

**DEPARTMENT  
OF  
MASTER OF COMPUTER APPLICATIONS**



**MOUNT CARMEL COLLEGE AUTONOMOUS**

**58, PALACE ROAD,  
BENGALURU - 560052**

**MOUNT CARMEL COLLEGE AUTONOMOUS**

**Affiliated to Bengaluru Central University**

**MCA SYLLABUS**

**CHOICE BASED CREDIT SYSTEM**

**(w.e.f. 2019 BATCH onwards)**

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**Mount Carmel College  
Autonomous**

**MCA Syllabus  
Choice Based Credit System  
(w.e.f. 2019 batch onwards)**

**I SEMESTER**

Sem	Paper Code	Paper Title	No. of Hours (per week)			Total	Marks			
			L	T	P	Credit	CIA	ESE	Total	
I	1MCACC1	Programming and Problem Solving Using C	4	-	-	4	30	70	100	
	1MCACC2	Computer Organization and Architecture	4	-	-	4	30	70	100	
	1MCACC3	Discrete Mathematics	4	-	-	4	30	70	100	
	1MCACC4	Management Information Systems	4	-	-	4	30	70	100	
	1MCAAC1	Accounting and Financial Management	3	1	-	2	30	70	100	
	1MCAP1	C Programming in Linux Lab	-	-	6	3	30	70	100	
	1MCAP2	Web Programming Lab	-	-	6	3	30	70	100	
	Total			19	1	12	24	210	490	700

L – Lecture

T – Tutorial

P – Practical

CIA – Continuous Internal Assessment

ESE – End Semester Examination

## II SEMESTER

Sem	Paper Code	Paper Title	No. of Hours (per week)			Total	Marks			
			L	T	P	Credit	CIA	ESE	Total	
<b>II</b>	2MCACC1	Database Management Systems	4	-	-	<b>4</b>	30	70	100	
	2MCACC2	Operating Systems	4	-	-	<b>4</b>	30	70	100	
	2MCACC3	Data and File Structures	4	-	-	<b>4</b>	30	70	100	
	2MCACC4	Java Programming	4	-	-	<b>4</b>	30	70	100	
	2MCAAC1	Probability and Statistics	3	1	-	<b>2</b>	30	70	100	
	2MCAP1	Java Programming Lab	-	-	6	<b>3</b>	30	70	100	
	2MCAP2	Data and File Structures Lab	-	-	6	<b>3</b>	30	70	100	
	Total			<b>19</b>	1	<b>12</b>	<b>24</b>	<b>210</b>	<b>490</b>	<b>700</b>

L – Lecture

T – Tutorial

P – Practical

CIA – Continuous Internal Assessment

ESE – End Semester Examination

### III SEMESTER

Sem	Paper Code	Paper Title	No. of Hours (per week)			Total	Marks			
			L	T	P	Credit	CIA (30)	ESE (70)	Total (100)	
<b>III</b>	3MCACC1	Advanced Web Programming	4	-	-	<b>4</b>	30	70	100	
	3MCACC2	Finite Automata and Formal Languages	4	-	-	<b>4</b>	30	70	100	
	3MCACC3	Software Engineering	4	-	-	<b>4</b>	30	70	100	
	3MCACC4	Mobile Applications Development	4	-	-	<b>4</b>	30	70	100	
	3MCAP1	DBMS Lab	-	-	6	<b>3</b>	30	70	100	
	3MCAP2	Advanced Web Programming Lab	-	-	6	<b>3</b>	30	70	100	
	3MCAP3	Mobile Applications Development Lab	-	-	6	<b>3</b>	30	70	100	
	Total			<b>16</b>	-	<b>18</b>	<b>25</b>	<b>210</b>	<b>490</b>	<b>700</b>

L – Lecture

T – Tutorial

P – Practical

CIA – Continuous Internal Assessment

ESE – End Semester Examination

## IV SEMESTER

Sem	Paper Code	Paper Title	No. of Hours (per week)			Total	Marks			
			L	T	P	Credit	CIA (30)	ESE (70)	Total (100)	
IV	4MCACC1	Data Communication and Computer Networks	4	-	-	4	30	70	100	
	4MCACC2	Design and Analysis of Algorithms	4	-	-	4	30	70	100	
	4MCACC3	Data Warehousing and Knowledge Mining	4	-	-	4	30	70	100	
	4MCAEC11/ 4MCAEC12/ 4MCAEC13	Elective 1	4	-	-	4	30	70	100	
	4MCAP1	UML and Software Testing Tools Lab	-	-	6	3	30	70	100	
	4MCAP2	Data Analytics Lab	-	-	6	3	30	70	100	
	4MCAECP11/ 4MCAECP12/ 4MCAECP13	Elective 1 Lab	-	-	6	3	30	70	100	
	Total			16	-	18	25	210	490	700

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### Elective 1

**4MCAEC11 Multimedia Systems and  
Communications**  
4MCAEC12 Open Source Technologies  
Technologies Lab  
**4MCAEC13 Artificial Intelligence**

### Elective 1 Lab

**4MCAECP11 Multimedia  
Lab**  
4MCAECP12 Open Source  
**4MCAECP13 J2EE Lab**

## V SEMESTER

Sem	Paper Code	Paper Title	No. of Hours (per week)			Total	Marks			
			L	T	P	Credit	CIA (30)	ESE (70)	Total (100)	
<b>V</b>	5MCACC1	Machine Learning using Python	4	-	-	<b>4</b>	30	70	100	
	5MCACC2	Network Information Security	4	-	-	<b>4</b>	30	70	100	
	5MCACC3	Cloud Computing	4	-	-	<b>4</b>	30	70	100	
	5MCAEC21/ 5MCAEC22/ 5MCAEC23	Elective 2	4	-	-	<b>4</b>	30	70	100	
	5MCAP1	Cloud Computing Lab	-	2	4	<b>3</b>	30	70	100	
	5MCAP2	Python Programming Lab	-	-	6	<b>3</b>	30	70	100	
	5MCAECP21/ 5MCAECP22/ 5MCAECP23	Elective 2 Lab	-	-	6	<b>3</b>	30	70	100	
	5MCAIMC1	Open Elective	2	-	-	<b>2</b>	15	35	50	
	Total			<b>18</b>	<b>2</b>	<b>16</b>	<b>27</b>	<b>225</b>	<b>525</b>	<b>750</b>

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### Elective 2

**5MCAEC21 Digital Image Processing**  
**5MCAEC22 Internet of Things**  
5MCAEC23 System Modeling and  
Simulation

### Elective 2 Lab

**5MCAECP21 Digital Image Processing Lab**  
**5MCAECP22 Internet of things Lab**  
5MCAECP23 System Modeling and Simulation  
Lab

**Inter/Multidisciplinary Course: 5MCAIMC13D Animation using Maya**

**VI SEMESTER**

Sem	Paper Code	Paper Title	Total	Marks			
			Credit	CIA	ESE	Total	
VI	6MCAEC31	Elective 3	4	30	70	100	
	6MCAEC32	Elective 4	4	30	70	100	
	6MCACC1	Project	8	60	140	200	
	6MCACDP1	Community Development Project	1	-	50	50	
	Total			17	120	330	450

**Elective 3 & 4:**

- Advanced Algorithm
  - Optimization Techniques
  - Advanced Networks
  - **Storage Area Networks**
  - Parallel Computing
  - **Software Project Management**
  - Big Data Analytics
  - Software Testing and Quality Assurance
  - Enterprise Resource Planning
  - Neural Networks
  - Services Oriented Architecture
  - Data Visualization
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# **Detailed Syllabus**

**1MCACC1: PROGRAMMING AND PROBLEM SOLVING USING C****Total No. of Hours: 52****Hours/Week: 04**

**Course Objective:** To acquire problem solving techniques and implement in computer Programming.

**Course Outcome:** Students will be able to

**CO1:** Understand the basic concepts of programming, C compiler and problem solving through C by writing algorithms.

**CO2:** Familiarize with variables, operators, expressions, input and output statements.

**CO3:** Learn decision making statement and looping structure.

**CO4:** Implement programs using Arrays, Pointers Structures, Unions and Functions.

**CO5:** Implement file concepts and Strings in programs and executing through command prompt.

<b>UNIT I</b>	<b>Introduction to Programming and Problem Solving:</b> The Problem solving aspect – Top-down design – Implementation of algorithm – program verification – the efficiency of algorithms – The analysis of algorithms. <b>Introduction to C:</b> Compilers and Interpreters –Structure of a C Program – Programming rules – Program execution	<b>08hrs</b>
<b>UNIT II</b>	<b>The C Declaration:</b> The C character set – Delimiters – C keywords – Identifiers –Constants - Variables – Rules for defining variables – Data types – Declaring variables – Initializing variables – Type conversion <b>Operators and Expressions:</b> Arithmetic, Relational, Logical and Bitwise operators – Priority of operators – comma and conditional operators. <b>Input and Output in C:</b> Formatted Functions – Unformatted functions – Commonly used Library functions.	<b>10 hrs</b>
<b>UNIT III</b>	<b>Decision Statement:</b> the <i>if</i> statement – <i>if...else</i> – Nested if-else statement – break – continue – goto – switch – Nested switch statement. <b>Loop control statement:</b> for loop – Nested for loop – While loop – do-while loop. <b>Arrays:</b> Array definition – initialization of array – characteristics of array – 1D and 2D array – Multidimensional array. <b>Strings and Standard functions:</b> Declaration and initialization of string – string standard functions – applications of strings.	<b>10 hrs</b>
<b>UNIT IV</b>	<b>Functions:</b> Definition of functions – declaration and prototype – return statement – call by value and call by reference – function arguments – Recursion. <b>Pointers:</b> Features of pointers – pointer declaration – arithmetic operations with pointers – pointers and arrays – Pointers to pointers – Pointers to Strings. <b>Storage class:</b> Automatic variables – External variables – Static variables – Register variables. <b>Structure and Union:</b> Features of structures – declaration and initialization of structures – Nested structure – Array of structures – Pointers to	<b>12 hrs</b>

	structure – Structure and functions – Bit fields – Union – calling BIOS and DOS service.	
<b>UNIT V</b>	<b>Files:</b> Streams and File types – Steps for file operations – File I/O – Structures Read and Write – Other file functions – Errors in reading and Writing files. Command line argument.	<b>12 hrs</b>

### REFERENCE BOOKS

- [1] R.G. Dromey, “*How to solve it by Computers*”, PHI
- [2] Ashok N. Kamthane, “*Programming with ANSI and Turbo C*”, Pearson Education
- [3] Brian Kernighan, W., Dennis Ritchie, M., “*The C Programming Language*”, Prentice Hall of India Pvt. Ltd., Second Edition.
- [4] Deitel and Deitel, “*C How to Program*”, Pearson Education, Sixth Edition.
- [5] Herbert Schildt, “*The Complete Reference C*”, Tata McGraw Hill, Fourth Edition.
- [6] YashwantKanetkar, “*Let Us C*”, BPB Publications, Sixth Edition.

## 1MCACC2: COMPUTER ORGANIZATION AND ARCHITECTURE

**Total No. of Hours: 52**

**Hours/Week: 4**

**Course Objective:** To understand the concept of organization and system architecture.

**Course Outcome:** Students will be able to

**CO1:** Design trade-offs Basic fundamentals in digital logic & structure of a digital computer

**CO2:** Identify performance issues in processor and memory design of a digital computer.

**CO3:** Develop independent learning skills and be able to learn more about different computer architectures and hardware

**CO4:** Articulate design issues in the development of Multiprocessor organization & architecture

<b>UNIT I</b>	<b>Fundamentals of Digital Logic:</b> Boolean Algebra, Logic Gates, Simplification of Logic Circuits: Algebraic Simplification, Karnaugh Maps. Combinational Circuits : Adders, Mux, De-Mux, Sequential Circuits : Flip-Flops (SR, JK & D), Counters : synchronous and asynchronous Counter	12
<b>UNIT II</b>	<b>Computer System:</b> Comparison of Computer Organization & Architecture, Computer Components and Functions, Interconnection Structures. Bus Interconnections, Input / Output: I/O Module, Programmed I/O, Interrupt Driven I/O, Direct Memory Access	10
<b>UNIT III</b>	<b>Memory System Organization:</b> Classification and design parameters, Memory Hierarchy, Internal Memory: RAM, SRAM and DRAM, Interleaved and Associative Memory. Cache Memory: Design Principles, Memory mappings, Replacement Algorithms, Cache performance, Cache Coherence. Virtual Memory, External Memory : Magnetic Discs, Optical Memory, Flash Memories, RAID Levels	8
<b>UNIT IV</b>	<b>Processor Organization:</b> Instruction Formats, Instruction Sets, Addressing Modes, Addressing Modes Examples with Assembly Language [8085/8086 CPU], Processor Organization, Structure and Function. Register Organization, Instruction Cycle, Instruction Pipelining. Introduction to RISC and CISC Architecture, Instruction Level Parallelism and Superscalar Processors: Design Issues.	10
<b>UNIT V</b>	<b>Control Unit:</b> Micro-Operations, Functional Requirements, Processor Control, Hardwired Implementation, Micro-programmed Control <b>Fundamentals of Advanced Computer Architecture:</b> Parallel Architecture: Classification of Parallel Systems, Flynn's Taxonomy, Array Processors, Clusters, and NUMA Computers. Multiprocessor Systems: Structure & Interconnection Networks, Multi-Core Computers: Introduction, Organization and Performance.	12

**REFERENCE BOOKS**

- [1] Modern Digital Electronics, R.P.Jain, 4e, Tata Mc Graw Hill.
- [2] Computer Organization & Architecture, William Stallings, 8e, Pearson Education.
- [3] Computer Architecture & Organization, John P. Hayes, 3e, Tata McGraw Hill.
- [4] Computer Organization, 5e, Carl Hamacher, Zconko Vranesic & Safwat Zaky, Tata McGraw Hill.
- [5] Digital Computer Fundamentals, Bartee C. Thomas, McGraw-Hill International Edition.
- [6] Computer System Architecture, M. Morris Mano, Pearson Education.
- [7] Computer Architecture & Organization, Nicholas Carter, McGraw Hill.
- [8] Computer Architecture & Organization, 2e, Miles Murdocca & Vincent Heuring, Wiley India.

**1MCACC3: DISCRETE MATHEMATICS****Total No. of Hours: 52****Hours/Week: 04**

**Course Objective:** To equip with mathematical skills for automating, simulating and modeling computer hardware and software systems.

**Course Outcome:** Students will be able to

**CO1:** Understand the concept of logical reasoning

**CO2:** Implement various algorithms using principles of mathematical induction

**CO3:** Interpret the importance of set theory concepts

**CO4:** Understand the importance of graph theory and its applications

<b>UNIT I</b>	Introduction to logic: Methods of proof, Rules of inference, valid arguments, Rules of inference for quantified statements. Principle of Mathematical Induction. Basic counting principles, the product rule and the sum rule, Examples to illustrate sum and product rule. The inclusion exclusion principle and examples, Pigeonhole Principle and examples.	<b>08 hrs</b>
<b>UNIT II</b>	Review of set theory concepts, Definition and types of relations. Representing relations using matrices and digraphs. Closure of relations, Transitive closure, Warshall's algorithm. Recurrence relations, modeling with recurrence relations with example of Fibonacci numbers. Generating function- definition with examples, List of generating functions. Partial orderings, Hasse diagrams, Maximal and minimal elements.	<b>12 hrs</b>
<b>UNIT III</b>	Introduction to Graph Theory, types of graphs Basic terminology, Sub graphs, Representing graphs as incidence matrix and adjacency matrix. Graph Isomorphism connectedness and simple graphs paths and cycles in graphs and digraphs, planar graphs, graph coloring. Trees, Rooted trees, Binary trees, properties of Trees, Minimal Spanning Trees, Network Flows-Graphs as Models of Flow of Commodities, Flows.	<b>12 hrs</b>
<b>UNIT IV</b>	Error analysis, Polynomial, algebraic and transcendental equations, Solution of equations -Bisection method, Fixed point iteration method, Newton Raphson method, convergence. System of linear equations- Solution by direct methods-Gauss Jordan method, LU decomposition method. Solution by iterative methods- Gauss Seidal method, Jacobi's method.	<b>10 hrs</b>
<b>UNIT V</b>	Numerical solutions of First order linear Ordinary Differential equations- Euler and Picard methods. Runge Kutta methods (III & IV level). Introduction to Eigenvalues and Eigenvectors.	<b>10 hrs</b>

**REFERENCE BOOKS**

- [1] C.L. Liu, “*Elements of Discrete Mathematics*”, Tata McGraw Hill, Second Edition.
- [2] J. L. Mott, A. Kandel and T. P. Baker, “*Discrete Mathematics for Computer Scientists and Mathematicians*”, Prentice Hall of India, Second Edition.
- [3] K. Shankar Rao, “*Numerical methods for Scientists and Engineers*”, Prentice Hall Publications, Second Edition.
- [4] M. K. Jain, S. R. Iyengar and R. K. Jain, “*Numerical Methods*”, Second Edition.
- [5] J. P. Trembly and R. P. Manohar, “*Discrete Mathematical Structures with applications to Computer Science*”, McGraw Hill.
- [6] F. Harary, “*Graph Theory*”, Addition Wesley.
- [7] J. H. Van Lint and R. M. Wilson, “*A course on Combinatorics*”, Cambridge University Press.
- [8] Gerald and Wheatly, “*Applied Numerical Analysis*”, Prentice-Hall Publications.
- [9] E. V. Krishnamurthy and S. K. Sen, “*Numerical Algorithms*”, East West Press.
- [10] E Balagurusamy, “*Numerical Methods*”, Tata McGraw Hill Publications.

## 1MCACC4: MANAGEMENT INFORMATION SYSTEMS

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To gain managerial skills and understanding of business environment aspects.

**Course Outcome:** Students will be able to

**CO1:** Understand the role of Information System in business and describe the Organizational Structure.

**CO2:** Analyze and identify the components of an Information System in an organization.

**CO3:** Interpret the applications of current input, output and storage technologies applied in business systems.

**CO4:** Comprehend the business applications concepts and the role of E-Commerce.

**CO5:** Understand the importance of DSS in business and also analyze the security and ethical challenges of IT in business.

<b>UNIT I</b>	<b>Introduction to MIS:</b> Information Systems in Business – The Components of Information Systems – Fundamentals of Strategic Advantage, Using IS for Strategic Advantage. <b>Computer Hardware and Software:</b> End-User and Enterprise Computing – Input, Output and Storage Technologies – Application software, Computer system Management – Fundamentals of Database Management – Managing Data resources.	<b>10 hrs</b>
<b>UNIT II</b>	<b>e-Business Systems:</b> -Introduction, Functional business systems <b>Enterprise Business System:</b> Customer Relationship Management – Enterprise Resource Planning – Supply Chain Management.	<b>12 hrs</b>
<b>UNIT III</b>	<b>Electronic Commerce systems:</b> Fundamentals of Electronic commerce – e-Commerce Applications and Issues.	<b>10 hrs</b>
<b>UNIT IV</b>	<b>Decision Support Systems:</b> Decision support systems in business – Developing Business Systems – Implementing Business systems.	<b>10 hrs</b>
<b>UNIT V</b>	<b>Security and Ethical Challenges:</b> Security, Ethical and Societal Challenges of IT – Security Management of Information Technology.	<b>10 hrs</b>

### REFERENCE BOOKS

- [1] James A O'Brien, George M Marakas, Ramesh Behl "Management Information Systems", McGraw Hill, Seventh edition
- [2] Murdick, "Information System for Modern Management", PHI.
- [3] Jawadekar, "Management Information System", TMH.
- [4] Jain Sarika, "Information System", PPM
- [5] Davis, "Information System", Palgrave Macmillan



## 1MCAAC1: ACCOUNTING AND FINANCIAL MANAGEMENT

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To explore the application of computers in the field of Accounting and Finance.

**Course Outcome:** Students will be able to

**CO1:** Understand the basic concepts, principles and conventions of accounting

**CO2:** Familiarize with income statement and balance sheet

**CO3:** Understand the importance of cost accounting and preparation of cost sheet

**CO4:** Apply concepts of financial accounting using computer application software

<b>UNIT I</b>	<p><b>Financial Accounting :</b> Accounting Principles, concepts and conventions, Double-entry system of Accounting – subsidiary books - trial balance – Trading and Profit and loss account and –v balance sheet of sole proprietary concerns (without adjustments)</p> <p><b>Company accounts</b> – features of company – Types of companies- Advantages of Companies- shares and Debentures (theory) - Format of final accounts of companies (no problems).</p>	<b>16 hrs</b>
<b>UNIT II</b>	<p><b>Financial statement Analysis</b> – meaning-need- common size-comparative – trends (income statement and Balance sheet – simple problems) Ratio analysis – meaning only Profitability ratios.</p>	<b>12 hrs</b>
<b>UNIT III</b>	<p><b>Cost Accounting:</b> Meaning – importance-objectives- methods of costing- Elements of cost- Preparation of Cost sheet.</p>	<b>10 hrs</b>
<b>UNIT IV</b>	<p><b>Financial Management</b>-meaning – Goals – Functional areas of financial management – Financial Decisions overview</p> <ol style="list-style-type: none"> <li>1. Investment decisions               <ol style="list-style-type: none"> <li>a) Capital budgeting</li> <li>b) Working capital management</li> </ol> </li> <li>2. Financing Decision :Capital structure</li> </ol> <p>Dividend decision</p>	<b>10 hrs</b>
<b>UNIT V</b>	<p><b>Introduction to computerized accounting-</b> application packages in accounting- Tally.</p>	<b>04 hrs</b>

**REFERENCE BOOKS**

- [1] Mohan Juneja, "*Financial Accounting*", Kalyani publishers.
- [2] R L Gupta & Radha Swamy, "*Introduction to Accounting*", Sultan Chand Publishers.
- [3] Sharma and Sashi Gupta, "*Financial Management*", Kalyani publishers.
- [4] I M Panda, "*Financial Management*", Vikas Publications.
- [5] Neeraj Sharma, "*Computerized Accounting and Business Systems*", Kalyani publishers.
- [6] Sukla and Grewal, "*Introduction to Accounting*" S Chand & Co.

**1MCAP1: C PROGRAMMING in LINUX LAB****Total No. of Hours: 72****Hours/Week: 06**

<b>Ex.No.</b>	<b>PART A</b>
<b>1</b>	Simple examples on Sequential structure with operators
<b>2</b>	Programs using Selective Controls
<b>3</b>	Illustration of Multi-way Selection control
<b>4</b>	Programs on Looping Controls
<b>5</b>	Programs using functions
<b>6</b>	Illustration of function: Call by Value and Call by Reference
<b>7</b>	Recursive functions
<b>8</b>	Demonstrate the concept of Arrays ( 1D & 2D)
<b>PART B</b>	
<b>9</b>	String Manipulation
<b>10</b>	Illustrate the use of pointers
<b>11</b>	Illustration of structure and nested structure
<b>12</b>	Demonstrate the concept of union
<b>13</b>	Demonstrate Bitwise operators
<b>14</b>	Demonstrate the concept of text files
<b>15</b>	Demonstrate the concept of binary files

**Scheme of Evaluation**

<b>Sections</b>	<b>Criteria</b>	<b>Marks</b>
<b>PART A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
<b>PART B</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
	Enhancement	10
	Viva	10
<b>Total</b>		<b>70</b>

**1MCAP2: WEB PROGRAMMING LAB****Total No. of Hours: 72****Hours/Week: 06**

<b>Ex.No.</b>	<b>PART A</b>
<b>1</b>	Create a Web page by making use of the following tags: Headers, Linking and Images.
<b>2</b>	Create a Web page that will have the following: Frames, Unordered Lists, Nested and ordered Lists
<b>3</b>	Create a Web page Layout with Tables and all its attributes
<b>4</b>	Create a Web page that will have Application form (Forms) , make use of Image Maps and <meta> Tags
<b>5</b>	Create an External Style Sheet that defines the style for the following tag: H1, H2, Body , P, Li .
<b>6</b>	Create an Internal Style Sheet that defines a style for Positioning elements & setting the background (color / image)
<b>7</b>	Create a Style Sheets that defines the style with class method , Id method , make use of DIV and Span TAG
<b>8</b>	Create a style Sheet that demonstrate Box Model
<b>9</b>	Write a JavaScript program to Demonstrate the use of Variable , message box , and loops
<b>10</b>	Write a JavaScript Program to demonstrate Functions (predefined / user defined)
<b>PART B</b>	
<b>11</b>	Write a PHP program to demonstrate GET and POST method of passing the data between pages
<b>12</b>	Write a PHP program to demonstrate Array , Key-pair values
<b>13</b>	Write a PHP program to read and write the Data from the Database
<b>14</b>	Create a PHP page that uses Session and cookies
<b>15</b>	File Handling in PHP
<b>16</b>	Implementing the OOPs concept in PHP

**Scheme of Evaluation**

<b>Sections</b>	<b>Criteria</b>	<b>Marks</b>
<b>PART A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
<b>PART B</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
	Enhancement	10
	Viva	10
<b>Total</b>		<b>70</b>

## 2MCACC1: DATABASE MANAGEMENT SYSTEMS

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To understand the concept of data modelling, file management and data management.

**Course Outcome:** Students will be able to

**CO1:** Describe basic concepts of database management systems

**CO2:** Design and develop database application software using RDBMS, relational Algebra and SQL programming

**CO3:** Understand the security aspects of DBMS

**CO4:** Explore the importance of distributed and object oriented design architecture and features.

<b>UNIT I</b>	<p><b>Introduction:</b> Data, Information, Database management system, characteristics, applications, advantages, costs and risks of DBMS approach, database users. DB Languages, User Interfaces.</p> <p>Database system concepts, DBMS Architecture, Data models–Relational, Network, Hierarchical, Schemas, Three schema Architecture Data Independence- logical and physical data independence.</p>	<b>10 hrs</b>
<b>UNIT II</b>	<p><b>Storage structure and file Organization:</b> Primary and secondary storage devices, sequential, indexed sequential, random file access, hashing techniques.</p> <p><b>E-R data model:</b> Entities, attributes, relationships, relationship types, roles, constraints. Different types of attributes, Case Study: Domain based problem - Company database, naming conventions, design issues, conceptual design, Drawing E-R diagrams</p>	<b>10 hrs</b>
<b>UNIT III</b>	<p><b>Relational data model:</b> concepts, Relational constraints - domain, key, entity integrity and referential integrity constraints.</p> <p><b>Relational algebra:</b> Select, project and join operations Normalization concepts - first, second, third normal forms, Boyce-Codd normal form, Fourth normal form.</p>	<b>10 hrs</b>
<b>UNIT IV</b>	<p><b>The Relational Database Standard:</b> Data definition, Constraints, Basic Queries in SQL, Nested queries, Aggregate Functions and grouping, Views in SQL. Procedures, triggers, Transaction and system concepts</p>	<b>12 hrs</b>
<b>UNIT V</b>	<p><b>Data Administration:</b> Introduction, security issues, Concurrency control Techniques, Database recovery techniques</p> <p><b>Object Databases:</b> Concepts, Object model, object definition and query language, Object based conceptual design</p> <p><b>Distributed databases:</b> Introduction, advantages and disadvantages, Types of distributed database systems. <b>NoSQL:</b> Introduction, History, NoSQL database, Types of NoSQL databases, Query tools, Advantages.</p>	<b>10 hrs</b>

### REFERENCE BOOKS

- [1] Ramez Elmasri, Shamkant B Navathe, “*Fundamentals of Database Systems*”, Addison Wesley, Pearson Education, Seventh Edition.
- [2] Abraham Silberschatz, Henry F. Korth and S. Sudarshan, “*Database System Concepts*”, Tata McGraw Hill, Sixth Edition.
- [3] Jeffrey A Hoffer, Mary B Prescott, HeikkiTopi, “*Modern Database management System*”, Pearson Education, Ninth Edition
- [4] Carlos Coronel, Steven Morris, Peter Rob, “*Database System Design, Implementation and Management*”, Thompson Learning Course Technology, Ninth Edition



## 2MCACC2: OPERATING SYSTEMS

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To understand the underlying principles, techniques and how the various elements that underlie operating system interact and provides services for execution of application software.

**Course Outcome:** Students will be able to

**CO1:** Understand the basics of Operating System Structure and various managerial functions of Operating System.

**CO2:** Apply and analyze the techniques of process scheduling, page replacement and disk scheduling algorithms to solve problems.

**CO3:** Understand the concepts of the Deadlock and different approaches to memory, file & I/O management.

**CO4:** Demonstrate the impact of virtualization and cloud through case study.

**CO5:** Analyze and critique example OS – UNIX, LINUX, Android and Windows.

<b>UNIT I</b>	<p><b>Introduction :</b> What is an Operating System - The Operating System as an Extended Machine - The Operating System as a Resource Manager</p> <p>History of Operating System -First – Fifth Generation Computers – Computer Hardware Review – The Operating System Zoo – Operating System Concepts – System Calls – Operating System Structure</p>	<b>04 hrs</b>
<b>UNIT II</b>	<p><b>Processes and Threads :</b> Processes – Threads – Interprocess Communication- Scheduling – Classical IPC problems – Research on Processes and Threads</p> <p><b>Memory Management :</b> A memory Abstraction : Address Spaces – Virtual Memory – Page Replacement Algorithms – Design Issues for Paging Systems – Implementation Issues – Segmentation – Research on Memory Management</p>	<b>14 hrs</b>
<b>UNIT III</b>	<p><b>File Systems :</b> Files – Directories- File System Implementation – File System Management and Optimization – Example File Systems- Research on File Systems</p> <p><b>Input/ Output :</b> Principles of I/O Hardware – Principles of I/O Software – I/O Software Layers – Disks – Clocks – User Interfaces – Thin Clients – Power Management- Research on Input/output</p> <p><b>Deadlocks :</b> Resources – Introduction to Deadlocks – The Ostrich Algorithm – Deadlock detection and recovery – Deadlock Avoidance- Deadlock Prevention – Other issues – Research on Deadlocks</p>	<b>14 hrs</b>

<b>UNIT IV</b>	<b>Virtualization and the Cloud</b> : History – Requirements for Virtualization - Type 1 and Type 2 Hypervisors – Techniques for efficient Virtualization – Memory Virtualization – I/O Virtualization – Clouds – Case Study – VMware <b>Multiple Processor Systems</b> : Multiprocessors – Multicomputers– Distributed Systems <b>Security</b> : The Security Environment – Operating Systems Security – Controlling Access to Resources – Formal models of Secure Systems	<b>12 hrs</b>
<b>UNIT V</b>	Case Study 1 : UNIX, LINUX and ANDROID Case Study 2 : Windows	<b>08 hrs</b>

**REFERENCE BOOKS**

- [1] Andrew S. Tanenbaum, Herbert Bos, “*Modern Operating Systems*”, Pearson Education, Fourth Edition.
- [2] William Stallings, “*Operating System*”, Pearson Education, Eighth Edition.
- [3] Abraham Silberschatz, Peter B. Galvin, Greg Gagne, “*Operating System Concepts*”, WSE Willey, Eighth Edition.
- [4] Andrew S. Tanenbaum, Albert S Woodhull, “*Operating System Design & Implementation*”, Pearson Education, Third Edition.
- [5] J. Archer Harris, “*Schaum’s Outline of Operating Systems*”, McGraw-Hill, Nov 2001.
- [6] Lubomir F. Bic, Alan C. Shaw, “*Operating systems principles*”, Prentice Hall, Nov 2002.

## 2MCACC3: DATA AND FILE STRUCTURES

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To know higher order concepts in data and structuring file using C language.

**Course Outcome:** Students will be able to

**CO1:** Determine preferred data structures (Arrays, linked lists, stack, queues, trees, graphs) for a given problem

**CO2:** Design algorithms for various operations (creation, insertion, deletion and traversal) on data structures

**CO3:** Explain the applications of data structures

**CO4:** Understand and apply searching techniques (linear, binary, and hashing)

**CO5:** Understand & Apply sorting techniques (Insertion sort, Selection sort, Quick sort, Merge Sort, Exchange sort)

**CO6:** Implement the data structures using a programming language

<b>UNIT I</b>	<p><b>Introduction to Abstract Data Types:</b> Data management concepts, Data types – primitive and non-primitive, Abstract data type. Performance analysis and measurement (Best, Average and Worst case analysis and time space tradeoff). Definition and Classification of Data Structures –Operations on Data Structures.</p> <p><b>Arrays:</b> Definition, representation of arrays (row-major, column-major), operations on arrays, Types of arrays (1D, 2D, multi-dimensional), operations on arrays (insertion, deletion, traversal). Strings - String operations - Character manipulation, String length, Concatenation, Sub string and Pattern Matching.</p>	<b>05 hrs</b>
<b>UNIT II</b>	<p><b>Linked Lists:</b> Definition, Types of Linked List (Singly Linked List, Doubly Linked List, Circularly Linked List), Operations on Linked List (Insertion, Deletion, and Search). Applications of Linked lists.</p> <p><b>Stack:</b> Definition, Primitive Operations (Push, Pop), Stack- implementation using Linked List. Applications of stacks (Function calls, recursion, infix to postfix expression, evaluation of postfix expression).</p> <p><b>Queues:</b> Definition, Primitive Operations (Insertion, Deletion), Queue - Implementation Using Linked List, Double Ended Queue, priority queues, Garbage Collection. Applications of queues.</p>	<b>10 hrs</b>
<b>UNIT III</b>	<p><b>Trees:</b> Definition of Trees concept, Binary Tree -Definition with example, Linear and Linked List Representation of Binary Tree, Expression trees. Binary search trees - concept, Operations -Creation, Insertion, Traversals. Height Balanced Trees – AVL trees, Multi way trees, B-trees, operations on B-tree, B+ trees, operations on B+ trees, comparison of B and B+ trees.</p> <p><b>Graphs:</b> Concepts, representation of graphs, applications of graphs, BFS &amp; DFS traversal, Shortest path algorithm.</p>	<b>14 hrs</b>
<b>UNIT IV</b>	<p><b>Searching &amp; Sorting:</b> Linear search, Binary search, and hashed list searches. General sort concepts, external &amp; internal sorting (insertion sort, selection sort, quick sort, merge sort, Exchange sort, Heap sort)</p>	<b>10 hrs</b>

<b>UNIT V</b>	<b>Hashing &amp; File Structures:</b> Hashing: The symbol table, Hashing functions, Collision-Resolution techniques. File Structure: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, index Files, Indexing and Hashing Comparisons.	<b>13 hrs</b>

**REFERENCE BOOKS**

- [1] Horowitz and Sahani, “*Fundamentals of data Structures*”, Galgotia Publication Pvt. Ltd., New Delhi, Second Edition.
- [2] Michael J. Folk, Bill Zoellick, Greg Riccardi, “*File Structures-An Object Oriented Approach with C++*”, Addison-Wesley, Third edition.
- [3] Mark Allen Weiss, “*Data Structures and Algorithm Analysis in C*”, Addison-Wesley, 2011.
- [4] Ellis Horowitz, Sartaj Sahani, Susan Anderson-Freed, “*Fundamentals of Data Structures*”, Universities Press, Second Edition.
- [5] Robert L. Kruse, Bruce P. Leung, Clovis L. Tondo, “*Data Structures and program Design in C*”, Prentice Hall India, Second Edition.

## 2MCACC4: JAVA PROGRAMMING

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To understand Object Oriented Programming Concepts and to map those concepts to the real world entities.

**Course Outcome:** Students will be able to

**CO1:** Understand the concepts and features of object oriented programming to solve any given problem

**CO2:** Learn the concept of classes and objects to implement inheritances, Interfaces and Packages

**CO3:** Learn the methods of creating Multi-threaded programs and handle Exceptions

**CO4:** Design GUI applications using applets and swings

**CO5:** Develop skills in internet programming using Socket programming, servlets and JSP

**CO6:** Implement distributed computing using RMI and JDBC

<b>UNIT I</b>	<p><b>Introduction to Object-Oriented Programming:</b> Evolution of programming methodologies, Procedural Approach Vs Object-Oriented Approach</p> <p><b>Principles of OOP:</b> Encapsulation, Inheritance and Polymorphism</p> <p><b>Concepts of OOP:</b> Abstraction, Overloading, Reusability, Extensibility, Dynamic Binding and Message passing.</p> <p><b>Introduction to Java Programming</b> History of Java, Characteristics of Java, JVM, Data types, Expressions, Keywords, Operators and control Flow Statements, Arrays – Special types. Creating and Running Java Programs.</p>	<b>10 hrs</b>
<b>UNIT II</b>	<p><b>Class:</b> Creating class and objects, methods, this key word, Constructors. Garbage Collection, finalize () method. Overloading – method overloading, operator overloading and Constructor overloading. Access Control, Static Blocks. Final, Nested and Inner Classes. String Class. Command Line Arguments. <b>Inheritance:</b> Basics, super key word, Method overriding, Dynamic Method dispatch, Abstract classes, Using final with inheritance, the object class. <b>Interfaces</b> Defining interfaces, Implementing interfaces.</p>	<b>12 hrs</b>
<b>UNIT III</b>	<p><b>Packages:</b> Defining package and CLASSPATH, Access protection, importing packages.</p> <p><b>Exception Handling in Java</b> Try-catch-finally mechanism, throw and throws keyword, Package and classes for exception handling.</p> <p><b>I/O streams:</b> Reading Console Input, Writing Console Output, PrintWriter, Reading and Writing Files. <b>Multithreading:</b> Java Thread model, Main Thread, Creating Threads, Creating Multiple threads, Thread Priorities, Synchronization, and Inter-thread Communication.</p>	<b>12 hrs</b>
<b>UNIT IV</b>	<p><b>Applets:</b> Applet fundamentals, Life cycle of Applet, Applet architecture, Simple Applet, The HTML Applet tag, passing parameters to Applets. Event</p>	<b>10 hrs</b>

	Handling, Introduction to AWT, Windows, Graphics and text. Using AWT Controls, Layout Managers and Menus, Introduction to Swings.	
<b>UNIT V</b>	<b>Distributed Computing:</b> Remote Method Invocation. <b>Socket</b> Programming, <b>JDBC</b> (Java Database Connectivity). Basics of <b>Servlets</b> , <b>Java Server Pages</b> .	<b>08 hrs</b>

**REFERENCE BOOKS**

- [1] Schildt Herbert, “*Java 2: The Complete Reference*”, Tata McGraw-Hill, Eighth Edition.
- [2] Deitel and Deitel, “*Java How to Program*”, Pearson Education Asia, Tenth Edition.
- [3] Horton Ivor, “*Beginning Java2*”, Wiley publishing Inc., Fifth Edition.
- [4] Holzner Steven, “*Java 2, Black Book*”, Dreamtech press, Fifth Edition.
- [5] Gaddis Tony, “*Stating out with Java*”, Dreamtech press, 2004
- [6] Eckel Bruce, “*Thinking in Java*”, Pearson Education Asia, Fourth Edition.
- [7] Flanagan David, “*Java in a nutshell*”, O’Reilly, Sixth Edition.
- [8] Kathy Sierra, Bert Bates, “*Head First Java*”, O’Reilly, Second Edition.

## 2MCAAC1: PROBABILITY AND STATISTICS

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To equip with statistical concepts used in computer software development.

**Course Outcome:** Students will be able to

**CO1:** Understand basic statistical concepts and analyze summary diagrams and charts

**CO2:** Understand probabilities of events and expectations of random variables for elementary problems such as games of chance.

**CO3:** Identify and analyze random variables and theoretical distribution

**CO4:** Understand statistical inference and formulate hypothesis and apply appropriate tests to checks its acceptability

**CO5:** Understand the meaning of research and analyze its various types

<b>UNIT I</b>	<b>Introduction and Data Analysis:</b> Basic statistical concepts: Population, sample variable, attribute. Types of data. Construction of a frequency distribution. Diagrams (bar, pie) and graphs (histogram, frequency curve and Ogives). Measures of central tendency – mean, median, mode. Statement of properties. Graphical location of median and mode. Measures of dispersion: range, quartile deviation, standard deviation. Relative measures. Correlation and regression – fitting of linear, quadratic to the given data by the principle of least squares (no derivations). Product moment correlation coefficient and its properties, Spearman’s rank correlation coefficient. Linear regression ( $Y=a +bX$ )	<b>12 hrs</b>
<b>UNIT II</b>	<b>Probability:</b> Basic Concepts – random experiment, trial, event, sample space. Definition of exhaustive, mutually exclusive, equally likely, complementary, favorable, simple and composite events. Definition of probability. Addition and multiplication theorems of probability (Statements only). Conditional probability and independent events. Bayes theorem (Statement only).	<b>08 hrs</b>
<b>UNIT III</b>	<b>Random variables &amp; Theoretical distributions:</b> Random variables – Definition, discrete and continuous random variables, probability mass and density functions, distribution function. Mathematical expectation, variance and their properties. Bivariate probability distributions – joint, marginal and conditional probability functions for discrete and continuous random variables, covariance and correlation coefficient. Independence of random variables. Additional and multiplication theorems of expectation (Statement only). Bernoulli, binomial, Poisson, normal distributions– definition through their p.m.f’s / p.d.f’s, statement of their mean and variance and important properties. Sampling distributions – definition of chi-square, t and F distributions.	<b>12 hrs</b>
<b>UNIT IV</b>	<b>Statistical Inference:</b> Statistical hypotheses – null, alternative, simple and composite, type I and type II errors, level of significance. Tests for	<b>10 hrs</b>

	1. Population mean, equality of two population means (large and small samples) 2. Population proportion and equality of two population proportions. Chi-square test for independence of two attributes. Analysis of one-way and two-way classified data.	
<b>UNIT V</b>	<b>Research Methodology:</b> Research methodology: An introduction - meaning of research, motivation in research, types of research, research methodology.	<b>10 hrs</b>

**REFERENCE BOOKS:**

- [1] Ronald E Walpole, Raymond H Myers, Sharon L Myers, “*Probability & Statistics for Engineers and scientists*”, Pearson Education, Ninth Edition.
- [2] Kothari C R, “*Research Methodology- Methods and Techniques*”, New Age International Publishers, Third Edition.
- [3] Trivedi et al, “*Probability & Statistics with Computer Applications*”, Tata McGraw-Hill, Second Edition.
- [4] Richard A Johnson, C.B. Gupta, Miller and Freund’s, “*Probability and Statistics for Engineers*”, Pearson Education, Fourth Edition.
- [5] Gupta.S.C., Kapoor .V.K., “*Fundamentals of Mathematical Statistics*”, Sultan Chand & Co., 2014
- [6] R.Pannerselvam, “*Research methodology*”, Prentice Hall of India. Second Edition.



**2MCAP1: JAVA PROGRAMMING LAB****Total No. of Hours: 72****Hours/Week: 06**

<b>Ex. No</b>	<b>Part - A</b>
<b>1</b>	Creating classes and objects
<b>2</b>	Demonstrate method overloading, operator overloading and constructor overloading.
<b>3</b>	Demonstrate the usage of static keyword in Java – use static data and static block.
<b>4</b>	Demonstrate inner classes in Java.
<b>5</b>	Demonstrate multilevel inheritance.
<b>6</b>	Demonstrate abstract class.
<b>7</b>	Demonstrate the usage of inheritance for multiple inheritances.
<b>8</b>	Illustrate the usage of throw, throws and try-catch-finally.
<b>9</b>	Demonstrate Packages.
<b>10</b>	Demonstrate various I/O streams in Java with exceptions
<b>Part – B</b>	
Note: Handle Exceptions for the following programs	
<b>11</b>	Demonstrate the multithreading concept by implementing Runnable interface.
<b>12</b>	Demonstrate the multithreading concept by extending Thread class.
<b>13</b>	Write an applet program to implement simple graphics methods.
<b>14</b>	Demonstrate the usage of different Layouts in Java.
<b>15</b>	Demonstrate various GUI components in Java (AWT) with appropriate Event Handling.
<b>16</b>	Demonstrate various GUI components in Java (Swings) with appropriate Event Handling.
<b>17</b>	Demonstrate RMI.
<b>18</b>	Create UDP Client and Server Socket.
<b>19</b>	Create TCP Client and Server Socket.
<b>20</b>	Write a Java program to establish database connectivity.

**Scheme of Evaluation**

<b>Sections</b>	<b>Criteria</b>	<b>Marks</b>
<b>PART A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
<b>PART B</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
	Enhancement	10
	Viva	10
<b>Total</b>		<b>70</b>

**2MCAP2: DATA AND FILE STRUCTURES LAB****Total No. of Hours: 72****Hours/Week: 06**

<b>Ex. No</b>	<b>Part – A</b>
<b>1</b>	Implement various operations on singly linked list ( Creation, Insertion, Traversal, Deletion)
<b>2</b>	Implement various operations on Circular linked list ( Creation, Insertion, Traversal, Deletion)
<b>3</b>	Implement stack operations using pointers ( push, pop, process )
<b>4</b>	Implement various operations on queue using pointers ( Insertion, Deletion, Process the Queue)
<b>5</b>	Create a double-ended queue (Deque) with the following operations: (a) insert in the Beginning (b) insert in the end (c) delete from beginning (d) delete from end
<b>6</b>	Implement sort algorithms (Any two – on rotation) (Insertion sort, Merge sort, Quick sort, Heap sort, Radix sort)
<b>7</b>	Implement search algorithms - Linear & Binary search
<b>8</b>	Implement conversion of infix expression to its postfix form
<b>9</b>	Implement evaluation of postfix expression
<b>Part – B</b>	
<b>10</b>	Implement various operations on Binary trees (Creation, Insertion, Deletion, Process)
<b>11</b>	Implement Binary tree traversals ( Pre-order, In-order, Post-order )
<b>12</b>	Given a graph G display the adjacency matrix
<b>13</b>	Implement traversal algorithms Breadth-First- Search/ Depth-First- Search traversal on a graph G
<b>14</b>	Implement B Tree for a given set of integers and perform operations insert(),search() and display() on the B Tree
<b>15</b>	Implement B+ Tree for a given set of integers and perform operations insert(),search() and display() on the B+ Tree
<b>16</b>	Program to store and retrieve student data from file using hashing. Use any collision resolution techniques

**Scheme of Evaluation**

<b>Sections</b>	<b>Criteria</b>	<b>Marks</b>
<b>PART A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
<b>PART B</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
	Enhancement	10
	Viva	10
<b>Total</b>		<b>70</b>

### 3MCACC1: ADVANCED WEB PROGRAMMING

**Total No. of Hours: 52**

**Lecture Hours per Week: 04**

**Course Objective:** To understand web development using core technologies for designing and Implementation

**Course Outcome:** Students will be able to

**CO1:** Develop interactive web pages using various web technologies such as JavaScript and dynamic HTML

**CO2:** Familiarize with .net framework and understand the Object Oriented programming concepts in C# to implement programming logic in Asp.net

**CO3:** Understand database connectivity and develop dynamic websites

**CO4:** Gain knowledge of state management and data binding

**CO5:** Learn basics of PHP and apply it to develop dynamic websites

<b>UNIT I</b>	<p><b>Web Design principles:</b> Basic Principles involved in developing a web site, Planning Process, Five Golden Rules of web designing.</p> <p><b>HTML and CSS:</b> Introducing Bootstrap, Working with Layouts – working with containers, Inserting rows and columns to layout, using responsive utility classes, Working with Content – Headings, Paragraphs, Lists, Coding Tables, Forms, Typography, Components – Button, Labels, Checkbox and Radio buttons, Coding Forms, Inline Forms, using Cards for Layout, Updating Blog, Adding Breadcrumbs, using Pagination component.</p>	<b>10 hrs</b>
<b>UNIT II</b>	<p><b>JavaScript:</b> Working with Data types and Variables, Conditional and Looping statements, Arrays.</p> <p><b>jQuery:</b> Adding jQuery to a page, DOM, Page Elements – Selectors, Filters, Setting and Removing Attributes, Events – Mouse, Document, Form and Keyboard events, jQuery Event concepts, jQuery Effects, Enhancing Web Forms – Adding Smarts to Forms, Form Enhancements, Form Validation,</p> <p><b>Ajax:</b> The Basics, Ajax the Query way – load, get and post, Formatting data to send to server, Processing data from server, JSON – Accessing JSON data, Complex JSON objects.</p>	<b>10 hrs</b>
<b>UNIT III</b>	<p><b>Ruby:</b> Background and introduction: Basics – Variables, Operators, Control Statements, Defining classes and methods, Strings, Numbers, Date and Time, Arrays, Hashes, Files and Directories.</p> <p><b>RUBY on RAILS:</b> Introduction - DRY - COC - MVC - REST - Migrations - Active Record Validations - Active Record Associations - Active Record Query Interface - Layouts and Rendering - Rails Routing.</p>	<b>10hrs</b>
<b>UNIT IV</b>	<p><b>PHP:</b> Introduction – Variables, Constants, Operators and Conditionals, Arrays, Strings, Numbers, Functions, Date and Time, Validating Form Data. Objects – Classes and Objects, Inheritance, Introspection.</p> <p>Modify Image files in different formats, Dynamic PDF files creation</p>	<b>12hrs</b>

<b>UNIT V</b>	<b>MySQL:</b> Naming Database Elements, Choosing Column Types and Properties, Accessing MySQL. <b>Using PHP with MySQL:</b> Connecting to MySQL, Executing and Retrieving Query Results, Updating Records with PHP. Sending Values to Script, Paginating Query Results, Making Sortable Displays. Using Cookies and Sessions	<b>10hrs</b>
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### REFERENCE BOOKS

- [1] Matt Lambert, “Learning Bootstrap 4”, Second Edition, Packt Publishing, 2016.
- [2] David Sawyer McFarland, “Javascript& jQuery – The Missing Manual”, O Reilly,2011.
- [3] Larry Ullman, “PHP and MySQL for Dynamic Web sites”, Fifth Edition, Peachpit Press.
- [4] Kevin Tatroe, Peter Macintyre and Rasmus Lerdorf, “Programming PHP: Creating Dynamic Web Pages”, O’Reilly, Third Edition.
- [5] Bruce A. Tate, Curt Hibbs, “Ruby on Rails: Up and Running”, O’Reilly Media, 2006
- [6] Carlson, Leonard Richardson, “Ruby Cookbook”, O’Reilly Media, 2006
- [7] Jon Duckett, “*Beginning HTML, XHTML, CSS, and JavaScript*”, Wiley Publishing,2010

## 3MCACC2: FINITE AUTOMATA AND FORMAL LANGUAGES

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** Insight to theory of computation and formal languages for aspiring systems level programming.

**Course Outcome:** Students will be able to

**CO1:** Learn the fundamentals of finite state machines

**CO2:** Design deterministic finite state automaton using NFA, RE, CFG

**CO3:** Learn the importance of applications in areas of automated systems

<b>UNIT I</b>	<b>Introduction</b> -Strings, Alphabets and Languages, Deterministic Finite Automaton (DFA), Non Deterministic Automaton (NFA). Equivalence of NFA and DFA without proof, Automaton with $\epsilon$ -moves, DFA design techniques, Moore and Mealy machines, conversion from NFA to DFA, Application of DFA.	<b>10 hrs</b>
<b>UNIT II</b>	<b>Regular expressions-</b> $\epsilon$ -NFA from RE – Kleen’s theorem, RE from FA, elimination states method, Applications of RE, Regular languages, properties of regular languages, Pumping lemma, Minimization of FA, Table fill algorithm	<b>10 hrs</b>
<b>UNIT III</b>	<b>Context Free grammar and Languages-</b> Definition of grammar, Chomsky Hierarchy, grammar from FA, Grammar from RE, Derivation, Derivation tree, ambiguous grammar, Application of CFG	<b>12 hrs</b>
<b>UNIT IV</b>	<b>Pushdown Automata</b> – Transitions, Graphical representation of PDA, language accepted by PDA, Construction of PDA, Deterministic and non-deterministic PDA, CFG to PDA, Application of GNF, PDA to CFG, Chomsky Normal Form, Properties of CFL’s	<b>10 hrs</b>
<b>UNIT V</b>	<b>Turing machines-</b> Model, transition table, Acceptance of a language by TM, Construction of TM, counter machines, off line TM, Undecidability - Language not recursively enumerable, halting problem	<b>10 hrs</b>

### REFERENCE BOOKS

- [1] John E Hopcroft and Jeffrey D Ullman, “*Introduction to Automata Theory*”, Addison-Wesley, Third Edition.
- [2] Gyorgy E Revesz, “*Introduction to Formal Languages*”, Jones and Bartlett Publishers, Fourth Edition.
- [3] Dick Grune, Henri E Bal, Cerial J. H. Jacobs, Kone G. Langendoen, “*Modern Compiler Design*”, Wiley dreamtech India Pvt. Ltd., Edition 2003.
- [4] Derick Wood, “*Theory of Computation*”, Longman Higher Education.
- [5] Daniel Cohen, “*Theory of Computation*”, ISBN Publications.

### 3MCACC3: SOFTWARE ENGINEERING

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** Equip with knowledge and skills of software development process

**Course Outcome:** Students will be able to

**CO1:** Understand different software engineering process models and the principle of requirement engineering

**CO2:** Understand design engineering and analyze various architectural styles and patterns.

**CO3:** Understand component level design and familiarize with quality management and SQA plan.

**CO4:** Understand and analyze various testing strategies

**CO5:** Understand project and risk management and analyze various metrics for project estimation

<b>UNIT I</b>	<p><b>Introduction to Software Engineering:</b> Software- Characteristics of software-Categories of software, Legacy software-software Myths.</p> <p><b>Generic View of Process:</b> Software Engineering-A layered technology-process framework-Capability Maturity Model Integration (CMMI)-Product and Process, <b>Process Models:</b> The waterfall Model-Incremental Model- Evolutionary Process Model- Specialized process models, Component based Development, The formal Methods Model – Agile process model.</p> <p><b>Requirements Engineering:</b> Requirement engineering Tasks-Initiating the requirement engineering process- Eliciting requirements-Developing use cases,-building the requirements model - Negotiating requirements- validating requirements.</p>	<b>10 hrs</b>
<b>UNIT II</b>	<p><b>Design Engineering:</b> The design within the context of Software Engineering-The design process and Design quality- Design concepts – Design Model</p> <p><b>Architectural Design:</b> Software architecture – Architectural style and Patterns – Architectural Design –Architectural mapping using Data flow, Transform Mapping, Refining Architectural Design.</p>	<b>08 hrs</b>
<b>UNIT III</b>	<p><b>Component Level Design:</b> What` is a component – Designing class based components – Designing conventional components</p> <p>User Interface Design: The golden rules – User Interface Analysis and Design - Interface Analysis User - Interface design steps</p> <p><b>Quality Management:</b> Software Quality, McCall's Quality Factors, ISO 9126 Quality Factors – Quality concepts – Software Quality Assurance – Software Reviews – Formal Technical reviews – Formal approaches to SQA – Software reliability – The ISO 9000 Quality Standards – SQA plan</p>	<b>10 hrs</b>



<p><b>UNIT IV</b></p>	<p><b>Testing Strategies:</b> A Strategic approach to software testing – strategic issues – Test strategies for conventional software – Test strategies for Object Oriented software – Validation testing – System testing – The art of Debugging</p> <p><b>Testing Tactics:</b> Software testing fundamentals - White-box testing - Basic path testing - Control structure testing - Black-box testing – Testing for specialized environments, Architectures, and Applications</p>	<p><b>12 hrs</b></p>
<p><b>UNIT V</b></p>	<p><b>Project Management:</b> The management spectrum - The people - The product - The Process - The project</p> <p><b>Metrics for Process and Projects:</b> Metrics in the process and project domains - software measurement- Metrics for software quality</p> <p><b>Estimation:</b> Observations on estimation - The project planning process - Software scope and Feasibility- Resources- Software project estimation - Decomposition techniques – Empirical estimation models</p> <p><b>Project Scheduling:</b> Basic concepts – Project Scheduling - Scheduling</p> <p><b>Risk Management:</b> Software risks - Risk identification - Risk projection - Risk Refinement - Risk Mitigation, Monitoring, and Management - The RMMM plan.</p>	<p><b>12 hrs</b></p>

**REFERENCE BOOKS**

- [1] Grady Booch, James Raumbaugh, Ivar Jacobson, “*The Unified Modeling Language User Guide*”
- [2] Ivar Jacobson, “*Object Oriented Software Engineering*”
- [3] Pressman, “*Software Engineering*”

### 3MCACC4: MOBILE APPLICATIONS DEVELOPMENT

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To introduce network, system, techniques and applications in Mobile Wireless Computing.

**Course Outcome:** Students will be able to

**CO1:** Understand the basic concepts of Android applications development

Environment, Android lifecycle and activities

**CO2:** Develop applications through Android user interface like

Fragments, Widgets, Views, Adapters, Intent and Broadcast receiver

**CO3:** Implement applications with flat file system and database using SQLite

**CO4:** Create applications with location based services

**CO5:** Develop applications for network using Bluetooth and Wi-Fi to publish in Google play store

<b>UNIT I</b>	<b>Introduction to Android:</b> Open Platform for Mobile Development - Android SDK Features - Introduction to Development Framework - Android Development Tools - The Application Manifest File - External Resources - The Android Application Lifecycle - Android Activities.	<b>10hrs</b>
<b>UNIT II</b>	<b>Android User Interface:</b> Layouts - Fragments - Widgets toolbox - Views - Adapters - Introduction to Intent - Intent Filters and Broadcast receivers - File system Introduction to Android Database - SQLite - Content Providers.	<b>12 hrs</b>

**REFERENCE BOOKS:**

- [1] Reto Meier, "*Professional Android 4 application Development*", Wiley Publications, 2012
- [2] Jerome (J.F) DiMarzio, "*Android -A programmer's Guide*", Tata Mcgraw Hill, 2010.
- [3] Paul Deitel, Harvey Deitel, Abbey Deitel, Michael Morgano, "*Android for Programmers An App-Driven Approach*", Pearson Education Inc., 2012.
- [4] Wei-Meng Lee, "*Beginning android 4 application Development*", John Wiley & sons, Inc, 2012.

### 3MCAP1: ADVANCED WEB PROGRAMMING LAB

**Total No. of Hours: 72**

**Hours Per week: 06**

Ex.No	Part – A
1	Bootstrap: Typography
2	Bootstrap: Tables and Images
3	Bootstrap: Jumbotron, Wells, Alerts
4	Bootstrap: Buttons, Button Groups, Labels, Progress Bar
5	Bootstrap: Navbar, Forms and Inputs
6	Bootstrap: Pagination and Grid System
7	Javascript: Arrays and operations on arrays
8	jQuery: Selectors and Filters
9	jQuery: Events and Effects
10	jQuery: Form Validation
11	Illustration of Arrays,String, Numbers in Ruby.
12	Illustration of Hashes, Date and Time in Ruby.
13	Illustration of File handling in Ruby.
14	Demonstration of Exception Handling in Ruby.
15	Active Record Validation in Ruby.
	Part B
	Domain based Project

### Scheme of Evaluation

Sections	Criteria	Marks
<b>PART A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
<b>PART B</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
	Enhancement	10
	Viva	10
<b>Total</b>		<b>70</b>

**3MCAP2: DBMS LAB****Total No. of Hours: 72****Hours/Week: 06**

<b>Ex.No</b>	<b>Part – A</b>
<b>1</b>	Data Definition, Table Creation, Constraints
<b>2</b>	Insert, Select commands, Update and Delete commands
<b>3</b>	Nested Queries & Join Queries
<b>4</b>	Views
<b>5</b>	Triggers
<b>6</b>	PL/SQL
<b>7</b>	Menu Design, Forms
<b>8</b>	Reports
<b>Part B (Mini Project)</b>	
Students should develop a mini project based on any domain of their choice.	

**Scheme of Evaluation**

<b>Sections</b>	<b>Criteria</b>	<b>Marks</b>
<b>Part A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	20
	Viva	10
<b>Part B</b>	Project Demo	20
	Viva-voce	10
	<b>Total</b>	<b>70</b>

**3MCAP3: MOBILE APPLICATIONS DEVELOPMENT LAB**

Total No. of Hours: 72

Hours/Week: 06

Ex.No	Part – A
1	Develop an application that uses GUI Components
2	Develop an application that uses Layout Managers and Event Listeners
3	Develop an application that makes use of database
4	Develop a native application that uses GPS Location information
5	Implement an application that writes data to the SD card
6	Write an application that draws basic graphical primitives on the screen
7	Implement an application that creates an alert upon receiving a message
8	Write a mobile application that creates alarm clock
<b>Part B (Mini Project)</b>	
	Students should develop a mini project based on any domain of their choice.

**Scheme of Evaluation**

Sections	Criteria	Marks
<b>Part A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	20
	Viva	10
<b>Part B</b>	Project Demo	20
	Viva-voce	10
	<b>Total</b>	<b>70</b>

## 4MCACC1: DATA COMMUNICATION AND COMPUTER NETWORKS

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To understand various computer networks, network technologies and application protocols

**Course Outcome:** Students will be able to

**CO1:** Understand the types of networks, network models and its related terminologies.

**CO2:** Describe the layer functionalities of OSI and TCP/IP model.

**CO3:** Comprehend the working of various layer protocols of network models.

**CO4:** Apply sub netting techniques to solve problems on classless and classful addressing.

**CO5:** Analyze and interpret concepts of network security and cryptography.

<b>UNIT I</b>	<p><b>Introduction :</b> Data Communication - Networks- Network Types – Internet History – Standards and Administration</p> <p><b>Network Models:</b> Protocol Layering – TCP/IP Protocol Suite – The OSI model. <b>Wired LANs Ethernet:</b> Ethernet Protocol – Standard Ethernet – Fast Ethernet – Gigabit Ethernet – 10 Gigabit Ethernet – Connecting Devices – Hubs- Link Layer Switches – Virtual LANs. <b>Wireless LANs :</b> Introduction – IEEE802.11 Project – Bluetooth – Other Wireless Networks – WiMAX – Cellular Telephony – 1G, 2G, 3G 4G</p>	<b>12hrs</b>
<b>UNIT II</b>	<p><b>Physical Layer :</b> Data and Signals – Periodic Analog Signals – Digital Signals – Transmission Impairment – Data Rate Limits – Performance – Multiplexing – FDM-WDM-TDM – Transmission Media – Guided Media – Unguided Media – Switching – Circuit Switched Networks – Packet Switching- Structure of Switch</p> <p><b>Data Link Layer :</b> Introduction – Link Layer Addressing –Error Detection and Correction – Introduction – Block Coding- Cyclic codes – Forward Error Correction – Data Link Control – DLC Services- DLL Protocols – HDLC – PPP – Media Access Control – Random Access – ALOHA-CSMA- CSMA/CD – CSMA/CA</p>	<b>12 hrs</b>
<b>UNIT III</b>	<p><b>Network Layer :</b>Network Layer Services – Network Layer Performance – IPv4 Addresses – Address Space – Classful – Classless Addressing Network Layer Protocols – IP –Mobile IP – Unicast Routing – Routing Algorithms – Distance Vector Routing – Link State Routing – Path Vector Routing – Unicast Routing Protocols – RIP-OSPF-BGP4- Multicast Routing Basics –IPv6 Protocol – Transition from IPv4 to IPv6</p> <p><b>Transport Layer :</b> Introduction – Transport Layer Protocols – Transmission Control Protocol – TCP Services – TCP features – Segment – A TCP connection- State Transition Diagram – Windows in TCP- Flow Control – Error Control – TCP Congestion Control – TCP timers</p>	<b>12 hrs</b>
<b>UNIT IV</b>	<p><b>Application Layer:</b> WWW – HTTP-FTP-Electronic Mail – TELNET-SSH-DNS. <b>Network Management :</b> Introduction – SNMP- Managers and Agents – Management Components – SMI –MIB</p>	<b>10 hrs</b>

<b>UNIT V</b>	<b>Cryptography and Network Security</b> : Introduction – Security Goals – Attacks – Services and Techniques – Symmetric Key ciphers – Asymmetric – Key Ciphers – Message Integrity – Message Authentication – Digital Signature – Entity Authentication – Key management	<b>06 hrs</b>
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**REFERENCE BOOKS**

- [1] Behrouz A. Forouzan “*Data Communications and Networking*”, TataMcgrawHill. Fifth Edition.
- [2] Andrew S. Tanenbaum, “*Computer Networks*”, Pearson, Fifth Edition
- [3] AtulKahate, “*Cryptography and Network Security*”, TataMcgrawHill, Second Edition.
- [4] Douglas E. Comer, “*Computer Networks and Internets with Internet Applications*”, Pearson, Third Edition.
- [5] William Stalling, “*Cryptography and Network Security*”, Prentice Hall, Fourth Edition.



**4MCACC2: DESIGN AND ANALYSIS OF ALGORITHMS****Total No. of Hours: 52****Hours/Week: 04**

**Course Objective:** To analyze the asymptotic performance & demonstrate a familiarity with major algorithms. Understand various algorithmic design paradigms and apply methods of analysis.

**Course Outcome:** Students will be able to

**CO1:** Explain fundamental concepts of algorithm design and analyze its efficiency using asymptotic notations

**CO2:** Understand various algorithm design techniques and compare them

**CO3:** Apply algorithm design techniques to various problems and obtain time-complexity

**CO4:** Apply algorithm design techniques to graph oriented problems

**CO5:** Understand and apply Back tracking and Branch and bound techniques to real time applications

**CO6:** Understand the fundamental concepts of P, NP and NP-Complete problems

<b>UNIT I</b>	<p><b>Introduction:</b> What is an algorithm? Fundamentals of Algorithmic problem solving, problem types, fundamental data structures.</p> <p><b>Fundamentals of the analysis of Algorithm Efficiency:</b> Analysis framework, Asymptotic Notations and Basic efficiency classes.</p> <p><b>Analysis of Simple Algorithms:</b> Maximum of given numbers, Matrix multiplication, linear search, Factorial of a number using recursion, Tower of Hanoi.</p>	<b>10 hrs</b>
<b>UNIT II</b>	<p><b>Brute force:</b> Selection Sort, String Matching.</p> <p><b>Divide-and-Conquer:</b> Merge Sort, Quick sort, Binary Search, Multiplication of large integers and Strassen's Matrix Multiplication. <b>Decrease-and-Conquer:</b> Decrease by constant, by a constant factor, variable size decrease - Insertion Sort, Depth-First-Search and Breadth-First-search graph traversals.</p> <p><b>Transform-and-Conquer -</b> Horner's rule.</p>	<b>12 hrs</b>
<b>UNIT III</b>	<p><b>Dynamic Programming:</b> Knapsack problem, Optimal Binary Search Tree, Optimal Parenthesization for product of sequence of matrices.</p>	<b>10 hrs</b>
<b>UNIT IV</b>	<p><b>Greedy Technique:</b> Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.</p>	<b>10 hrs</b>
<b>UNIT V</b>	<p><b>Limitations of Algorithm Power:</b> Lower Bound Theory, Decision Trees, P, NP &amp; NP-Complete problems. <b>Coping with the Limitations of Algorithm Power:</b> Back Tracking: n-Queens problem. <b>Branch &amp; Bound:</b> Travelling Salesman problem.</p>	<b>10 hrs</b>

**REFERENCE BOOKS:**

[1] AnanyLevitin, “*Introduction to the Design and Analysis of Algorithms*”, Pearson Education, Second Edition.

[2]E. Horowitz and S. Sahani, “*Fundamentals of Computer Algorithms*”, Galgotia Publications.

[3] Aho, Hopcraft and Ullman, “*Design and Analysis of Computer Algorithms*”, Addison-Wesleyseries.

[4] Thomas H Coreman, Charles E Leiserson and Ronald L Rivest, CliffordStien, “*Introduction toAlgorithms*”, Prentice Hall of India Pvt. Ltd.

### 4MCACC3: DATA WAREHOUSING AND KNOWLEDGE MINING

Total No. of Hours: 52

Hours/Week: 04

**Course Objective:** To introduce the concept of Data Mining techniques and its applications.

**Course Outcome:** Students will be able to

**CO1:** Understand the concepts of data warehouse and data mining

**CO2:** Use data preprocessing techniques to build data warehouse

**CO3:** Analyze transaction databases for association rules.

**CO4:** Use classification methods and prediction techniques on transaction databases.

**CO5:** Understand various clustering techniques for categorizing data.

**CO6:** Understand methods for outlier analysis.

UNIT I	<p><b>Data Warehousing and Online Analytical Processing:</b> Basic concepts, Data warehouse Modeling: Data cube and OLAP, Data Warehouse Design and Usage, Data warehouse implementation.</p> <p><b>Data Preprocessing:</b> Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.</p>	12 hrs
UNIT II	<p><b>Data Mining:</b> Introduction, Kinds of Data, Patterns and Technologies, Architecture of Data Mining Systems, Applications, Primitives and Issues in Data Mining.</p> <p><b>Exploring the Data:</b> Data Objects and Attributes, Data Quality, Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity, Data Visualization.</p>	8hrs
UNIT III	<p><b>Mining Frequent Patterns Associations and correlations:</b> Basic concepts, Frequent Itemset Mining Methods, Patterns evaluation Methods.</p> <p><b>Advanced Pattern Mining:</b> Pattern Mining: A Road Map, Pattern Mining in Multilevel, Multidimensional Space, Constraint Based Frequent Pattern Mining, Mining High-Dimensional Data and Colossal Patterns, Mining Compressed or Approximate Patterns, Pattern Exploration and Application.</p>	12 hrs
UNIT IV	<p><b>Classification:</b> Basic Concepts, Decision tree induction, Bayes classification Methods, Bayesian Belief Networks, Rule Based Classification, Lazy Learners, Model Evaluation and Selection.</p> <p><b>Clustering:</b> Clustering Analysis, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid Based Methods, Evaluation of Clustering.</p>	12hrs

<b>UNIT V</b>	<b>Data Mining Trends and Research Frontiers-</b> Mining complex Data types, Other Methodologies of Data Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends.  <b>Application</b> –Implementation using Data Mining tool.	<b>08 hrs</b>
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**REFERENCE BOOKS:**

- [1] Jaiwei Han and Micheline Kamber, “*Data Mining: Concepts and Techniques*”, Morgan Kaufman Publishers, Third Edition, San Francisco, USA 2002.
- [2] Pang-Ning Tan, Michael Steinbach, Vipin Kumar, “*Introduction to Data Mining*”, Addison-Wesley, 2006.
- [3] Arun K Pujari, “*Data Mining Techniques*”, University Press 2<sup>nd</sup> Edition, 2009
- [4] Alex Berson and Stephen J. Smith, “*Data Warehousing, Data Mining & OLAP*”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
- [5] Claudia Imhoff, Nicholas & et al “*Mastering Data Warehouse Design*”, J. Wiley.

**4MCAEC11: MULTIMEDIA SYSTEMS AND COMMUNICATIONS****Total No. of Hours: 52****Hours/Week: 04**

**Course Objective:** To gain knowledge in different medias. Familiarize with various compression schemes, techniques and algorithms

**Course Outcome:** Students will be able to

**CO1:** Understand the various multimedia information representations and digitization principle and analyze various multimedia data

**CO2:** Understand the techniques of text and image compression

**CO3:** Understand and analyze the various audio and video compression

**CO4:** Familiarize with the standards of Multimedia communications

**CO5:** Apply and analyze multimedia techniques in real time applications

<b>UNIT I</b>	<b>Multimedia Information representation:</b> Introduction, Definition of Multimedia, Digitization principles - Analog signals, Encoder design, Decoder design, Text - Unformatted text, Formatted text, Hypertext, Images - Graphics, digitized documents, digitized pictures, Audio – PCM speech , CD quality audio, synthesized audio. Video - Broadcast television, digital video, PC video, Video Content	<b>10 hrs</b>
<b>UNIT II</b>	<b>Text and Image Compression:</b> Introduction, compression principles - Source encoders and destination decoders, Lossless and lossy compression, entropy encoding, source encoding. Text compression - static and dynamic Huffman coding, Arithmetic coding, Image compression - Graphics interchange format, Tagged image file format, digitized documents, digitized pictures, JPEG	<b>10 hrs</b>
<b>UNIT III</b>	<b>Audio and Video Compression:</b> Introduction, Audio compression, Frequency, amplitude, sample rate, Differential pulse code modulation, Adaptive differential PCM, Adaptive predictive coding, Linear predictive coding, code - excited LPC, perceptual coding, MPEG - MP3 audio coders, Dolby audio coders. Video compression principles, video Standards: NTSC, PAL, SECAM, Inter-frame, Intra-frame, video encoding, algorithms H.261, H.263, MPEG, MPEG1, MPEG2, MPEG4, Video for WEB	<b>12hrs</b>
<b>UNIT IV</b>	<b>Standards for Multimedia communications:</b> Reference models - TCP/IP, Protocol basics, standards relating to interpersonal communications, Circuit mode networks, Packet - switched networks, Electronic mail, standards relating to interactive applications over the Internet, information browsing, Electronic commerce, intermediate systems, Java and Java Script, Standards for entertainment applications, Movie/Video on demand, Interactive television	<b>10 hrs</b>
<b>UNIT V</b>	<b>Multimedia Applications:</b> Understanding Designing and implementations of interactive applications, entertainment applications, Multimedia in internet and Web, Video Emails, video	<b>10 hrs</b>

	conferencing, Web casting, Software for image editing and Compression, Audio editing and compression, Video editing and compression, Voice recognition applications, Gesture based applications, interactive games designing	
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**REFERENCE BOOKS**

- [1] Fred Halshall, "*Multimedia communication - application, network, protocol and standards, First*", Edition, Pearson Education Ltd, 2009
- [2] Ralf Steinmetz, KlaraNahrstedt, "*Media Coding and Content Processing*", Volume I, PHI,2011
- [3] Krishna Kumar, *Multimedia communication*, Dorling Kindersley Publishers, Pearson Education, 2008
- [4] Nigel Chapman and Jenny Chapman, *Digital Multimedia*, John Wiley & Sons Ltd, 2009

## 4MCAEC12: OPEN SOURCE TECHNOLOGIES

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To develop the skills in Open Source Technology, which will enable the students to acquire the skills in Linux, Apache Server, MySQL and specially PHP.

<b>UNIT I</b>	<p><b>Overview of Open Source Software:</b> Introduction: Open Software, Free Software, Need of Open Source, Applications, FOSS, Free Software Movement, Commercial Aspect of Open Source Management, Licensing – Certification – Open Source</p> <p>Software Development Model – Comparison with close source / Proprietary software - Widely used open source software license :Apache License, BSD license, GNU General Public License, GNU Lesser General Public License, MIT License, Eclipse Public License and Mozilla Public License</p>	<b>08 hrs</b>
<b>UNIT II</b>	<p><b>Linux Operating System:</b> Linux Operating System concepts and Architecture, Overview of Linux Kernel, User space, Kernel Space, Processes and Daemons, Process Control, Overview of Linux Administration, Linux File System, User, Group and Resource Management; Configuration Files overview; File System permissions, Access Permissions and Security, Common File System Commands, Recursion Option in Commands, Find, Grep, Cat, More, Less and Sort commands.</p>	<b>08 hrs</b>
<b>UNIT III</b>	<p><b>Apache Web Server:</b> Linux Distribution Apache Installation, Starting and Stopping Web Server. Apache Configuration Files, Apache Directives – Server Configuration, Directory level configuration: htaccess and &lt;Directory&gt;, Access Control, URL Pathnames, MIME Types, CGI Files, Automatic Directory Indexing, Authentication, Log Files, Virtual Hosting – IP Address Virtual Host, Name based Virtual Host, Dynamic Virtual Hosting, Apache GUI Configuration Tools, Web Server Security, Apache Web Server Configuration Files.</p>	<b>11 hrs</b>
<b>UNIT IV</b>	<p><b>PHP:</b> Introduction - How web works - Setting up the environment (LAMP/WAMP server) -Introduction to Server side Programming, Introduction to PHP, PHP and HTML, Variables, Strings and its Manipulations, Arrays, Array – Key pair value, Control and Looping statements, User Defined Functions, global variable, default value, GET and POST method, URL encoding, HTML Encoding, Cookies, Sessions, File:Read and Write from file.</p>	<b>12 hrs</b>
<b>UNIT V</b>	<p><b>Database Connectivity:</b> Establishing connectivity with MySQL database. Creating MySQL Databases with PHP, Manipulating MySQL data with PHP.</p>	<b>13 hrs</b>

**REFERENCE BOOKS**

- [1] Richard Peterson, “*Open Source Development with LAMP: Using Linux, Apache, MySQL, Perl and PHP*”, Pearson Education Asia
- [2] Mathew Moodie, “*Pro Apache Tomcat 6*”, Apress / Wiley
- [3] Matt Doyle ,“*Beginning PHP 5.3*”, Willey Publishing, 2010
- [4]Sheldon, Moes, “*Beginning MySQL*”, Wiley Wrox
- [5] Richard Peterson, “*Linux: The Complete Reference*”, TMGH Publishers
- [6] Mike Mcgrath, “*PHP & MySQL in easy Steps*”, Tata McGraw Hill, 2012



## 4MCAEC13: ARTIFICIAL INTELLIGENCE

Total No. of Hours: 52

Hours/Week: 04

**Course Objective:** To familiarize students with Artificial Intelligence techniques for building well-engineered and efficient intelligent systems.

**Course Outcome:** Students will be able to

**CO1:** Understand the basic principles and applications of Artificial Intelligence

**CO2:** Solve various problems by applying a suitable search method

**CO3:** Represent knowledge using various different techniques

**CO4:** Apply knowledge representation and list the key aspects of planning

<b>UNIT I</b>	<b>Introduction:</b> What is Artificial Intelligence, what is an AI technique, criteria for success, Problems, problem spaces and search, Production system, Problem characteristics, Hill-climbing, Best-First search, AO algorithm, constraint satisfaction.	<b>08 hrs</b>
<b>UNIT II</b>	<b>Knowledge Representation:</b> Knowledge Representation Issues, Approaches to knowledge Representation, Representing simple facts in logic, computable functions and predicates, Procedural vs declarative knowledge, forward vs Backward Reasoning matching, control knowledge.	<b>10 hrs</b>
<b>UNIT III</b>	<b>Natural language Processing:</b> Natural language Processing, Introduction, overview of linguistics, Grammars and language, Basic Parsing techniques, Semantic analysis and representation, structure, Natural Language generation, Natural Language systems	<b>10 hrs</b>
<b>UNIT IV</b>	<b>Expert systems:</b> Expert systems, Rule-Based system architecture Non-production system Architecture, dealing with uncertainty, knowledge acquisition and validation, knowledge system Building tools.	<b>12 hrs</b>
<b>UNIT V</b>	<b>Pattern Recognition:</b> Pattern Recognition, Recognition and classification process, learning classification Patterns, Recognizing and understanding speech.	<b>12 hrs</b>

### REFERENCE BOOKS

- [1] E. Rich and K. Knight, “*Artificial Intelligence*”, Second Edition
- [2] Dan. W. Patterson, “*Introduction to Artificial Intelligence and expert system*”. PHI
- [3] S. Russell and P. Norvig, “*Artificial Intelligence: A Modern Approach*”, Second Edition Pearson Education
- [4] Eugene Charniak and Drew McDermott, “*Introduction to Artificial Intelligence*”, Second Edition
- [5] Nils J. Nilson, “*Principles of Artificial Intelligence*”, Narosa Publication

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## 4MCAP1: UML AND SOFTWARE TESTING TOOLS LAB

**Total No. of Hours: 72**

**Hours/Week: 06**

Choosing a case study draw the following diagrams using Star UML/Rational Rose:

Ex.No.	Part - A UML
1	Use case diagram
2	Class Diagram
3	Interaction Diagram
4	Sequence Diagram
5	Collaboration Diagram
6	State Diagram
7	Activity Diagram
8	Component Diagram
9	Deployment Diagram
Part – B ( Software Testing)	
1	Consider a working system (e.g. ATM system) and study its specifications and report the various bugs.
2	Using Selenium IDE, Write a test suite containing minimum 4 test cases
3	Conduct a test suite for any two web sites
4	Write and test a program to login a specific web page
5	Write and test a program to update 10 student records into table into Excel file
6	Write and test a program to select the number of students who have scored more than 60 in any one subject ( or all subjects )
7	Write and test a program to provide total number of objects present / available on the page
8	Write and test a program to get the number of list items in a list / combo box
9	Write and test a program to count number of items present on a desktop
10	Write and test a program to login a specific web page

### Scheme of Evaluation

<b>Sections</b>	<b>Criteria</b>	<b>Marks</b>
<b>Part A</b>	Case Study Analysis	10
	Execution	15
<b>Part B</b>	Writing ONE program	10
	Execution of ONE program	15
	Enhancement	10
	Viva Voce	10
	<b>Total</b>	<b>70</b>

**4MCAP2: DATA ANALYTICS LAB****Total No. of Hours: 72****Hours/Week: 06****Tool to be used: R**

<b>Ex. No</b>	<b>Part – A</b>
<b>1</b>	Expressions and Functions
<b>2</b>	Arrays and Vectors
<b>3</b>	Matrices
<b>4</b>	Lists
<b>5</b>	Data Frames& Factors
<b>6</b>	Frequency and Crosstabs
<b>7</b>	Data Interfaces – CSV, Excel, Binary Files
<b>8</b>	Data Exploration – Descriptive and Dispersion measures.
<b>9</b>	Data Visualization.
<b>10</b>	Correlation – Simple, Polychoric and Partial
	<b>Part – B</b>
<b>11</b>	Regression: - Linear, Multiple, Nonlinear and Logistic
<b>12</b>	t-tests: - One Sample, Independent and Paired
<b>13</b>	Association Analysis and Rule Speedup
<b>14</b>	Classification: Naïve Bayes Classifier
<b>15</b>	Classification: Decision trees and Random Forest
<b>16</b>	Classification: K-Nearest Neighbor
<b>17</b>	Clustering: Partitioning clustering
<b>18</b>	Clustering: Hierarchical Clustering
<b>19</b>	Clustering: Density-based, Model-based and Fuzzy
<b>20</b>	Cluster Validation and Evaluation

**Scheme of Evaluation**

<b>Section</b>	<b>Criteria</b>	<b>Marks</b>
<b>PART A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
<b>PART B</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
	Enhancement	10
	Viva Voce	10
<b>Total</b>		<b>70</b>

**4MCAECP11: MULTIMEDIA LAB****Total No. of Hours: 72****Hours/Week: 06**

<b>Session</b>	<b>Part – A</b>
<b>1</b>	Program to read a text file in different formats
<b>2</b>	Program to implement arithmetic encoding and decoding of text file
<b>3</b>	Program to store an image file in different file formats
<b>4</b>	Implementing various image editing options
<b>5</b>	Program to implement various sound controls
<b>6</b>	Implementing various sound editing options
<b>7</b>	Program to animate an image
<b>8</b>	Program to add Multimedia files in a webpage (Hyper Linking)
<b>9</b>	Program to embed Multimedia files in a webpage
	<b>Part – B</b>
<b>10</b>	Program to implement Huffman encoding for a text file
<b>11</b>	Program to implement JPEG compression scheme
<b>12</b>	Program to implement GIF compression scheme
<b>13</b>	Program to implement MP3 compression scheme
<b>14</b>	Program to implement MPEG4 compression

**Scheme of Evaluation**

<b>Sections</b>	<b>Criteria</b>	<b>Marks</b>
<b>PART A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
<b>PART B</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
	Enhancement	10
	Viva	10
<b>Total</b>		<b>70</b>

**4MCAECP12: OPEN SOURCE TECHNOLOGIES LAB****Total No. of Hours: 72****Hours/Week: 06**

<b>Session</b>	<b>Part - A</b>
<b>1</b>	MySQL: Database Creation and Commands
<b>2</b>	MySQL: Administration Commands
<b>3</b>	MySQL: Insert and Insert Multiple
<b>4</b>	MySQL: Prepared Statements
<b>5</b>	MySQL: Queries
<b>6</b>	MySQL: Loading Text File into Table
<b>7</b>	MySQL: Running Batch Job from Command Directory
	<b>Part - B</b>
<b>8</b>	PHP: To demonstrate Indexed and Associative Array , Key-pair values
<b>9</b>	PHP: Functions
<b>10</b>	PHP: Calendar and Date Functions
<b>11</b>	PHP: To demonstrate GET and POST method of passing the data between pages
<b>12</b>	PHP: Preserving values using Query string
<b>13</b>	PHP: Web page that uses Session and cookies.
<b>14</b>	PHP: Implementing the OOPs concept in PHP
<b>15</b>	PHP: Interface
<b>16</b>	PHP: File Handling
<b>17</b>	PHP Form Validation
<b>18</b>	PHP: Filters
<b>19</b>	PHP: Exception
<b>20</b>	PHP: To read and write the Data from the Database

**Scheme of Evaluation**

<b>Sections</b>	<b>Criteria</b>	<b>Marks</b>
<b>PART A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
<b>PART B</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
	Enhancement	10
	Viva	10
<b>Total</b>		<b>70</b>



**4MCAECP13: J2EE LAB****Total No. of Hours: 72****Hours/Week: 06****Scheme of Evaluation**

<b>Sections</b>	<b>Criteria</b>	<b>Marks</b>
<b>PART A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
<b>PART B</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	15
	Enhancement	10
	Viva	10
<b>Total</b>		<b>70</b>

<b>Ex.No.</b>	<b>Part - A</b>
1	Create a servlet that accepts an image name and displays the corresponding image to the user.
2	Create a servlet that accepts the name of a file and displays the contents of the file to the user.
3	Create a servlet to display the contents of http header
4	Create a servlet to display user visit count of a site using a hidden field that stores the session ID.
5	Create a servlet to display user visit count of a site using a cookie that stores the session ID.
6	Create a servlet to display user visit count of a site using URL rewriting that stores the session ID.
7	Create a servlet to maintain a Login session using session variable.
8	Illustration of Form processing using JSP.
9	Demonstration of common mathematical and statistical functions by creating stateless bean.
10	Demonstration of string functions by using stateless bean.
11	Illustration of common conversions such as currency, temperature, length etc. by creating stateless bean. Access them using a swing MDI client application.
12	Create a Web application to simulate an arithmetic calculator using JSF framework
13	Designing a web page that displays an image stored in a database.
14	Creation of an AdRotator bean and use it in a JSP page.
15	Create a Web application to demonstrate the uses of JSTL core tag library.
	<b>Part - B</b>
16	Demonstration of a shopping cart management using Servlet.
17	Simulate common banking operations with database using JSP.
18	Demonstrate online result publication using JSP. Use database to store the marks details.
19	Demonstration of Guest Book application using JSP.
21	Demonstration of One-to-Many relationship between a student and marks scored in various subjects using Java Swing client application
22	Demonstration of One-to-Many relationship between a Company and Employees using Java Swing.
23	Demonstration of Many-to-Many relationship between Project and Person using Java Swing.
24	Creation of an Enterprise application that uses an Entity Bean to add a new Movie to a database table, search for a Movie and retrieve all the Movie details

25	Illustration of Purchase Order management using Entity Bean.
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## 5MCACC1: MACHINE LEARNING USING PYTHON

**Total No. of Hours: 52**

**Lecture Hours per Week: 04**

**Course Objective:** To understand the basic theory underlying Machine Learning, and also to apply machine Learning algorithms to solve problems of complexity, to formulate machine Learning problems corresponding to different applications.

**Course Outcome:** Students will be able to

**CO1:** Understand the concepts of machine learning and types of machine learning

**CO2:** Learn neural networks, classifiers and different algorithms

**CO3:** Understand the concepts Support vector machine, Ensemble Classifiers, clustering and decision problems

**CO4:** Familiarize with Python, data types, operators, List, Tuple, Dictionary, Functions, Modules and Packages

**CO5:** Understand the applications of machine learning in various fields like text data processing and computer vision

<b>UNIT I</b>	Introduction to learning - Types of Learning, Rote learning, Learning by parameter adjustment, Learning by general problem solving, Concept learning, Learning by analogy. Introduction to machine learning, Why machine learning. Types of problems in machine learning, History of machine learning, Aspects of inputs to training, Learning systems, Machine learning as a classifier, Intelligent agents, Machine learning applications. Evaluation of machine learning algorithms.	<b>10 hrs</b>
<b>UNIT II</b>	Neural Networks. Artificial Neural Nets, ANN Basics, ANN - Learning Process, Types of Networks, Perceptron, Multilayer Perceptron, Error back Propagation Algorithm, RBF Networks. Linear Classifiers, Quadratic Classifiers, Decision Trees, C 4.5 Algorithm, Random Forest, Bayesian Networks, Bayesian Networks Learning, Limitation of Bayesian Networks. Self-Organizing Maps, Learning Process of SOM, Adaptive Resonance Theory, ART Networks, ART Architecture, ART Algorithms	<b>12hrs</b>
<b>UNIT III</b>	Support Vector Machines, Inductive Logic Programming, Generic ILP Algorithm, Principal Approaches to ILP, Characteristics of ILP System, Ensemble Classifiers, Ada Boost algorithm, Bayes Optimal Classifier, Nearest Neighborhood techniques, Fuzzy Network, Fuzzy Systems, Fuzzy Neural Systems. Clustering, Fuzzy Clustering, Reinforcement Learning, Markov Decision Problem, Q-learning, Q-Learning Algorithms.	<b>12hrs</b>
<b>UNIT IV</b>	Core Python: Data Types, Operators, Control Statements, List, Tuple, Dictionary, Functions, Modules and Packages. Machine Learning and Python: Introduction to NumPy, SciPy, Matplotlib. Reading in data, Preprocessing and cleaning data, Building a Classifier,	<b>10 hrs</b>

	Evaluation, Improve performance of the classifier, Clustering, Tweaking the parameters, Regression – Single and Multidimensional regression, Cross Validation, Penalized regression.	
<b>UNIT V</b>	Applications in some fields: Text Data Processing, Topic Modeling – LDA, Sentiment Analysis from Twitter Data, Basket Analysis, Music Genre Classification, Computer Vision – Pattern Recognition, Dimensionality Reduction.	<b>8hrs</b>

**REFERENCE BOOKS**

- [1] Vinod Chandra S S, Anand Hareendran S, “Artificial Intelligence and Machine Learning”, PHI, 2014.
- [2] Willi Richert, Luis Pedro Coelho, “Building Machine Learning Systems with Python”, Packt Publishing, 2013.
- [3] Ethem Alpaydin, “Introduction to Machine Learning”, 2nd Ed., PHI Learning Pvt. Ltd., 2013.
- [4] Tom M Mitchell, “Machine Learning”, McGraw Hill.
- [4] Jacek M. Zurada, „Introduction to Artificial Neural Systems“, Jaico Publishing home, 2002
- [5] Laurance Fausett, „Fundamentals of Neural Networks“, Pearson Education, 2004.

## 5MCACC2: NETWORK INFORMATION SECURITY

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To introduce the concept of network security and techniques

**Course Outcome:** Students will be able to

**CO1:** Identify and classify computer and security threats and understand the concept of encryption and decryption

**CO2:** Apply modern algebra and number theory to understanding of cryptographic algorithms and vulnerabilities

**CO3:** Examine and understand the techniques and algorithms used for message authentication: MAC, Digital Signatures and Hash functions.

**CO4:** Understand the need for Kerberos authentication and the techniques involved.

**CO5:** Familiarize with network security designs using available secure solutions such as PGP, SSL, IPsec, etc.

<b>UNIT I</b>	<p><b>Introduction to Computer Security:</b> Computer security concepts, The OSI Security architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security <b>Classical Encryption Techniques:</b> Symmetric Cipher Models, Substitution techniques, Transposition techniques, Steganography. Block Ciphers and Data Encryption Standards: Block Cipher Principles, Data Encryption Standard (DES) Operation, DES Example, The Strength of DES <b>Advanced Encryption Standard(AES):</b> AES structure, AES example</p>	<b>12 hrs</b>
<b>UNIT II</b>	<p><b>Introduction To Number Theory:</b> Prime Numbers, Fermat's and Euler's theorem. <b>Public key Cryptography and RSA:</b> Principles of Public Key Cryptosystems, The RSA Algorithm. <b>Other Public key cryptosystems:</b> Diffie Hellman Key Exchange. <b>Cryptographic Hash Functions:</b> Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA)</p>	<b>10 hrs</b>
<b>UNIT III</b>	<p><b>Message Authentication Codes:</b> Message Authentication Requirements, Message Authentication Functions, Requirements for Security of MACs <b>Digital Signature:</b> Concepts of Digital Signature, Digital Signatures Standard</p>	<b>10 hrs</b>

<p><b>UNIT IV</b></p>	<p><b>Key Management and Distribution:</b> Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Public Key Infrastructure. <b>User Authentication:</b> Remote user Authentication Principles, Remote User- Authentication Using Symmetric Encryption, Kerberos, Remote User-Authentication Using Asymmetric Encryption, Federated Identity Management.</p>	<p><b>10 hrs</b></p>
<p><b>UNIT V</b></p>	<p><b>Transport-Level Security:</b> Web security Considerations, Secure Socket Layer and Transport layer Security, Transport Layer Security. <b>E-Mail Security:</b> Pretty Good Privacy, S/MIME</p>	<p><b>10 hrs</b></p>
	<p><b>IP Security:</b> IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange</p>	

**REFERENCE BOOKS:**

- [1] William Stallings, “*Cryptography and Network Security*”, PHI, Fifth Edition, 2011
- [2] AtulKahate, “*Cryptography and Network Security*”, Tata McGraw-Hills, Eighth Reprint, 2006.
- [3] Eric Maiwald, “*Information Security Series, Fundamental of Network security*”, DreamtechPress

## 5MCACC3: CLOUD COMPUTING

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To explore massive parallel architecture and distributed computing that enable cloud technology.

**Course Outcome:** Students will be able to

**CO1:** Learn basics of Cloud computing

**CO2:** Understand the importance of virtualization

**CO3:** Knowledge of various cloud computing services

**CO4:** Understand the key concepts of Cloud Deployment using AWS as case studies

<b>UNIT I</b>	<p><b>Distributed System Models and Enabling Technologies:</b> Scalable Computing Service over the Internet: The Age of Internet Computing, scalable computing Trends and New Paradigms, Internet of Things and Cyber-Physical Systems. System Models for Distributed and Cloud Computing: Clusters of Cooperative Computers, Grid Computing Infrastructures, Peer-to-Peer Network Families, Cloud Computing over the Internet. Software Environments for Distributed Systems and Clouds: Service-Oriented Architecture (SOA), Trends towards Distributed Operating Systems, Parallel and Distributed Programming Models. Performance, Security, and Energy-Efficiency: Performance Metrics and Scalability Analysis, Fault-Tolerance and System Availability, Network Threats and Data Integrity, Energy-Efficiency in Distributed Computing.</p>	<b>12hrs</b>
<b>UNIT II</b>	<p><b>Computer Clusters and Virtualization of clusters and data centers:</b> Clustering for massive parallelism: Cluster Development Trends, Design Objective of Computer Clusters, Fundamental Cluster Design issues. Virtual machines and Virtualization of clusters and Data centers: Implementation levels of virtualization: levels of virtualization Implementation, VMM Design requirements and providers, Virtualization support at the OSlevel, Middleware Support for Virtualization. Virtualization Structure, CPU, Memory, I/O Devices and Data Center Automation.</p>	<b>10hrs</b>
<b>UNIT III</b>	<p><b>Computing clouds and Service Oriented Architecture:</b> Cloud computing and Service Models: Public, Private, and Hybrid Clouds, Cloud Ecosystem and Enabling Technologies, Infrastructure-as-a-Service (IaaS), Platform- and Software-as-a-Service (PaaS, SaaS). Data Center Design, Interconnection of Modular Data Centers, Management issues. Generic Cloud architecture Design, Layered Cloud Architectural development, Virtualization Support and Disaster Recovery, Architectural Design Challenges</p>	<b>10 hrs</b>



<b>UNIT IV</b>	<b>Intercloud Resource Management, Cloud Programming and Environment:</b> Extended Cloud Computing Services, Platform deployment, global exchange of cloud Resources, Cloud Security and Trust Management, Programming support of Google App Engines, Case Study: Amazon Open Source Cloud Software Environment. Case Study: Nimbus	<b>10 hrs</b>
<b>UNIT V</b>	<b>Ubiquitous Clouds and the Internet of Things:</b> Performance of Distributed Systems and the Cloud Data-intensive Scalable Computing(DISC), Quality of Service in Cloud computing, Benchmarking MPI, Azure, EC2,MapReduce, and Hadoop. Online social and Professional Networking: Online SocialNetwork Characteristics, Graph-Theoretic Analysis of Social networks, Communities and Applications of Social Networks, Facebook: The World’s Largest Content-Sharing Network, Twitter for Micro blogging, News and Alert Services.	<b>10hrs</b>

**REFERENCES**

- [1] Kai Hwang, Jack Dungaree, and Geoffrey Fox, “*Distributed and Cloud Computing*”, MK Publishers, 2012.
- [2] Michael Miller, “*Cloud Computing-Web-Based Applications that change the Way you work and collaborate Online*”, Pearson Publication, 2012.
- [3] Anthony T. Volte, Toby J. Volte, Robert Elsenpeter, “*Cloud Computing, A Practical Approach*”, McGraw Hill, 2010.

## 5MCAEC21: DIGITAL IMAGE PROCESSING

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To study the basic concepts and methodologies for digital image processing

**Course Outcome:** Students will be able to

**CO1:** Understand fundamentals of Digital image processing and various stages of Digital image processing

**CO2:** Learn spatial operations and use it for various image processing applications namely image enhancement, image sharpening and image resampling

**CO3:** Know frequency domain concepts and operations namely frequency domain filtering and apply it to enhance the images

**CO4:** Identify various noise and image degradation models and restore the images using filters

**CO5:** Understand various segmentation techniques and use it for object segmentation

**CO6:** Identify various morphological operations and apply to segment objects based on shapes

<b>UNIT I</b>	<b>Fundamentals of Digital Image Processing:</b> Fundamental steps in digital image processing, Components of image processing visual perception, image sensing and acquisition, sampling and quantization, mathematical tools used in digital image processing.	<b>08 hrs</b>
<b>UNIT II</b>	<b>Image transformations:</b> Intensity transformation functions, Fundamentals of spatial filtering, smoothing and sharpening spatial filters, Intensity transformations using fuzzy sets.	<b>10 hrs</b>
<b>UNIT III</b>	<b>Filtering in the frequency domain:</b> Fourier series, Fourier transform of functions of continuous variable, Convolution, Discrete Fourier transformation of one variable, Sampling, Image interpolation and resampling, Moiré patterns, Properties of 2D discrete Fourier transform. Filtering basics and fundamentals.	<b>14 hrs</b>
<b>UNIT IV</b>	<b>Image restoration and reconstruction:</b> Image degradation/restoration process, Noise models- spatial and frequency properties of noise, noise probability density functions, image construction from projection.	<b>10 hrs</b>
<b>UNIT V</b>	<b>Morphological Processing:</b> Dilation and Erosion, Opening and Closing, Hit-or-miss transform. <b>Image Segmentation:</b> Point, line and edge detection, Thresholding (Different Techniques), Region growing, Region splitting and merging.	<b>10 hrs</b>

**REFERENCE BOOKS:**

- [1] Rafael C Gonzalez, Richard E Woods, "*Digital Image Processing*", Pearson education Third Edition.
- [2] William K Pratt, "*Digital Image Processing*", John Willey, June 2010.
- [3] A.K. Jain, "*Fundamentals of Digital Image Processing*", Prentice Hall of India, 2011.
- [4] ChandaDutta, Magundar, "*Digital Image Processing and Applications*", Prentice Hall.

## 5MCAEC22: INTERNET OF THINGS

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To introduce the implementation of web based services on IoT devices

**Course Outcome:** Students will be able to

**CO1:** Understand constraints and opportunities of wireless and mobile networks for Internet of Things.

**CO2:** Analyze the societal impact of IoT systems and its domains.

**CO3:** Develop critical thinking skills.

**CO4:** Analyze, design or develop parts of an Internet of Things solution and map it toward selected business model(s)

**CO5:** Evaluate the impact of cloud technology and its issues related to the Internet of Things.

<b>UNIT I</b>	<b>Introduction to Internet of Things</b> –Definition and Characteristics of IoT,Physical Design of IoT – IoT Protocols, IoT communication models, IoT Communication APIsIoT enabled Technologies – Wireless Sensor Networks, Cloud Computing, Big data analytics,Communication protocols, Embedded Systems, IoT Levels and Templates - Domain Specific IoT’s – Home, City, Environment, Energy, Retail, Logistics, Agriculture, Industry, health andLifestyle	<b>12 hrs</b>
<b>UNIT II</b>	<b>IoT and M2M</b> – Software defined networks, network function virtualization, difference between SDN andNFV for IoT Basics of IoT System Management with NETCOZF, YANG- NETCONF, YANG, SNMP NETOPEER	<b>10 hrs</b>
<b>UNIT III</b>	<b>Introduction to Python</b> - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling <b>Python packages</b> - JSON, XML, HTTPLib, URLLib, SMTPLib	<b>10 hrs</b>
<b>UNIT IV</b>	<b>IoT Physical Devices and Endpoints</b> - Introduction to Raspberry PI-Interfaces (serial, SPI, I2C) <b>Programming</b> – Python program with Raspberry PI with focus of interfacing external gadgets, controllingoutput, reading input from pins	<b>10 hrs</b>
<b>UNIT V</b>	<b>IoT Physical Servers and Cloud Offerings</b> – Introduction to Cloud Storage models and communication APIs <b>Webserver</b> – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API	<b>10 hrs</b>

**REFERENCE BOOKS:**

[1] ArshdeepBahga and Vijay Madiseti, “*Internet of Things- A Hands-on Approach*”  
Universities Press, 2015, ISBN: 9788173719547

[2] Matt Richardson & Shawn Wallace, “*Getting Started with Raspberry Pi*”, O’Reilly (SPD),  
2014, ISBN: 9789350239759

[3] Marco Schwartz, “*Internet of Things with the Aruino Yun*”, Packt Publishing, 2014.

## 5MCAEC23: SYSTEM MODELING AND SIMULATION

**Total No. of Hours: 52**

**Hours/Week: 04**

**Course Objective:** To provide strong foundation on concept of simulation and modeling and practice to design simulation models for various case studies like inventory, traffic flow networks.

<b>UNIT I</b>	<b>Modeling and Simulation:</b> Nature of Simulation systems, Models and Simulation, Continuous and Discrete Systems, System Modeling, Concept of Simulation, Components of Simulation study, Principles used in modeling, Static and Dynamic physical models, Static and Dynamic Mathematical models. Introduction to Static and Dynamic System Simulation, Advantages, Disadvantages and pitfalls of Simulation.	<b>10hrs</b>
<b>UNIT II</b>	<b>System Simulation and Continuous System:</b> Simulation Types of System Simulation, Monte Carlo Method, Comparison of analytical and Simulation methods, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model, Continuous System Models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time Simulations.	<b>10hrs</b>
<b>UNIT III</b>	<b>System Dynamics &amp; Probability Concepts in Simulation:</b> Exponential growth and decay models, logistic curves, Generalization of growth models, System dynamics diagrams, Multi segment models, Representation of Time Delays, Discrete and Continuous Probability functions, Continuous Uniformly Distributed Random Numbers, Generation of Random Numbers, Generating Discrete Distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method.	<b>11hrs</b>
<b>UNIT IV</b>	<b>Simulation of Queuing Systems and Discrete System:</b> Simulation Poisson arrival patterns, Exponential Distribution, Service Times, Normal Distribution Queuing Disciplines, Simulation of Single and Two Server Queue. Application of queuing theory in computer system, Discrete Events. Generation of arrival patterns, Simulation Programming tasks, Gathering Statistics, Measuring Occupancy and Utilization, Recording Distribution and Transmit Times	<b>11hrs</b>
<b>UNIT V</b>	<b>Introduction to Simulation Languages and Analysis of Simulation Output GPSS:</b> Action Times, Succession of events, Choice of paths, Conditional Transfers, Program Control Statements, SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels, SIMSCRIPT statements Estimation Methods, Replication of Runs, Batch Means, Regenerative Techniques, Time Series Analysis, Spectral Analysis and Autoregressive Processes	<b>10hrs</b>

**REFERENCE BOOKS:**

- [1] Jerry Banks, John S Carson, “*Discrete event System Simulation*”, Pearson Education
- [2] Gordon G., “*System Simulation*”, PHI Learning India
- [3] DrShailendra Jain, “*Modeling & Simulaion Using Matlab and Simulink*”, Wiley
- [4] David Cloud, Larry Rainey, “*Applied Modeling and Simulation*”, TMGH
- [5] Frank L Severence, “*System Modeling and Simulation An Introduction*”, Wiley
- [6] Thomas J Sciber, “*Simulation using GPSS*”, Wiley & Sons
- [7] James Harrington, KerimTumay, “*Simulation Modeling Methods*”, TMGH

## 5MCAP1: CLOUD COMPUTING LAB

**Use Eucalyptus or Open Nebula or equivalent to set up the cloud**

**Total No. of Hours: 72**

**Hours/Week: 06**

<b>PART - A</b>	
<b>1</b>	Find procedure to run the virtual machine of different configuration. Check how many virtual machines can be utilized at particular time.
<b>2</b>	Find procedure to attach virtual block to the virtual machine and check whether it holds the data even after the release of the virtual machine.
<b>3</b>	Install a C compiler in the virtual machine and execute a sample program.
<b>4</b>	Configure Java compiler in the virtual machine and execute a sample program
<b>5</b>	Find procedure to install storage controller and interact with it.
<b>6</b>	Find procedure to set up the one node Hadoop cluster.
<b>7</b>	Mount the one node Hadoop cluster using FUSE.
<b>8</b>	Write a program to use the API's of Hadoop to interact with it.
<b>9</b>	Write a word count program to demonstrate the use of Map and Reduce tasks
<b>PART – B</b>	
<b>10</b>	<p>Case Study: Cloud Application Design – Cloud Service &amp; Platforms</p> <ol style="list-style-type: none"> <li>a. Amazon –EC2</li> <li>b. Google Compute Engine</li> <li>c. Windows Azure VM</li> <li>d. Amazon – S3</li> <li>e. Google Cloud Storage</li> <li>f. Windows Azure Storage</li> <li>g. Amazon – RDS</li> <li>h. Amazon – DynamoDB</li> <li>i. Google Cloud SQL</li> <li>j. Windows- Azure SQL database</li> </ol> <p>And beyond (Choice Unlimited)</p>



### Scheme of Evaluation

<b>Writing 2 programs (10 marks each )</b>	<b>20</b>
<b>Executing 2 programs</b>	<b>30</b>
<b>Extended/Debugging module</b>	<b>10</b>
<b>Viva</b>	<b>10</b>
<b>Total</b>	<b>70</b>

**5MCAP2: PYTHON PROGRAMMING LAB**

Total No. of Hours: 72

Hours Per week: 06

Ex. No	Part – A
1	Array, String, List
2	Tuple, Set, Dictionary
3	Class and Object & Regular Expression
4	NumPy: Arrays, Random, Date Time
5	NumPy: Math, Statistics
6	Pandas: Data Series
7	Pandas: Data Frame
8	Classifier: KNN
9	Classifier: SVM
10	Classifier: ANN
11	Regression
11	Clustering: k-Means
12	Clustering: Hierarchical
13	Clustering: Fuzzy k-Means
14	Visualization using Matplotlib
<b>Part – B</b>	
<b>Mini project:</b> Implement a machine learning algorithm for a specific domain.	

**Scheme of Evaluation**

Section	Criteria	Marks
<b>Part A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	20
	Viva	10
<b>Part B</b>	Project Demo	20
	Viva-voce	10
	<b>Total</b>	<b>70</b>

**5MCAECP21: DIGITAL IMAGE PROCESSING LAB**

Total No. of Hours : 72

Hours/Week: 06

Ex. No	Part – A
1	Image Manipulation. Read, write, and view images and conversion between different image formats. [imread(), imwrite(), imshow(), gray2ind(), ind2gray(), ind2rgb(), mat2gray(), rgb2gray(), rgb2ind()]
2	Spatial Transformations. Convolution and Correlation.[imfilter(), conv2(), filter2()]
3	Perform algebraic operations. [ Image addition, subtraction, multiplication, division ]
4	Explore Image histogram. Histogram equalization and Histogram matching operations.
5	Perform Geometric transformations. [Image negative, logarithmic, gamma and contrast stretching transformations].
6	Perform frequency Transformations. Fourier transforms. [ fft2(), ifft2(), fftshift() ]
7	Implement Low Pass Filter , High Pass Filter
8	Noise identification and filtering techniques to remove it. [imnoise(), medfilt2(), ordfilt2(), wiener2() ].
9	Morphological Transformations. Dilatation and erosion as fundamental morphological operations.[ imdilate(), imerode(), imclose(), imopen(), bwmorph() ]
10	Discontinuity based Segmentation : Edge Detection, Detection of boundaries between two regions using different gradient approximations
11	Similarity based Segmentation: Thresholding, Divide the image in regions depending on the gray level.
12	Demonstrate various models for representing the color and methods of processing the color plane
<b>Part – B</b>	
	<b>Mini project:</b> Implement a simple GUI based application that will appropriately apply various image operations specific to the chosen problem.

**Scheme of Evaluation**

<b>Section</b>	<b>Criteria</b>	<b>Marks</b>
<b>Part A</b>	Writing <b>ONE</b> program	10
	Execution of <b>ONE</b> program	20
	Viva	10
<b>Part B</b>	Project Demo	20
	Viva-voce	10
	<b>Total</b>	<b>70</b>

## 5MCAECP22: INTERNET OF THINGS LAB

**Total No. of Hours: 72**

**Hours/Week: 06**

Students are to design an IoT system as a mini project using Arduino/Raspberry Pi/ equivalent boards

### Scheme of Evaluation

Criteria	Marks
Project Presentation	10
Project Demo	40
Viva-voce	20
<b>Total</b>	<b>70</b>

**5MCAECP23: SYSTEM MODELING AND SIMULATION LAB**

**Total No. of Hours: 72**

**Hours/Week: 06 Hours**

Students have to develop a mini project using any open source.

Statistical/mathematical/programming tools.

**Scheme of Evaluation**

<b>Criteria</b>	<b>Marks</b>
Project Presentation	10
Project Demo	40
Viva-voce	20
<b>Total</b>	<b>70</b>

## 5MCAIMC13D ANIMATION USING MAYA

**Total No. of Hours: 25**

**Hours/Week: 02**

**Course Objective:** To understand the basics of 3D Animation, Techniques of animating on Object, Polygons, NURBS and Rendering in Maya

**Learning Outcome:** Students can efficiently work with 3D animation tool – Maya and create stunning 3D Projects.

<b>UNIT I</b>	<b>Introduction to Maya</b> - Installation and Exploring the User Interface of Maya Working with Scene, Projects and Objects: Working with Projects and Scenes – Viewing the workspace – working with Objects – grouping, ungrouping and duplicating objects. <b>Polygon modeling:</b> Components of a Polygon Mesh – creating Polygon Mesh – Modifying Polygon Mesh <b>NURBS Modeling:</b> NURBS curve – creating NURBS curve – Editing NURBS curve – Creating NURBS surface – Editing NURBS surface.	10 hrs
<b>UNIT II</b>	<b>Animating Objects:</b> Types of Animation – Using Animation Controls – Animating Objects using Key frame – Adding Sound – Previewing Animation	10hrs
<b>UNIT III</b>	<b>Adding Special Effects:</b> Shader types – Shader attributes – Lights – Adding shadow. Rendering Scenes: Types of Rendering – setting Window – Camera – Adding Depth field –Software Rendering - Rendering Nodes	5hrs

### REFERENCE BOOKS

- [1] Kognet Solutions ,”*Maya 20018 in simple steps*”, Dreamtech Press, 9<sup>th</sup> Edition
- [2] DariushDerakhshani, “*Introducing Autodesk Maya 2013*”, Autodesk Official Training guide, SYBEX
- [3] Patrica Beckman and Phil Young, “3d Animation with Maya 7”
- [4] Paul Naas, “*Maya 2014 Essentials*”, Autodesk Press

**Scheme of Evaluation**

<b>Criteria</b>	<b>Marks</b>
Scene creation with special effects	15
Animating the scene	10
Viva-voce	10
<b>Total</b>	<b>35</b>



## VI SEMESTER

## 6MCAEC31: STORAGE AREA NETWORKS

Total No. of Hours: 52

Hours/Week: 04

**Course Objective:** To understand the fundamentals of storage centric and server centric systems and metrics used for designing storage area networks.

**Course Outcome:** Students will be able to

**CO1:** Understand the basic concepts of storage centric and server centric systems.

**CO2:** Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, and CAS.

**CO3:** Apply the techniques used for data maintenance and realize strong virtualization concepts.

**CO4:** Understand the importance of RAID concepts.

**CO5:** Identify components, management and monitoring of data center.

<b>UNIT I</b>	<b>Introduction:</b> Server Centric IT Architecture and its Limitations; Storage – Centric IT Architecture and its advantages. <b>Case study:</b> Replacing a server with Storage Networks The Data Storage and Data Access problem; The Battle for size and access.	<b>10 hrs</b>
<b>UNIT II</b>	<b>Intelligent Disk Subsystems:</b> Architecture of Intelligent Disk Subsystems; Hard disks and Internal I/O Channels; JBOD, Storage virtualization using RAID and different RAID levels; <b>Caching:</b> Acceleration of Hard Disk Access; Intelligent disk subsystems, Availability of disk subsystems. <b>I/O Techniques:</b> The Physical I/O path from the CPU to the Storage System; SCSI; Fibre Channel Protocol Stack; Fibre Channel SAN; IP Storage.	<b>12 hrs</b>
<b>UNIT III</b>	<b>Network Attached Storage:</b> The NAS Architecture, The NAS hardware Architecture, The NAS Software Architecture, Network connectivity, NAS as a storage system. File System and NAS: Local File Systems; Network file Systems and file servers; Shared Disk file systems; Comparison of fibre Channel and NAS.	<b>10 hrs</b>
<b>UNIT IV</b>	<b>Storage Virtualization:</b> Definition of Storage virtualization; Implementation Considerations; Storage virtualization on Block or file level; Storage virtualization on various levels of the storage Network; Symmetric and Asymmetric storage virtualization in the Network. <b>SAN Architecture and Hardware devices:</b> Overview, Creating a Network for storage; SAN Hardware devices; The fibre channel switch; Host Bus Adaptors; Putting the storage in SAN; Fabric operation from a Hardware perspective.	<b>10 hrs</b>
<b>UNIT V</b>	<b>Software Components of SAN:</b> The switch's Operating system; Device Drivers; Supporting the switch's components; Configuration options for SANs. <b>Management:</b> Planning Business Continuity; Managing availability; Managing Serviceability; Capacity planning; Security considerations.	<b>10 hrs</b>

**REFERENCE BOOKS**

- [1] Ulf Troppens, Rainer Erkens and Wolfgang Muller: “*Storage Networks Explained*”, Wiley India, 2007.
- [2] Marc Farley: Storage Networking Fundamentals – “*An Introduction to Storage Devices, Subsystems, Applications, Management, and File Systems*”, Cisco Press, 2005.
- [3] Robert Spalding: “*Storage Networks The Complete Reference*”, Tata McGraw-Hill, 2003.
- [4] Richard Barker and Paul Massiglia: “*Storage Area Network Essentials A Complete Guide to understanding and Implementing SANs*”, Wiley India, 2006.

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**6MCAEC32: SOFTWARE PROJECT MANAGEMENT**
**Total No. of Hours: 52****Hours/Week: 04**

**Course Objective:** To understand and explore the industrial formats in the design and executing software projects.

**Course Outcome:** Students will be able to understand

**CO1:** The basic concepts of Software Project Management and Project Management life cycle through case study.

**CO2:** Selection of project approach and planning activities and scheduling

**CO3:** To monitor and control project through case study

**CO4:** Manage to understand people resource and ethics

**CO5:** Decision making and controlling the project in terms of maintaining the quality of the Project and closure of the project process

<b>UNIT I</b>	Introduction-Software Project Management, Project management life cycle, Project Evaluation and Programme Management, An overview of Project Planning – Case Study	<b>12 hrs</b>
<b>UNIT II</b>	Selection of an appropriate Project Approach, Activity Planning-Introduction, Objectives of activity planning, Project Schedules, Sequencing and scheduling activities, Network Planning Models, Formatting a network Planning Model, Identifying, Case Study	<b>10 hrs</b>
<b>UNIT III</b>	Monitoring and Control – Introduction, Creating the Framework, Collecting the Data, Review, Visualizing Progress, Cost Monitoring, Earned value analysis, Managing Contracts – Introduction, Types of Contract, Stages in Contract Placement, Typical Terms of a Contract, contract Management, Case Study	<b>10 hrs</b>
<b>UNIT IV</b>	Managing People in Software Environments – Introduction, Understanding behavior, Organizational behavior, Selecting the Right Person for the Job, Motivation, Stress, Stress management, Health and Safety, Ethical and Professional Concerns	<b>10 hrs</b>
<b>UNIT V</b>	Software Project Teams – Introduction, Decision making, Organization and Team structures, Co-ordination dependencies, Dispersed and Virtual teams, Communication plans, Software Quality – Introduction, Role of Software Quality on Project Planning, Software Quality Models, Product versus Process quality management, Quality plans, Project Closure Process	<b>10 hrs</b>

**REFERENCE BOOKS**

[1] Bob Hughes, Mike Cotterell, Rajib Mall, “*Software Project Management*”, Mc-Graw Hill Education, 2018.

[2] Walker Royce, “*Software Project Management – A Unified Framework*”, Pearson Publication, 2013.

[3] John M. Nicholas, *“Project Management for Business and Technology – Principles and Practice”*, PHI Publications, 2006.

### **6MCACC1: PROJECT**

Two Elective Papers to be offered by the department and in addition students are expected to do a live/in house project in an industry/college for a minimum period of four months.

Internal guide (Faculty of MCA department) is allotted to every student on campus, Students have to interact with their internal guides for *four* interactive sessions.

### **Scheme of Evaluation**

<b>Criteria</b>	<b>Marks</b>
Interaction (1,2,3,4)	20
Review 1 & Review 2	20
Project Report	20
<b>CIA Total</b>	<b>60</b>
Industry Evaluation	40
End Semester Viva Voce	100
<b>ESE Total</b>	<b>140</b>
<b>Total (CIA + ESE)</b>	<b>200</b>

### **6MCACDP1: Community Development Project**