Design - Dhruba Borthakur, Apache Software Foundation.

<b>Paper Name: DATA SCIENCE</b>					
<b>Paper Code: MCA2143</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### **Course Outcomes:**

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

- MCA2143.1 Categorize how data is collected, managed and stored.
- MCA2143.2 Describe the key concepts in data science and popular statistical measures used by data scientists.
- MCA2143.3 Build skills over various types of ML Algorithms.
- MCA2143.4 Demonstrate proficiency with statistical measures using data Visualization.
- MCA2143.5 Develop ability to build, analyze, exploration and assess data-based models.
- MCA2143.6 Apply the concepts and algorithms to solve the real-life application.

### **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 - T. Mitchell, McGraw-Hill.

### **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 - Sheldon Ross; Pearson Education Inc.
4. Mining of Massive Datasets v2.1 - Jure Leskovek, Anand Rajaraman and Jeffrey Ullman; Cambridge University Press.



<b>Paper Name: MANAGEMENT INFORMATION SYSTEM</b>					
<b>Paper Code: MCA2144</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>3</b>

### Course Outcomes:

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

- MCA2144.1 Relate the basic concepts and technologies used in the field of management information Systems.
- MCA2144.2 Compare the processes of developing and implementing information systems.
- MCA2144.3 Outline the role of the ethical, social, and security issues of information systems.
- MCA2144.4 Translate the role of information systems in organizations, the strategic management processes, with the implications for the management.
- MCA2144.5 Apply the understanding of how various information systems work together to accomplish the information objectives of an organization.
- MCA2144.6 Assess information security and infrastructure requirement.

### **Module I [10L]**

#### **Management Information Systems (MIS)**

Perspectives on Information Systems, Nature and scope of MIS, Characteristics of MIS, Need and Role of MIS, Impact of MIS, functions and future of MIS, MIS: A support to the management, MIS: organization effectiveness, MIS for a digital firm Case Study on digital firm.

#### **Information System and MIS:**

#### **Organisations and Information Systems**

Modern Organisation, Information Systems in Organisations, Managing Information Systems in Organisations

#### **Concepts of Management Information Systems**

Data and Information, Information as a Resource, Information in Organisational Functions, Types of Information, Types of Information Systems, Decision Making with MIS, Communication in Organizations. Case Study: Management Issues- Challenges for Managers.

### **Module II [10L]**

**Decision Support System, Knowledge Management and Management of Global Enterprise**

Decision Support System(DSS), DSS Models, Group Decision Support System(GDSS), Knowledge based Expert System(KBES), Enterprise Resource Planning(ERP) System, ERP Model and Modules, Benefits of ERP, Supply Chain Management(SCM), Information Management in SCM, Customer Relationship Management (CRM). Study of EMS and MIS.

### **Module III [10L]**

#### **Business Intelligence for MIS**

Business Intelligence and MIS, what is Business Intelligence (BI), Tools and Techniques of BI, why is BI Developed? How is BI used? Process of generation of BI, MIS and BI. Case illustration of BI

#### **Managing Information Systems and Information Technology Infrastructure:**

##### **Managing Information System**

Challenges of Managing the IT Function, Vendor Management, IT Governance,

### **Module IV [10L]**

#### **Information Technology Infrastructure and Choices:**

What is the IT Infrastructure? IT Infrastructure Decisions, Infrastructure Components, Networks

Case Study of Managing Information System

##### **Information Security**

Introduction, Threats and Vulnerability, Controlling Security Threat and Vulnerability, Managing Security Threat in E-Business, Measures of Information Security, Information Security Management. Network Security, and Cyber Security for Information

#### **Text Books:**

1. Management Information Systems - Jawadekar, W.S., Tata McGraw Hill Private Limited, New Delhi.
2. Management Information Systems - Kenneth C. Laudon and Jane P. Laudon, Pearson Education, New Delhi.

#### **Reference Books:**

1. Data Base Management Systems - Alex Leon and Mathew Leon, Vikas Publishing House, New Delhi.
2. Management Information System - Goyal, D.P., MACMILLAN India Limited, New Delhi.
3. Management Information System - Mahadeo Jaiswal, Monika Mital, Oxford University Press, New Delhi.
4. Management Information System - Murthy C.S.V. , Himalaya Publications, New Delhi.



<b>Paper Name: SOFTWARE ENGINEERING LAB</b>					
<b>Paper Code: MCA2151</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

### **Course Outcomes:**

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

- MCA2151.1 Elaborate the problem and identify project scope and objectives.
- MCA2151.2 Analyse the software requirements and prepare SRS document.
- MCA2151.3 Identify ambiguities, inconsistencies and incompleteness from a requirements specification and state functional and non-functional requirement.
- MCA2151.4 Demonstrate how to generate a high-level design of the system from the software requirements.
- MCA2151.5 Develop the design of software using UML diagrams.
- MCA2151.6 Acquire knowledge about open source tools used for implementing software engineering methods

### **Problems related to**

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

<b>Paper Name: WEB TECHNOLOGY LAB</b>					
<b>Paper Code: MCA2152</b>					
<b>Contact hrs per week</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>	<b>Credit Points</b>
	<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

### **Course Outcomes:**

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

- MCA2152.1 Analyze a web page and identify its elements and attributes.
- MCA2152.2 Design web pages using HTML5.
- MCA2152.3 Combine styles to web pages using CSS.
- MCA2152.4 Use JavaScript in web pages for dynamic effects.
- MCA2152.5 Construct well formed and valid XML documents.
- MCA2152.6 Develop dynamic, database-driven web applications using PHP and MySQL.

### **HTML**

Design web pages incorporating the following features - Basic Text Formatting & Presentation, HTML lists, Links and URLs, Images, Tables, HTML forms.

### **CSS**

Combine style elements with HTML pages for styling - Background, Fonts, Lists, Displaying, positioning and floating an element, Table Layouts, Pseudo classes and pseudo elements.

### **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. Write a well formed XML document.
2. Validate an XML document.

### **PHP**

1. Writing methods to implement GET and POST requests.
2. Implementing cookies and sessions.

### **DATABASE CONNECTIVITY**

1. Connecting to MySQL through PHP.
2. Query processing to retrieve data from database and update tables.