



**SHRI RAMDEOBABA COLLEGE OF  
ENGINEERING AND MANAGEMENT,  
NAGPUR - 440013**

An Autonomous College affiliated to  
Rashtrasant Tukadoji Maharaj Nagpur University,  
Nagpur, Maharashtra (INDIA)

**PROGRAMME SCHEME & SYLLABI  
2019-20**

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**MASTER IN COMPUTER APPLICATION (MCA)**

**About the Department**

The Department of Computer Application started functioning at Shri Ramdeobaba College of Engineering (RCOEM) in the year 2001, offering a three-year postgraduate degree in Computer Applications (MCA). The management at RCOEM nurtured the first shift of MCA through the years, allowing it to take roots firmly. The huge success of the course and its demand as a viable career option resulted in the establishment of the second shift in the year 2010. Today the department successfully runs two shifts to full capacity with a total intake of 120 students (60 in each shift). With phenomenal placements and institute backed internship efforts, it has become one of the most preferred destinations for students who opt for the MCA course.

**Department Vision**

To pursue excellence in quality education, research and innovation through team work with a focus on computer applications for the benefit of the industry, students and society.

**Department Mission**

The Department of Computer Application is working with the mission to excel in imparting quality education with dedicated and strongly motivated faculty. We also strive to foster mutually beneficial relationship with industry and academia.

**Program Educational Objectives**

1. To provide students with sound foundation of computer fundamentals, core computer knowledge, techniques, tools and skills from mathematics required to solve problems in computer application.
2. To provide students with the knowledge of system development life cycle (SDLC) so that they can create computing solutions for various fields of IT and able to understand the importance of environmental, social, professional and ethical issues.
3. To provide exposure to emerging technologies, professional and ethical attitude, effective communication skills, adequate training & opportunities to work as part of a team in multidisciplinary projects and adapt to current industry trends by engaging in lifelong learning.

**Program Outcomes**

1. An ability to apply knowledge of computing fundamentals and mathematics across disciplines.
2. An ability to identify, formulate and implement complex computing solutions using principles of mathematics, computing and relevant domain knowledge.
3. An ability to design, analyze and evaluate solutions for complex computing problems taking into account cultural, societal and environmental aspects.
4. An ability to design and conduct experiments, analyze and interpret data to provide valid conclusion.
5. An ability to apply current techniques, skills and appropriate tools in various domains in the field of IT.
6. An ability to understand professional ethics, legal and social issues along with the cyber regulations.
7. An ability to engage in life-long learning and continuing professional development.
8. Apply the understanding of management principles with computing knowledge to manage the projects in multidisciplinary environments as a dedicated team.
9. To inculcate an ability to communicate effectively in written and verbal form to a variety of audiences about complex computing activities.

Published by

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ISO 9001 : 2015 CERTIFIED ORGANISATION

10. An ability to understand the impact of local and global computing on individuals, organizations and society.
11. An ability to apply the principles of teamwork, leadership and collaborations to function productively and professionally.
12. An ability to develop oneself as an entrepreneur in the software domain through innovative approach to benefit the society at large.

#### The MCA Course Structure

The master of computer application is a three year full time course, and each year is divided into two semesters. The first five semesters have to be attended in college and in the sixth semester students have to complete internship by doing a live project in some company.

#### Choice Based Credit System

The main objective of introducing CBCS by our department was to provide opportunity to the learners to pursue courses as per their choice. It is a system of evaluation which offers maximum opportunities and avenues to the learners to learn core subjects with the provision of additional soft courses for their holistic development. It will prove as an instrument to bridge the gap between the two students of various courses as it has a provision for students to pursue core subjects as well as soft courses of other department simultaneously. Exceptional students who have opted additional courses in 1st & 2nd year, and have earned 120 credits out of 150; they are at an advantage. They can go for one full year Project Internship. They can earn remaining 10 credits of V<sup>th</sup> Sem in Summer of IV and V Semester.

#### Updated Syllabus

- Since MCA is a professional course catering basically to the IT and ITES sector, the program syllabus is designed so that it perfectly aligns with the current requirement of the IT Industry. Continuous syllabus review undertaken by the Board of Studies constituted for the department ensures that the students are learning theoretical concepts and technologies relevant to the industry. This has been possible due to the autonomy status enjoyed by RCOEM.

#### Facilities

- The Department is equipped with modern infrastructure and state-of-art laboratories. The classrooms are equipped with LCD projectors, white boards, and other supporting equipment. The department has three independent computer laboratories equipped with latest infrastructure, LAN, high speed internet and a repository of advanced soft-wares for the purpose of teaching, project implementation as well as for research work.

#### Co-curricular activities and Career Guidance for students

- The department considers career guidance as an extension to the teaching learning process which culminates into increased employability of the students. The process of career guidance facilitates a range of activities along with regular teaching which includes conduction of seminars and workshops, guest lectures by renowned resource persons from the industry, interaction with HR professionals etc.
- The department annually conducts workshop on aptitude development for the students where resource persons from the industry are invited to give talks on topics like available career choices, writing effective resumes, developing interview and presentation skills, tips for solving aptitude tests etc.

- From the first year itself students are compulsorily made to undergo series of aptitude tests designed and implemented by the faculty members of the department. Special problem solving techniques and tips are discussed in these sessions.
- Faculty members from the department are also involved in conducting extra classes for relevant technologies as part of the central level Training & Placement activities.

#### Industry Initiatives

- The Department has taken an initiative to set up Kratin Android Lab in collaboration with Kratin Software solutions Pvt. Ltd, Nagpur
- It has signed MOU with the companies in the region to enable the students to undertake their sixth semester internships as well as to promote interaction with the industry. These MOUs provided the right impetus for knowledge upgradation and training for students / staff of the department through regular guest lectures, workshops, project definitions and internships for sixth semester students.

#### College Website

The college website has been developed and is being maintained by the department of computer application.

#### GEMS(Governing Education Management System)

GEMS is being managed by the department of computer application. The department looks after the issues related with day to day functioning of academics in GEMS for the entire college.

#### Department Placement Cell

The department has an active Placement Cell that organizes Workshops and Guest Lectures by officials from reputed industries and professionals to give a live exposure to our students. Apart from this, online aptitude tests and technical brush sessions are also conducted on regular basis to prepare our students for the recruitment process. Placement cell also invites IT industries of repute for providing six months internship opportunities to the students to give shape to the career of MCA's in the process of Placement.

#### Career prospects

- The MCA course offers variety of course specializations due to which multitude of job profiles are created.
- The course has a wide acceptance and offers excellent career opportunities in various industries including software development companies in the areas of System analysis/design/developments/supports, mobile application programming, game programming, web and e-commerce development, database administration, software testing, education and training etc.
- Multinational corporations like Accenture, Siemens etc. and many software companies in India like TCS, Wipro, Infosys etc. hire candidates with MCA degree. They also get high paying jobs with the prospect of going abroad for off-shore development in the top IT companies across the world. Many government organizations also hire MCA graduates.
- The employability and career growth prospects for an MCA graduate are extremely high.

**Scheme of Examination of Master in Computer Application  
Semester Pattern  
I Semester Master in Computer Application**

Sr. No.	Code	Course	L	P	Credits	Maximum Marks			Exam Duration
						Continuous Assessment	End Sem Exam	Total	
1	MCT530	Computer Organization & Architecture	4	0	4	40	60	100	3 Hrs.
2	MCT531	Concepts in Data Structures	4	0	4	40	60	100	3 Hrs.
3	MCP531	Concepts in Data Structures Lab	0	4	2	25	25	50	-
4	MCT532	Principles of Programming Languages	4	0	4	40	60	100	3 Hrs.
5	MCT533	Elective-I	4	0	4	40	60	100	3 Hrs.
6	MCP533	Elective Lab-I	0	4	2	25	25	50	-
7	MCT534	Elective-II	4	0	4	40	60	100	3 Hrs.
8	MCP534	Elective Lab-II	0	4	2	25	25	50	-
9	HUP501	Elective Humanities Lab-I	0	4	2	50	-	50	-
<b>TOTAL</b>			<b>20</b>	<b>16</b>	<b>28</b>				

Elective Lab-I	
Course Code	Course Name
MCP533-1	Numerical Methods Lab
MCP533-2	Foundations of Data Analytics Lab

Elective I	
Course Code	Course Name
MCT533-1	Discrete Mathematics & Graph Theory

Elective Lab-II	
Course Code	Course Name
MCP534-1	Basics of Computer Hardware Lab
MCP534-2	User Interface Design Lab

Elective II	
Course Code	Course Name
MCT534-1	Principles of Management
MCT534-2	Digital Electronics and Microprocessors

Elective Humanities Lab-I	
Course Code	Course Name
HUP501-1	Communication Skills
HUP501-2	Environmental Science

**Scheme of Examination of Master in Computer Application  
Semester Pattern  
II Semester Master in Computer Application**

Sr. No.	Code	Course	L	P	Credits	Maximum Marks			Exam Duration
						Continuous Assessment	End Sem Exam	Total	
1	MCT535	Theory of Automata & Formal Languages	4	0	4	40	60	100	3 Hrs.
2	MCT536	Introduction to Operating System	4	0	4	40	60	100	3 Hrs.
3	MCP536	Elective Lab-III	0	4	2	25	25	50	-
4	MCT537	Concepts in Software Engineering	4	0	4	40	60	100	3 Hrs.
5	MCP537	Concepts in Software Engineering Lab	0	4	2	25	25	50	-
6	MCT538	Object Oriented Programming-1	4	0	4	40	60	100	3 Hrs.
7	MCP538	Object Oriented Programming-1 Lab	0	4	2	25	25	50	-
8	MCP539	Elective Lab-IV	0	4	2	25	25	50	-
9	HUT502	Elective Humanities-I	2	0	2	20	30	50	1.5 Hrs.
<b>TOTAL</b>			<b>18</b>	<b>16</b>	<b>26</b>				

Elective Lab-III	
Course Code	Course Name
MCP536-1	Computer Workshop-I Lab

Elective Lab-IV	
Course Code	Course Name
MCP539-1	Game Programming Lab
MCP539-2	PHP Programming Lab

Elective Humanities - I	
Course Code	Course Name
HUT502-1	Soft Skills
HUT502-2	Professional Practice & Ethics

**Scheme of Examination of Master in Computer Application  
Semester Pattern  
III Semester Master in Computer Application**

Sr. No.	Code	Course	L	P	Credits	Maximum Marks			Exam Duration
						Continuous Assessment	End Sem Exam	Total	
1	MCT620	Database Management Systems	4	0	4	40	60	100	3 Hrs.
2	MCP620	Database Management Systems Lab	0	4	2	25	25	50	-
3	MCT621	Design and Analysis of Algorithms	4	0	4	40	60	100	3 Hrs.
4	MCT622	Object Oriented Programming-2	4	0	4	40	60	100	3 Hrs.
5	MCP622	Object Oriented Programming-2 Lab	0	4	2	25	25	50	-
6	MCT623	Computer Networks	4	0	4	40	60	100	3 Hrs.
7	MCP623	Elective Lab-V	0	4	2	25	25	50	-
8	MCT624	Elective-III	4	0	4	40	60	100	3 Hrs.
9	HUT601	Elective Humanities-II	2	0	2	20	30	50	1.5 Hrs.
<b>TOTAL</b>			<b>22</b>	<b>12</b>	<b>28</b>				

Elective Lab V	
Course Code	Course Name
MCP623-1	Mobile Application Development Lab
MCP623-2	Linux System Administration & Maintenance Lab
MCP623-3	Ethical Hacking Lab
MCP623-4	System Programming Lab

Elective III	
Course Code	Course Name
MCT624-1	Development Frameworks & Virtual Machines
MCT624-2	Advanced Computer Architecture
MCT624-3	Image Processing
MCT624-4	Introduction to Real Time Operating Systems
MCT624-5	Pattern Recognition

Elective Humanities II	
Course Code	Course Name
HUT601-1	Business Correspondence & Report Writing
HUT601-2	Constitution of India & Human Rights

**Scheme of Examination of Master in Computer Application  
Semester Pattern  
IV Semester Master in Computer Application**

Sr. No.	Code	Course	L	P	Credits	Maximum Marks			Exam Duration
						Continuous Assessment	End Sem Exam	Total	
1	MCT625	Compiler Construction	4	0	4	40	60	100	3 Hrs.
2	MCT626	Internet & Web Technologies	4	0	4	40	60	100	3 Hrs.
3	MCP626	Internet & Web Technologies Lab	0	4	2	25	25	50	-
4	MCT627	Open Elective (Offered by other departments)	4	0	4	40	60	100	3 Hrs.
5	MCP628	Elective Lab-VI	0	4	2	50	-	50	-
6	MCT629	Elective-IV	4	0	4	40	60	100	3 Hrs.
7	MCP629	Elective Lab-VII	0	4	2	25	25	50	-
8	HUT602	Elective Humanities-III	4	0	4	40	60	100	3 Hrs.
<b>TOTAL</b>			<b>20</b>	<b>12</b>	<b>26</b>				

Elective Lab VI	
Course Code	Course Name
MCP628-1	Software Documentation
MCP628-2	Multimedia & Its Applications

Elective Lab VII	
Course Code	Course Name
MCP629-1	Programming in Python Lab
MCP629-2	Web Development Lab

Elective Humanities III	
Course Code	Course Name
HUT602-1	Human Resource Management
HUT602-2	Organizational Behavior

Elective IV	
Course Code	Course Name
MCT629-1	Advanced Databases
MCT629-2	Introduction to Internet of Things
MCT629-3	Operations Research
MCT629-4	Computer Graphics & its Applications
MCT629-5	High Performance Computing

Open Elective (Offered by other Department)*	
MBT699	Entrepreneurship Development
ENT699	Arduino Playground
HUT699	Psychology for Professional Growth
CST699-1	Foundation of Business Intelligence
CST699-2	Mobile Technology

**Scheme of Examination of Master in Computer Application  
Semester Pattern  
V Semester Master in Computer Application**

Sr. No.	Code	Course	L	P	Credits	Maximum Marks			Exam Duration
						Continuous Assessment	End Sem Exam	Total	
1	MCT720	Elective -V	4	0	4	40	60	100	3 Hrs.
2	MCP720	Elective Lab-VIII	0	4	2	25	25	50	-
3	MCT721	Elective-VI	4	0	4	40	60	100	3 Hrs.
4	MCP721	Elective Lab-IX	0	4	2	50	-	50	-
5	MCT722	Elective-VII	4	0	4	40	60	100	3 Hrs.
6	MCP722	Elective Lab-X	0	4	2	25	25	50	-
7	MCT723	Elective-VIII	2	0	2	20	30	50	1.5Hrs.
8	HUT701	Elective Humanities-IV	2	0	2	20	30	50	1.5Hrs.
<b>TOTAL</b>			<b>16</b>	<b>12</b>	<b>22</b>				

Elective Humanities IV	
Course Code	Course Name
HUT701-1	Presentation & Interview Skills

Elective V	
Course Code	Course Name
MCT720-1	Artificial Intelligence
MCT720-2	Data Mining

Elective VI	
Course Code	Course Name
MCT721-1	Network Security
MCT721-2	Soft Computing
MCT721-3	Introduction to Web Development

Elective VII	
Course Code	Course Name
MCT722-1	Distributed Database Management Systems
MCT722-2	Distributed Systems
MCT722-3	Big Data & Analytics
MCT722-4	Information Retrieval

Elective VIII	
Course Code	Course Name
MCT723-1	Business Intelligence
MCT723-2	Software Testing
MCT723-3	API Development using Spring Data Mongo

Elective Lab VIII	
Course Code	Course Name
MCP720-1	Artificial Intelligence Lab
MCP720-2	Data Mining Lab

Elective Lab IX	
Course Code	Course Name
MCP721-1	Technical Seminar
MCP721-2	Mini-Project

Elective Lab X	
Course Code	Course Name
MCP722-1	API Level Programming Lab
MCP722-2	R Programming Lab
MCP722-3	Big Data & Analytics Lab

**Scheme of Examination of Master in Computer Application  
Semester Pattern  
V (1 Year Internship) Semester Master in Computer Application**

Sr. No.	Code	Course	Contact Hours/ Sem.	Credits	Maximum Marks			Exam Duration
					Continuous Assessment	End Sem Exam	Total	
1	MCP724	Project Work-Full Time (Phase I)	22	22	300	300	600	-
					100-Internal 200-Company Mentor			

**Scheme of Examination of Master in Computer Application  
Semester Pattern  
VI Semester Master in Computer Application**

Sr. No.	Code	Course	Contact Hours/ Sem.	Credits	Maximum Marks			Exam Duration
					Continuous Assessment	End Sem Exam	Total	
1	MCP723	Project Work-Full Time	20	20	300	300	600	-
					100-Internal 200-Company Mentor			

**Credits Distribution Semester-wise :**

SEM-I	SEM-II	SEM-III	SEM-IV	SEM-V	SEM-VI	Total Credits
28	26	28	26	22	20	150

**Semester - I****SYLLABUS OF SEMESTER - I, MCA (MASTER IN COMPUTER APPLICATION)****Course Code: MCT530****Course: Computer Organization & Architecture****L: 4 Hrs., P:0 Hrs., Per week****Total Credits: 4****Course Objectives**

1. Identify the elements of modern instructions sets, hardware components and their impact on processor design.
2. To discuss in detail computer arithmetic operations and control unit operations.
3. To study in detail function of each element of a memory hierarchy and the concept of Pipelining.
4. To study the performance of CPU, memory and I/O operations.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Solve arithmetic operations of binary number system and the elements of modern instructions sets, hardware components and their impact on processor design.
2. Perform computer arithmetic operations and control unit operations.
3. Conceptualize elements of a memory hierarchy, I/O organization and pipelining.
4. Design basic computer system and to measure the performance of CPU, memory and I/O operations.

**UNIT-I****Basic Structure of Computer Hardware & Software :**

Introduction, Memory Locations and Address, Main memory operations, Instructions & Instruction Sequencing, Addressing modes, Assembly language, Basic I/O operations, Stacks, Subroutines.

**UNIT-II****The Processing Unit :**

Fundamental concepts, Execution of Complete Instruction, Multiple bus Organization, Hardwired control, Micro Programmed Control, Introduction to RISC, CISC.

**UNIT-III****Input-Output Organization:**

Accessing I/O devices, Interrupts, Direct Memory Access, Buses.

**UNIT-IV****Arithmetic Operations :**

Number arithmetic, Logic design of Fast adders, Addition & Subtraction, Arithmetic & Branching conditions, Multiplication of positive numbers, Signed operand multiplication, Fast multiplication, Integer division, Floating point numbers & operations, IEEE standards.

**UNIT-V****The Main Memory :**

Semiconductor RAM, ROM memories, Multiple-module memories and Interleaving, Cache memories, Virtual memories, Memory management requirements.

**UNIT-VI****Pipelining :**

Basic Concepts, Data Hazards, Instruction Hazard, Influence on Instruction Set, Performance Consideration.

**Text Books :**

1. Computer Organization: Carl Hamacher, Zvonko Vranesic & Safwat Zaky. Mc-Graw Hill, Fifth edition.
2. Computer Architecture & Organization: J. P. Hayes, McGraw-Hill.
3. Computer organization and Design: David A. Patterson, John L. Hennes

**Reference Books:**

1. Computer Organization & Architecture: William Stalling, Prentice Hall.
2. Computer Architecture: Behrooz Parhami, Oxford University Press.
3. Computer System Architecture: Morris Mano

## SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT531

Course: Concepts in Data Structures

L: 4 Hrs.,T: 0 Hrs., P:0 Hrs., Per week

Total Credits: 4

## Course Objectives

1. Be familiar with writing recursive methods.
2. To compare and analyze various data structures.
3. To know various applications of different data structures.
4. To learn advanced data structures such as balanced search trees, hash tables and priority queues.

## Course Outcomes

On successful completion of the course, students will be able to:

1. Explore concept and innovative applications of various data structures.
2. Conceptualize optimal techniques in storing, searching and sorting.
3. Implement binary tree traversals and operations on binary search trees to design applications like directory structure management and expression trees.

## Syllabus

## UNIT-I

**Introduction to Data Structures:** Definition, Concept of data types, Abstract Data Type. Arrays implementation in memory, Types of arrays. Applications of Arrays: Polynomial Representation Using Arrays, Addition and multiplication of Two Polynomial, Sparse Matrices and its operations.

## UNIT-II

**Linked List** - Concept of Linked Lists, Types, Operations on Linked lists, concept of Doubly Linked List, Header Linked List. Other Operation & Applications: Reversing a Linked List, Concatenation of Two Lists, Representation of Polynomials.

## UNIT-III

**Stacks:** Definition and example, primitive operations on Stacks, Arithmetic expressions - (Infix, Postfix and Prefix), Evaluating postfix expression, converting an expression from infix to postfix. Applications of Stacks: Uses of stacks in simulating recursive procedures/ functions.

## UNIT-IV

**Queues** - Definition and examples of queues, primitive operations, Types of Queues.

**Trees:** Definition and Basic Terminology of trees, Binary Tree, Binary Search Tree, Tree Traversal, types of Trees (Threaded Binary Tree, Height Balanced Tree), Introduction to B-trees.

## UNIT-V

**Graphs and digraphs:** Representations and traversals like Depth First Search Technique and Breadth First Search Technique, Connectivity algorithms, shortest path, Minimal spanning tree.

## UNIT VI

**Sorting & Searching:** General Background, Different Sorting & Searching Techniques and their complexities. Files: File attributes and organization. Introduction to Hashing, Different Hashing Techniques and Collision Handling Mechanisms.

## Text Books:

1. Data Structures and Program Design: Robert Kruse, PHI.
2. Classical Data Structure: Samanta, PHI.
3. Data Structures using C/C++: Tanenbaum, PHI.

## Reference Books:

1. How to solve it by Computers: R G Dromey, PHI.
2. Science of Programming: David Greece: Springer Verlag New York Pub.
3. Fundamentals of Data Structures: Elis Horowitz, SartajSahani, Galgotia Publications.
4. Schaum's Outlines Data structure: Seymour Lipschutz, Tata McGraw Hill 2nd Edition.



## SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP531

Course: Concepts in Data Structures Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. Able to implement programming logic basic constructs static and dynamic data structures and different operations on it.
2. Able to implement various mathematical expression evaluation and memory & CPU management using stacks and queues.
3. Able to implement different types of trees, optimization techniques and different algorithms on graphs and diagraphs.
4. Able to implement different hashing and collision techniques.

**Course Outcomes**

On Successful completion of course, students will be able to:

1. Implement various data structures and operations on them.
2. Implement various mathematical expression evaluation and memory & CPU management using stacks and queues.
3. Implement different types of trees, optimization techniques and different algorithms on graphs and diagraphs.

**Syllabus**

Minimum 8 practicals based on theory subject.



## SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT532

Course: Principles of Programming Languages

L: 4 Hrs., T: 0 Hrs., P:0 Hrs.,Per week

Total Credits: 4

**Course Objectives**

1. Be familiar with syntax and semantics of programming languages.
2. To know the concepts of Object oriented languages.
3. To understand exception and event handling in programming languages.
4. To get familiarize with the concepts of functional and logic programming constructs.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Describe syntax & semantics of programming languages.
2. Design & implement subprogram constructs.
3. Apply exception and event handling programming constructs.
4. Implement functional & logic programming constructs.

**Syllabus****UNIT-I**

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues.

Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

**UNIT-II**

Elementary and Structured Data Types, Structured data type and objects, Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programmes, abstract data types. Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, co-routines, Scheduled sub programmes, concurrent execution.

**UNIT-III**

Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism. Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management.

**UNIT-IV**

Introduction to Exception Handling, Exception Handling in Ada, Exception Handling in C++ , Exception Handling in Java, Introduction to Event Handling, Event Handling with Java, Event Handling in C#

**UNIT-V**

Introduction to Functional Programming, fundamentals of FPL, LISP, ML, Haskell, application of Functional Programming Languages and comparison of functional and imperative Languages.

**UNIT-VI**

Introduction to Logic Programming, Basics of Predicate Calculus, Predicate Calculus and Proving Theorems, The Origins of Prolog, Basic Elements of Prolog, Deficiencies of Prolog, Applications of Logic Programming

**Text Books:**

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Robert.W.Sabesta "Concept of Programming Language", 10th Edition, Pearson Publication.

**Reference Books:**

1. Programming languages –Ghezzi, 3/e, John Wiley
2. Fundamentals of Programming Languages, Galgotia Publications.

**SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)****Course Code: MCT533-1****Course: Discrete Mathematics & Graph Theory****L: 4 Hrs., T: 0 Hrs., P:0 Hrs.,Per week****Total Credits: 4****Course Objectives**

1. To demonstrate the basic concepts of set theory, apply induction and other proof techniques particularly those found in the area of computer science.
2. To introduce Mathematical Logic, especially Propositional Logic and Predicate Logic.
3. To develop an understanding of counting, functions, relations and graph theory.
4. To introduce a number of Discrete Mathematical Structures, serving as tools for simulation modeling and algorithmic thinking.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Use various logical notations related to set theory, modular arithmetic and relations.
2. Build up truth –tables using various connectives and solve inference logic as well as predicate logic problems.
3. Analyze basics of graph theory, shortest path and partial order sets.
4. Demonstrate concept of functions and mathematical structure in various computer science applications.

**Syllabus**

**UNIT-I : Fundamentals:** Sets and Relations, Operations on sets, Sequences, Division in the Integers, Boolean Matrices ,Mathematical Structures, Methods of Proof, Mathematical Induction.

**UNIT-II : Mathematical Logic:** Statements and Notation, Proposition and Logical operations, Connectives, Normal Forms, Theory of Inference for the Statement Calculus, Inference Theory of the Predicate Calculus.

**UNIT-III : Counting:** Permutations, Combinations, The Pigeonhole Principle, Recurrence Relations, Relations and Digraphs-Product Sets and Partitions, manipulation of Relations, Transitive Closure & Warshall's Algorithm.

**UNIT-IV : Functions:** Functions for Computer Science, Permutation Functions, Growth of Functions.

**UNIT-V : Graph Theory:** Basic Concept of Graph Theory, Euler's Path & Circuits, Hamiltonian Path & Circuits, Partially Ordered Sets Lattices, Finite Boolean Functions as Boolean Polynomials, Trees. (Minimal Spanning Trees)

**UNIT-VI : Semi-groups & Groups:** Binary Operations Revisited, Semi-groups, Group Products & Quotients of Groups.

**Text Books:**

1. Discrete Mathematical Structures: Bernard Kolman, Robert C. Busby & Sharon Ross, PHI.
2. Discrete Mathematical Structures with Applications to Computer Science: J.P. Tremblay & R. Manohar, Tata McGraw Hill.
3. Discrete Mathematics: J.K. Sharma, McMillan.

**Reference Books:**

1. Discrete Mathematics: S.K. Chakraborty and B.K. Sarkar, Oxford Uni. Press, India.
2. Combinational Mathematics: C.J. Liu.
3. Discrete Mathematics with Graph Theory: E. Goodaire, PHI.

## SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP533-1

Course: Numerical Methods Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs.,Per week

Total Credits: 2

**Course Objectives**

1. To learn the basic concepts of Numerical methods.
2. To know the applications of Numerical methods.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Apply the concepts of Numerical Methods practically.
2. Develop and execute Numerical Methods programs in Matlab / Mathematica / Maple.

**Syllabus**

Minimum 8 practicals based on the following:-

1. Find the roots of the equation by bisection method.
2. Find the roots of the equation by secant/Regula – Falsi method.
3. Find the roots of the equation by Newton's method.
4. Find the solution of a system of nonlinear equation using Newton's method.
5. Find the solution of tridiagonal system using Gauss Thomas method.
6. Find the solution of system of equations using Jacobi/Gauss-Seidel method.
7. Find the cubic spline interpolating function.
8. Evaluate the approximate value of finite integrals using Trapezoidal and Simpson's Rules.
9. Solve the initial value problem using Euler's method and compare the result with the exact solutions.
10. Solve the boundary value problem using finite difference method.

**Note:** Programming is to be done in any one of Computer Algebra Systems: MATLAB / MATHEMATICA / MAPLE.



## SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP533-2

Course: Foundation of Data Analytics Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs.,Per week

Total Credits: 2

**Course Objectives:**

1. To explore the social, business, technical based problems.
2. To apply proper techniques for the analysis of various data sets.
3. To interpret the outcomes of the analysis so as to take correct decisions.

**Course Outcomes:**

On successful completion of the course, students will be able to:

1. Describe the structure and characteristics of the data sets.
2. Achieve a basic understanding of statistical techniques.
3. Demonstrate and interpret the results of the outcomes.

**Syllabus:**

Minimum 8 practicals based on the following but not limited to

1. Introduction to Statistics I- Types of variables, descriptive statistics, inferential statistics.
2. Introduction to Statistics II- Correlation Regression and Predictive analysis.
3. Introduction to R – R environment, packages, programming concepts.
4. Data handling and exploring data for missing values and outliers.
5. Data visualization and normalizing data techniques.
6. Descriptive statistical approach- mean, median, mode, SD, etc.
7. Inferential statistical approach- Parametric tests, ANOVA and Non parametric test – chi square.
8. Predictive analysis: Linear and Non linear models, Logistics regression.
9. Time series analysis: Long terms fluctuation, short term fluctuation, Concept of ARIMA.
10. Mini project based on above topics.

NOTE : Programming is to be done using Excel and R Programming.



## SYLLABUS OF SEMESTER - I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT534-1

Course: Principles of Management

L: 4 Hrs., T: 0 Hr., P: 0 Hrs., Per week

Total Credits: 4

## Course Objectives

1. To present a thorough and systematic coverage of management theory, the basic roles, skills and functions of management.
2. To draw student's attention towards social responsibility, managerial ethics, and the importance of various types of management.
3. To emphasize on basic areas which are required as prerequisites for understanding subjects like Organizational Behavior, Human Resource Management, etc.
4. To cover in details the foundations of planning and decision-making, organizational design, managing change and innovation, leadership, motivation, communications, supervision and control of operations.

## Course Outcomes

On successful completion of the course, students will be able to:

1. Describe and discuss the various components of management, identify and explain issues involved in managing a diverse workforce.
2. Discuss and apply the planning, organizing and controlling the processes in the organization.
3. Identify, discuss and/or describe various theories related to the development of leadership skills, motivation techniques, teamwork and effective communication.
4. Work effectively as a team member through group projects, case studies and problem analysis.

## Syllabus

## UNIT-I

**Foundation of Management:** Meaning and nature of Management, Development of Management thought, Levels of Management, Role of managers, Managerial skills.

## UNIT-II

**Functions of Management:** Planning, Decision-making, Directing and supervision, Coordination, Communication, Managerial control.

## UNIT-III

**Marketing Management:** Marketing and concepts of Marketing, Marketing Management, Marketing environment, Marketing Research, Market Segmentation, Marketing Planning.

## UNIT-IV

**Human Resource Management:** Human resource planning; Analyzing work and Designing Job, Performance appraisal and Incentive-Based Payments, Job safety, and health; Work Stress.

## UNIT-V

**Financial Management:** Meaning and nature of financial management, Financial Statements, Budget, Ratio analysis.

## UNIT-VI

**Organization Behavior:** Meaning and elements of organization behavior, Individual behavior, group behavior, Organizational Change and Development.

## Text Books:

1. Principles of Management: P. C. Tripathi and P.N. Reddy, Tata McGraw Hill Publisher, New Delhi.
2. Marketing Management: Global Perspective Indian Context : V. S. Ramaswamy and S.Namakumari, MacMillian Publishers India Ltd, New Delhi.
3. Industrial and Business Management: Martand T Telsang, S.Chand Co. Ltd, New Delhi.
4. Human Resource Management: K. Aswathappa; Tata-McGraw-Hill Publishing Co. Ltd, New Delhi.

## Reference Books:

1. Industrial Engineering and Management: P. Khanna and A. Sarup, Dhapat Rai Publication, New Delhi.
2. Financial Management: Ram M Kishore, Taxman Allied Services Pvt Ltd.

**SYLLABUS OF SEMESTER - I, M.C.A. (MASTER IN COMPUTER APPLICATION)****Course Code: MCT534-2****Course: Digital Electronics and Microprocessors****L: 4 Hrs., T: 0 Hr., P:0 Hrs., Per week****Total Credits: 4****Course Objectives**

1. To introduce number systems and codes.
2. To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions.
3. To introduce the methods for simplifying Boolean expressions.
4. To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits.
5. To introduce the basic concepts of microprocessor 8085 and assembly language programming.

**Course Outcomes**

On completion of this course, students will be able to:

1. Perform arithmetic operations with different number systems.
2. Understand and use various optimization techniques to minimize and design digital circuits.
3. Analyze and design various combinational logic circuits and sequential circuits.
4. Discuss the architecture & programming of 8085 microprocessor.

**Syllabus****Unit-I : Binary Systems**

Digital Computers and Digital Systems, Number Systems, Representation of Signed Numbers and Binary Arithmetic in Computers, Binary Codes.

**Unit-II : Logic gates**

Truth table, properties and symbolic representation of NOT, AND, OR, NOR, NAND, EX-OR, EX-NOR gates. NOR and NAND gates as a universal gates.

**Unit-III : Boolean algebra**

Axioms and Laws of Boolean Algebra, Duality, Reducing Boolean expressions, Canonical and Standard Forms, Minimization of switching functions: 2, 3, 4 variable Karnaugh map.

**Unit-IV : Combinational Logic**

Adders, Subtractors (Half and Full), Decoders, Encoders, Multiplexers, Demultiplexers, code converter.

**Unit-V : Sequential Logic**

Flip-Flop, Concept of clock, Counters- Ring Counter, Johnson Counter.

**Unit-VI : 8085 Microprocessor**

Architecture, Pin Diagram, Instruction set, Addressing modes. Memory organization and interrupts, Simple Assembly language programming using 8085.

**Text Books:**

1. Digital Design: *M. M. Mano, Prentice Hall.*
2. Fundamentals of Digital Circuits: *A. Anand Kumar, PHI.*
3. *Ramesh Gaonkar: 8 bit Microprocessor: CBS Publisher: 2011*

**Reference Books:**

1. Modern Digital Electronics: *R.P.Jain.*
2. Digital Electronics: *G.K.Kharate, Oxford University Press.*
3. Microprocessors and Microcontrollers: *N.Senthil Kumar, M.Saravanan, S.Jeevananthan, Oxford University Press.*

## SYLLABUS OF SEMESTER -I, M.C.A. (Master in Computer Application)

Course Code: MCP534-1

Course: Basics of Computer Hardware Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To understand basic concept & structure of computer hardware & networking.
2. To identify the earlier and existing configuration of the Motherboard and other peripherals.
3. To apply knowledge to identify / rectify onboard problems & to work on different OS.
4. To integrate the PCs into Local Area Network & re-install operating systems.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Conceptualize the basics of computer hardware devices and their evolution.
2. Assemble CPU by interfacing different hardware components.
3. Format machine, install OS and prepare machine for LAN setting.
4. Use the troubleshooting commands of UNIX and DOS.

**Syllabus**

Minimum 8 practicals and assignments based on the following:-

1. Components inside a computer
2. Networking hardware.



## SYLLABUS OF SEMESTER -I, M.C.A. (Master in Computer Application)

Course Code: MCP534-2

Course: Use Interface Design Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To know the aesthetic way of preparing the design with relevant to the kind of application.
2. Understand the importance and usage of creating user friendly interfaces and responsive designs using Wireframe.

**Course Outcomes**

1. Implementing beautiful and rich user interfaces for the applications created.
2. Knowing and Grasping the techniques for user friendly interfaces and responsive flows using Wireframe.

**Syllabus**

Minimum 8 practical and assignments based on Wire framing, UX and UI designing using any of the following tools but not limited to :

- Justinmind
- Wireframe .cc
- Moqups
- Fluid UI
- Balsamiq Mockups
- Axure RP
- Pidoco
- Visio
- In Design CC
- Photoshop CC



## SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: HUP501-1

Course: Communication Skills

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To know the basics of verbal communication.
2. To learn Basic English grammar and its usage.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Verbally condense larger amounts of information into concise, condensed analysis.
2. Prepared for Group discussion, Personal interviews, etc.
3. Give a clear, organized and accurate oral presentation of course material.

**Syllabus**

1. Various strategies to overcome oral communication apprehension.
2. Presentation skills - visual aid and public speaking skills.
3. Mock presentation sessions.
4. Basic English grammar.



## SYLLABUS OF SEMESTER -I, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code : HUP501 - 2

Course : Environmental Science

L : 0 Hrs., T : 0 Hrs., P : 4 Hrs., Per week

Total Credits : 2

**Course Objectives**

1. To recognize major concepts in environmental sciences and demonstrate in-depth understanding of the environment.
2. To develop a sense of community responsibility by becoming aware of scientific issues in the larger social context.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Learn about different components of environment & ecology.
2. Understand principles of environmental impact assessment.
3. Know different types of Pollutions, their effects, standards & control.

**Syllabus**

1. Introduction, components of the environment, environmental degradation
2. Ecology: Elements of Ecology; Ecological balance and consequences of change, principles of environmental impact assessment
3. Air Pollution and Control: Atmospheric composition, energy balance, climate, weather, dispersion, sources and effects of pollutants, primary and secondary pollutants, green house effect, depletion of ozone layer, standards and control measures.
4. Water Pollution and Control: Hydrosphere, natural water, pollutants: their origin and effects, river / lake / ground water pollution, standards and control.
5. Land Pollution: Lithosphere, pollutants (municipal, industrial, commercial, agricultural, hazardous solid wastes); their origin and effects, collection and disposal of solid waste, recovery and conversion methods.
6. Noise Pollution: Sources, effects, standards and control

**Reference Books:**

1. Environmental Science, Cunningham, TMH
2. Environmental Science, Wright & Nebel, PHI
3. Fundamentals of Ecology, Dash, TMH
4. Environmental Pollution Control Engineering, C.S.Rao, New Age International
5. Environmental Pollution Analysis, S.N.Khopkar, New Age International
6. Environmental Management, N. K. Oberoi, EXCEL BOOKS
7. Environmental Management, Mukherjee, VIKAS
8. Ecosystem Principles & Sustainable Agriculture, Sithamparamathan, Scitech

**Semester - II****SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)****Course Code : MCT535****Course : Theory of Automata & Formal Languages****L: 4 Hrs., T: 0 Hrs., P:0 Hrs., Per week****Total Credits : 4****Course Objectives**

1. To learn the basic properties of formal languages and formal grammars
2. To understand the concepts of deterministic and nondeterministic finite automata and to prove or disprove theorems in automata theory using its properties.
3. To learn computing with Turing machines.
4. To determine the decidability and intractability of computational problems.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Learn notion of a regular set and its representation by DFA's, NFA's, and regular expressions
2. Understand context-free language and its representation by context-free grammars and push-down automata.
3. Implement universal model of computation and its representation by a Turing machine.
4. Analyze an unsolvable & undecidable decision problem.

**Syllabus****Unit I: Finite Automata**

Informal picture of Finite automation model (FA), Deterministic Finite Automata, Definition and Notations of DFA, How a DFA processes Strings and Languages, Non-deterministic finite Automation, Definition, Equivalence of NFA & DFA, Conversion of NFA into DFA, Finite Automata with Epsilon transitions, Finite Automata with output: Moore & Mealy machines.

**Unit II: Regular Expressions**

Regular expressions (RE), Operators and rules, Building regular expressions, Converting DFA's to RE and RE to Automata, Pumping lemma for regular languages, Closure properties of regular languages, Regular grammars (RG), Right linear and Left linear grammars, Interconversion between RE and RG, Minimization of FSM.

**Unit III: Context Free Grammar and Languages**

Context-free grammars, Parse trees, Ambiguity in grammar and languages, Normal forms for Context-Free Grammars Chomsky normal form, Greibach normal form, Reduction of CFG's, Elimination of  $\epsilon$ -Productions, Unit Productions and Left Recursion, Useless Symbols, closure and decision properties of CFLs.

**Unit IV: Push Down Automata**

Definition of Pushdown Automata (PDA), Formal definition of PDA, Languages of PDA-Acceptance by final state and Empty Stack, , From PDA to CFG and CFG to PDA, Deterministic vs. Nondeterministic PDA .

**Unit V: Turing Machines**

The Turing Machine, Transition diagrams for Turing machines, Languages, Turing machines and Halting, Extensions to basic Turing Machine, Universal Turing Machine, Recursive and Recursively enumerable languages.

**Unit VI: Undecidability**

Undecidable Problem, Decidability, Rice's theorem, Post's Correspondence problem, Church's Hypothesis, Recursive function theory,

**Text Books:**

1. Introduction to Language and Theory of Computation: John C. Martin, TMH, 3<sup>rd</sup> Edition, ISBN: 978-0-07-066048-9.
2. Introduction to Automata Theory, Languages and Computations: Hopcroft Ulman, Pearson Education Asia, 2nd Edition, ISBN: 9788131720479.
3. Introduction to the Theory of Computation: Michael Sipser, CENGAGE Learning, 3<sup>rd</sup> Edition, ISBN13:978-81-315-2529-6
4. Theory of Computation: O. G. Kakde, University Science Press
5. Theory of Computation: Vivek Kulkarni, Oxford University Press, ISBN-13: 978-0-19-808458-7.

**Reference Books:**

1. Theory of Computer Science (Automata, Languages and Computation): K.L.P. Mishra, N.Chandrasekaran, PHI 3<sup>rd</sup> Edition
2. Introduction to Computer Theory: Daniell. A. Cohen, Wiley-India, ISBN: 978-81-265-1334-5.



## SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT536

Course: Introduction to Operating Systems

L: 4 Hrs., P:0 Hrs., Per week

Total Credits: 4

## Course Objectives

1. To study various elements of operating systems and concurrent processes problems.
2. To understand various memory management, deadlock avoidance and prevention techniques.
3. To learn different protection and security concerns of operating system.
4. To understand core functionalities of different operating system like windows / UNIX.

## Course Outcomes

On successful completion of the course, students will be able to:

1. Identify various elements of operating system and concurrent processes problems.
2. Analyze various memory management, deadlock avoidance and prevention techniques.
3. Understand different protection and security concerns of operating systems.
4. Understand core functionalities of different operating system like windows / UNIX.

## Syllabus

## UNIT-I

**Introduction** - Types of OS, Operating system services, user view, and system view. File system Introduction, Access methods, Allocation methods, Directory system, protection, Implementation issues, Disk and drum scheduling.

## UNIT-II

**Process** - Introduction, Threads, CPU Scheduling, Concurrent processes Precedence graph, the critical section problem, Semaphores, Classical process coordination problem, Inter-process communication.

## UNIT-III

**Memory Management** – Concept of Fragmentation, Swapping, Multiple partition, Paging, Segmentations, Combined systems.

**Virtual memory** - Overlays, Demand Paging, Performance of demand paging, Page replacement, Allocation algorithm, Thrashing.

## UNIT-IV

**Deadlocks** - Characterization, prevention, avoidance, Banker's algorithm for deadlock avoidance, combined approach.

## UNIT-V

Protection Goal, Mechanisms and Policies, Domain of protection, Access matrix, Dynamic protection structures. Security- The security problem, User authentication, Program threats, System threats.

## UNIT-VI

**Case Studies:** UNIX Operating System /Windows Operating System.

## Text Books :

1. Operating System Concepts: *Silberschatz Galvin: John Wiley & Sons.*
2. Modern Operating Systems: *Andrew Tanenbaum, PHI.*
3. Operating System, internals and Design Principles: *Williams Stallings.*

## Reference Books :

1. An Introduction to Operating System: *H.M.Dietel, Pearson Education.*
2. Operating System: *Charles Crowley, IRWIN Publications.*
3. Operating systems: *Archer J. Harris, Schaum's Outline, McGraw Hill Publication*

## SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP536 -1

Course: Computer Workshop-I Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

## Course Objectives

1. To know the basics of operating systems.
2. To learn commands of UNIX and automate tasks using scripts.
3. To learn how to use gdb and DDD.

## Course Outcomes

On successful completion of the course, students will be able to:

1. Learn the basics of operating systems.
2. Use and run the commands of Linux.
3. Use and develop programs on IDEs.

## Syllabus

Minimum 8 practicals and assignments based on but not limited to the following topics:

- \* Introduction to Linux/Unix OS
- \* Installing Linux (or any variant)
- \* Introduction to using different tools for identification of possible errors in C program gdb, concepts of "core dump", backtracing using "bt", using "info" to dump all registers, creating watch list / watch variables.
- \* DDD (Data Display Debugger)–introduction and usage.
- \* IDE for code development
- \* Create a project, using multiple .c and .h files with cross-references
- \* Bash scripting –variables, conditionals, loops, finding logged in users.
- \* Parameter passing to C program from shell (argc / argv)



## SYLLABUS OF SEMESTER –II, M.C.A. (Master in Computer Application)

Course Code: MCT537

Course: Concepts in Software Engineering

L: 4 Hrs., T:0 Hrs, P: 0 Hrs. Per week

Total Credits: 4

## Course Objectives

1. To enable the development of skills through which the student will gain expertise to engineer software of high quality by following sound analysis and design principles.
2. Learn to plan and execute the project effectively through requirements analysis, estimation, risk management and project scheduling activities.
3. To develop various project management techniques for managing real world projects and object oriented approach towards software engineering.
4. To inculcate quality consciousness in students through effective testing strategies and software quality management.

## Course Outcomes

On successful completion of the course students will be able to:

1. Develop skills to engineer software of high quality by following sound analysis and design principles.
2. Learn successful project execution strategies like requirements analysis, estimation, risk management and project scheduling activities.
3. Use various project management techniques for managing real world projects and to develop an object oriented approach towards software engineering.
4. Inculcate quality consciousness through effective software quality management.

## Syllabus

## UNIT-I

**Introduction to Software Engineering:** Software engineering paradigms, Generic view of software engineering, Software metrics, Measures and metrics, Estimation, Risk analysis, Scheduling, Metrics of software quality.

## UNIT-II

**Software Project Management:** Software project estimation and planning, Decomposition techniques, Risk Management, Software reengineering, Requirement analysis, Task Analysis, Software prototyping

## UNIT-III

**Object Oriented Analysis:** Object oriented analysis and data modeling, Object oriented concepts, Class Based Modeling, Inter object communication, Finalizing object definition, Object oriented analysis modeling.

**UNIT-IV**

**Agile Development:** About Agility, Agility and cost of change, Agile process, Agile process models (Adaptive software development, Scrum, Dynamic system development method), Agile Software development Approaches.

**Data Modeling:** Data modeling concepts, Warner diagrams and the DSSD approach, Jackson system development.

**UNIT-V**

**Software Design Engineering:** The design process and fundamentals, Effective modular Design, Dataflow oriented design, Transform analysis, Transaction analysis, Design heuristics, Object oriented design methods and concepts, Refining operations.

**UNIT-VI**

**Software Quality Management:** Software quality assurance, Quality metrics, Halstead's S/W science, Software testing techniques, S/W testing fundamentals, White box testing, Black box testing, Validation testing, System testing, Debugging software maintenance maintainability, Maintenance tasks, Reverse engineering and reengineering.

**Text Books:**

1. Software Engineering : *Roger S. Pressman, TMH*
2. Software Engineering For Students : *D.Bell, AddisonWisley*

**Reference Books:**

1. Fundamentals of Software Engineering : *Ghezzi, Jazayeri & Mandrioli, PHI.*
2. Software Engineering concept : *Richard Fairley, Tata McGraw Hill.*
3. Fundamental of Software Engineering : *Mall, PHI.*

**SYLLABUS OF SEMESTER –I1, M.C.A. (Master in Computer Application)**

**Course Code: MCP537**

**Course: Concepts in Software Engineering Lab**

**L: 0 Hrs. P: 4 Hrs. Per week**

**Total Credits: 2**

**Course Objectives**

1. To learn basic concepts of UML and its open source tools.
2. To understand UML constructs and their usage.
3. To understand Normal Testing and Agile Testing methodologies.

**Course Outcome**

On successful completion of the course students will be able to:

1. Analyze and implement software development models using UML through open source tools.
2. Analyze and design software system using various UML constructs.
3. Understand Normal Testing and Agile Testing methodologies.

**Syllabus**

Minimum 8 Practical's based on the theory subject.



## SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT538

Course: Object Oriented Programming-1

L: 4 Hrs, T: 0 Hrs., P: 0 Hrs, Per week

Total Credits: 4

## Course Objectives

1. To know object oriented features, class and member concept and their implementation.
2. To understand various Mathematical Operator Overloading concepts and its implementation.
3. To study and understand the concept of File Handling, operations on file, Pointers manipulation and management techniques.
4. To Study different Templates, Exception Handling Technique and it's implementation.

## Course Outcomes

On Successful completion of course, students will be able to:

1. Conceptualize object oriented features, class and member concepts and their implementation.
2. Implement various Mathematical operator overloading concepts.
3. Develop programs based on different operations on files and file pointers manipulation and management techniques.
4. Implement different templates, Exception handling technique.

## Syllabus

## UNIT I

**OOPs Features:** Data encapsulation, Inheritance, Data abstraction, Polymorphism and Difference between OOPS and POP, Benefits of OOP, Applications of OOP.

## UNIT II

**Class and Members:** Concept of a class, Access control of members of a class, Instantiating a class, Static and Non-static data members and member functions, Friend Function, Array of objects, Constructors and Destructors: Different types of Constructors.

## UNIT III

**Inheritance:** Deriving a class from another class, Different types of Inheritance, Access control of members under derivation, Different ways of class derivation, Virtual Base Classes and abstract Classes. Virtual Functions

## UNIT IV

**Operator Overloading:** Overloading unary and Binary Operators, Rules for Overloading Operators. Streams: C++ Streams, C++ Stream Classes, Unformatted I/O Operations, Formatted console I/O Operations, Managing output with manipulators.

## UNIT-V

**File Handling:** Classes for File stream operations, Opening and closing File, Detecting End of File, File opening modes, File Pointers and their Manipulations, Sequential and Random input-output operations on file.

## UNIT-VI

**Templates:** Class Templates, Function Templates. Exception Handling: Basics, Exception Handling Mechanism, Throwing, Catching Mechanism, Rethrowing an Exception, Specifying Exceptions.

## Text Books:

1. Object Oriented Programming Using C++ : E. Balaguruswamy.
2. The C++ Programming Language: Stroustrup B., Addison Wesley.
3. Mastering C++ : K Venugopal, Raj Buyya, T ravishankar

## Reference Books:

1. The Complete Reference: Herbert Schildt, 4th Edition, Tata McGraw Hill
2. Object oriented Programming in C++ : Robert Lafore

**SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)**

Course Code: MCP538

Course: Object Oriented Programming-1 Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To understand the class and member concept and are able to implement it using different access modifiers.
2. To learn programming using mathematical operator overloading.
3. To learn how to implement different File Handling Operations and pointer manipulation programs.
4. To understand the concepts of Templates and Exception Handling.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Conceptualize the class and member concepts as to implement them using different access modifiers.
2. Implement programs using mathematical operator overloading.
3. Implement different file handling operations and pointers manipulation programs.
4. Implement templates and Exception handling concept

**Syllabus**

Minimum 8 practicals based on theory subject.



**SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)**

Course Code: MCP539 - 1

Course: Game Programming Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To understand Game Designing and Development.
2. To design the logic and develop Game Engine Model.
3. To enable the students to create Interactive Games.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Model and develop a new Gaming System.
2. Develop interactive games with their knowledge gained out of various Gaming Platforms.

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics:

- \* Mobile Gaming for the Android
- \* Adventure Game Studio - Unity
- \* Developing 2D and 3D interactive games using OpenGL



## SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP539 - 2

Course: PHP Programming Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To learn programming skills to construct a complete end-to-end Information system solution.
2. To get exposure of important technologies and components including languages, clients and middleware development tools.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Create and maintain a dynamic web site
2. Use PHP to add server-side processing to a Web site
3. Design and create web applications that dynamically access a database

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Handling HTML form with PHP
- PHP conditional events and Loops
- PHP Functions
- String Manipulation and Regular Expression
- Arrays in PHP



## SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: HUT502-1

Course: Soft Skills

L: 2 Hrs., T: 0 Hrs., P:2 Hrs., Per week

Total Credits: 2

**Course outcomes:**

- CO1:**Ability to conceptualize fundamentals of effective group discussion strategies  
**CO2:**Ability to conceptualize fundamentals of effective Personal Interview strategies  
**CO3:** Ability to prepare effective resumes

**Syllabus****Unit 1: Group Discussion**

Introduction, Definition, Difference between GD and Debate, Number and duration, Personality traits evaluated in GD, GD etiquettes and mannerism, Opening and summarizing, tips for GD, mock GD sessions

**Unit 2: Personal Interviews**

Importance of personal interview, types of PI, Types of questions in PI, introduction to KYC, dressing, body-language

**Unit 3: Resumé Making**

Types of Resumé, Components of a resume, important features of a selling Resumé, sample Resumé

**Text Books**

1. Sanjay Kumar, PushpaLata, *Communication Skills*, , Oxford Higher Education Publication
2. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: Principles and Practice* , Oxford Higher Education Publication

**Reference books**

1. Dr. K Alex, *Soft Skills: Know Yourself & Know the World*, S. Chand Publishers
2. Barun K. Mitra, *Personality Development and Soft Skills*, 9<sup>th</sup> edition, , Oxford Higher Education Publication
3. Shital Kakkar Mehra, *Business Etiquette: A Guide for the Indian Professionals*;, Harper Collins Publishers



## SYLLABUS OF SEMESTER -II, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: HUT502 - 2

Course: Professional Practice &amp; Ethics

L: 2 Hrs., T: 0 Hrs., P:0 Hrs., Per week

Total Credits:2

## Course Outcomes

CO1: Students will understand professional ethics

CO2: Students will understand various dimensions of professional ethical problems and dilemmas

CO3: Students will understand methods and strategies to resolve various ethical problems

## Syllabus

## Unit I:

## Professional Ethics

Professionalism and types of ethics, negative and positive face of ethics, responsibility of professionals.

## Unit II:

## Ethical Problems

Technology optimism and pessimism, computer technology and dimensions of ethics, ethical issues in design, trust and reliability, case studies (bigdata mining, cyber Psychology).

## Unit III:

## Ethical Resolution

Framing the problem, resolving problems, ethical resources for solving boundary-crossing problems, ethical obligations of professionals towards environment.

## Reference Books:

1. Charles, E. Harris, Michael, S Pritchard, Michael J Rabins, *Engineering Ethics: Concepts and Cases*, CENGAGE Learning India Pvt Ltd, 2012.
2. R. Subramanian, *Professional ethics (including Human values)*, Oxford publication, 2017



## Semester - III

## SYLLABUS OF SEMESTER - III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT620

Course: Database Management Systems

L: 4 Hrs., P: 0 Hrs., Per week

Total Credits : 4

## Course Objectives

1. To know how to design, manipulate and manage databases.
2. Develop preliminary understandings and skills for designing a database information system.
3. Understand implementation of database systems in real world problems.

## Course Outcomes

On successful completion of the course, students will be able to:

1. Design and implement a database schema, database objects for a given problem-domain.
2. Recognize the context, phases and techniques for designing and building database information systems in business.
3. Correctly use the techniques, components and tools to build application for real world problem.

## Syllabus

## UNIT-I

Database Management System: Introduction, Conventional File Processing System, Components of DBMS, Advantages and Disadvantages, Three-level Architecture proposal for DBMS, Abstraction and Data Integration, Data Independence

Data Models: Introduction, Types of Data Models, Entity-Relationship Model: E-R diagram, Reduction to relational schemas, Generalization, Specialization &amp; Aggregation

## UNIT-II

The Relational Model: Keys, Relationship, Integrity rules, Relational Algebra.

SQL: Overview of SQL, DDL, integrity constraints, DML, set operations, null values, aggregate functions, sub-queries.

## UNIT-III

Intermediate SQL: Joins, Views, Indexes, Abstract Data type, Advanced SQL:Functions, Procedures, Cursors, Triggers, PL-SQL.

Relational Database Design: Functional Dependency, Normalization.

## UNIT-IV

File Organization: Fixed length vs Variable length records, organization of records in files.

Indexing &amp; Hashing: Introduction, Ordered indices, B-Tree and B+-Tree file organization, Static &amp; Dynamic hashing.

**UNIT-V**

**Query Processing :** Overview, Measures of Query Cost, Selection Operation, Join Operation.

**Query Optimization :** Overview, Estimating Statistics of Expression Results, Transformation of Relational Expressions, Cost-Based Optimization, Heuristic Optimization.

**UNIT-VI**

**Concurrency Control :** Concept of Transaction, Serializability, Problems of Concurrent Access: lost update, inconsistent read, phantom record, locking protocols, timestamp based protocols.

**Database Recovery :** Deadlock Detection and Recovery, Log based Recovery, Recovery with concurrent transactions.

**Text Books :**

1. Database Systems Concepts : *Silberschatz, Korth, Sudarshan, McGraw-Hill.*
2. An Introduction to Database Systems : *Bipin C. Desai, Galgotia.*
3. SQL & PL/SQL using Oracle : *Ivan Bayross, BPB Publications.*

**Reference Books :**

1. Fundamental of Database Systems: *Elmasri, Navathe, Somayajulu, Gupta Pearson Publications.*
2. Database Management System: *Raghu Ramkrishan, Johannes, McGraw Hill.*
3. An Introduction to Database Systems: *C.J.Date, Narosa.*
4. Related *IEEE/ASME/ASCE/EBSCO* Papers.

**SYLLABUS OF SEMESTER - III, M.C.A. (MASTER IN COMPUTER APPLICATION)**

**Course Code: MCP620**

**Course: Database Management Systems Lab**

**L: 0 Hrs. P: 4 Hrs. Per week**

**Total Credits: 2**

**Course Objectives**

1. To give a good formal foundation on the relational model of data.
2. To present SQL and procedural interfaces to SQL comprehensively.
3. To introduce the concepts and techniques relating to query processing by SQL Implementations.
4. To understand the concepts of PL/SQL and implementation of it.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Understand, appreciate and effectively explain the underlying concepts of database technologies.
2. Design and implement a database schema, database objects for a given problem-domain.
3. Declare and enforce business rules on a database using RDBMS.
4. Normalize a database, populate and query a database using SQL DML/DDDL commands.
5. Programming for real world problem using PL/SQL.

**Syllabus**

Minimum 8 Practicals based on theory subjects





## SYLLABUS OF SEMESTER –III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT621

Course: Design and Analysis of Algorithms

L: 4 Hrs., P:0 Hrs., Per week

Total Credits: 4

**Course Objectives**

1. To introduce key techniques for designing and analyzing computer algorithms.
1. Pointing out the importance of designing efficient algorithms by comparing different complexity classes.
2. To study algorithm design paradigms and approaches for their analysis.
3. To give an insight into tractable and intractable problems and different techniques to deal with them.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Design, evaluate and compare different algorithms using worst-, average-, and best-case analysis.
2. Synthesize efficient algorithms using various algorithm design paradigms and apply them in different domains.
3. Apply the algorithms and design techniques to solve certain NP and NPC problems.

**Syllabus****UNIT-I**

**Elementary Algorithmics:** Asymptotic analysis of algorithms. **Analysis of Algorithms:** Analyzing control structures, Amortized Analysis, recurrences and generating functions.

**UNIT-II**

**Introduction to Graphs:** Basic definition of Graphs, Operations on Graphs, Graph Connectivity and Traversals-BFS, DFS, Shortest Path Algorithms

**Network Flow:** Maximum flow problem and Ford – Fulkerson algorithm, maximum flows and minimum cuts in a network.

**UNIT-III**

Greedy Algorithms, Minimum spanning trees and shortest paths, Knapsack Problem, Scheduling with deadlines, Scheduling without deadlines.

**UNIT-IV**

**Divide and Conquer:** Multiplying large numbers, binary search, quick sort, merge sort, matrix operations. Finding the median – Matrix multiplication.

**UNIT-V**

**Dynamic Programming:** The Principle of optimality, knapsack problem, shortest paths, Chained matrix multiplication-approaches using recursion.

**UNIT-VI**

**Back Tracking & Branch Bound:** Traversing trees, traversing graphs, Branch and Bound, The Mini-max principle.

**Introduction to NP and Intractability:** Introduction to NP Completeness, Polynomial reductions, NP-Complete Problems, NP-Hard Problems.

**Text Books:**

1. Fundamentals of Algorithms: Gilles Brassard and Paul Bratelly, Prentice Hall India Ltd.
2. Introduction to Algorithms: Thomas H. Cormen et.al, Prentice Hall of India.
3. Algorithm Design: Jon Kleinberg & Eva Tardos, Pearson India Education services Pvt. Ltd.

**Reference Book:**

1. Computer Algorithms–Introduction to Design and Analysis: Sara Baase and Alien Van Gelder – Addison –Wesley Publishing Company.
2. An Introduction to Analysis of Algorithms: Robert Sedgewick, Philippe Flajolet
3. Fundamentals of Computer Algorithms: Ellis Horowitz and Sartaj Sahani.
4. Related IEEE/ASME/ASCE/EBSCO Papers.

## SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT622

Course : Object Oriented Programming - 2

L: 4 Hrs, P: 0 Hrs, Per week

Total Credits: 4

## Course Objective

1. To learn principles of object-oriented programming.
2. To learn the concept of Multithreading, Exception handling, Streams, Generic and Collection classes.
3. To learn the basic concepts of JSP and Servlets.

## Course Outcomes

On Successful completion of course, student will be able to:

1. Illustrate the principles of object-oriented programming to create modular programs.
2. Apply the concept of Multithreading, Exception handling, Streams, Generic and Collection classes.
3. Apply the basic concepts of JSP and Servlets.

## Syllabus

## UNIT-I

Features of Object Oriented Programming languages like data encapsulation, inheritance, polymorphism and late binding. Introduction to class and Methods, Access control of members of a class, instantiating a class, Constructors, Garbage Collection, finalize() Method.

## UNIT-II

Concept of inheritance, methods of derivation, use of super keyword and final keyword in inheritance, run time polymorphism. Abstract classes and methods, interface, implementation of interface, creating packages, importing packages, static and non-static members.

## UNIT-III

Exceptions, types of exception, use of try catch block, handling multiple exceptions, using finally, throw and throws clause, user defined exceptions, Generics, generic class with two type parameter, bounded generics, Collection classes: Arrays, Vectors, Array list, Linked list, Hash set, Queues, Trees

## UNIT-IV

Introduction to streams, byte streams, character streams, file handling in Java, Serialization Multithreading: Java Thread models, creating thread using runnable interface and extending Thread, thread priorities, Thread Synchronization, InterThread communications.

## UNIT-V

JSP-Why JSP?, JSP Directives, Writing simple JSP page, Scripting Elements, Default Objects in JSP, JSP Actions, Managing Sessions using JSP, JSP with beans JSP. Java Database Connectivity: working with Connection, Statement and Result Set, Data Manipulation using JDBC, Data navigation.

## UNIT-VI

Servlets - Introduction Servlets vs CGI, Servlets API Overview, Servlets Life Cycle, Coding Writing & running simple Servlets, Generic Servlets, HTTP Servlet, Servlets Config, Servlets Contest Writing Servlets to handle Get & Post methods.

## Text Books:

1. JAVA The Complete Reference : *Herbert Schildt*; Seventh Edition, Tata McGraw- Hill Publishing Company Limited 2007.
2. A programmer's Guide to Java SCJP Certification: A Comprehensive Primer: *Khalid A. Mughal and Rolf W. Rasmussen*, Third Edition.
3. Java Fundamentals : A Comprehensive Introduction: *Herbert Schildt and Dale Skrien*; Tata McGraw- Hill Education Private Ltd., 2013.

## Reference Books:

1. Core JAVA Volume-II Advanced Features: *Cay S. Horstmann and Gary Cornell*; Eighth Edition; Prentice Hall, Sun Microsystems Press, 2008.
2. Java Programming: A Practical Approach: *C Xavier*; Tata McGraw- Hill Education Private Ltd., 2011
3. Related *IEEE/ASME/ASCE/EBSCO* Papers.

## SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP622

Course: Object Oriented Programming-2 Lab

L: 0 Hrs., P: 4 Hrs., Per week

Total Credits: 2

**Course Objective**

1. To apply the object based programming techniques using objects and classes.
2. To apply the Specialized Java programming concepts like Multithreading, Exception handling, Streams, Generic and Collection classes
3. To apply the Java Server side concepts like JSP and Servlets.

**Course Outcomes**

On the successful completion of this course student will be able to:

1. Develop programs using object based programming techniques using objects and classes.
2. Develop programs using Specialized Java programming concepts like Multithreading, Exception handling, Streams, Generic and Collection classes
3. Develop programs using Java Server side concepts like JSP and Servlets.

**Syllabus**

Minimum 8 practicals based on theory subject.

## SYLLABUS OF SEMESTER –III, M.C.A. (Master in Computer Application)

Course Code: MCT623

Course: Computer Networks

L: 4 Hrs., P:0 Hrs., Per week

Total Credits: 4

**Course Objective**

1. To enumerate the layers of the OSI model and TCP/IP and understand the function(s) of each layer.
2. To acquire in-depth knowledge of error detection and correction, flow control technique, multiple access control techniques along with switching, and routing.
3. To study various protocols used in transport layer and application layer.

**Course Outcomes**

On the successful completion of the subject students will be able to:

1. Learn the layered architecture of computer networks.
2. Analyze simple protocols and can independently study literature concerning computer networks.
3. Learn the conflicting issues and resolution techniques in data transmission.

**Syllabus****Unit-I**

**Computer Network Basics :** Introduction, Protocol Standards, Basic Concepts, Network Software. Reference Model: ISO- OSI and TCP/IP Model, Networking Devices

**Unit-II**

**Physical Layer :** Transmission of Digital Media, Transmission Media, Transmission Impairment, Multiplexing, Multiplexing Application: The telephone System, DSL, FTTC.

**Unit-III**

**Data Link Layer :** Design Issues in Data Link Layer, Error Detection & Correction, Elementary data link protocols, Sliding window protocol, MAC Sublayer: Channel Allocation problem, Multiple Access protocol, Ethernet and Types, Switching in Data Link Layer.

**Unit-IV**

**Network Layer :** Network Layer Design Issues, Routing Algorithm, Congestion Control Algorithms, Internetworking, The Network layer in the Internet

**Unit-V**

**Transport Layer :** The transport service, elements of transport protocols, A Simple transport protocol, The Internet Transport Protocol TCP, UDP.

**Unit-VI**

**Application Layer :** Client Server Model, DNS, FTP, SMTP, HTTP, WWW, Multimedia.

**Text Books:**

1. Computer Networks: *Andrew Tanenbaum, PHI Publication* Fourth Edition

**Reference Books:**

1. Data Communications and networks: *Forouzan, TMH.*
2. Computer Network A system approach : *Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann Publishers, 5th Edition.*
3. Data & Computer Communication: *William Stallings, PHI Publication.*
4. Related *IEEE/ASME/ASCE/EBSCO* Papers.



**SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)**

**Course Code: MCP623-1**

**Course: Mobile Application Development Lab**

**L: 0 Hrs., P: 4 Hrs., Per week**

**Total Credits: 2**

**Course Objectives**

1. To know about various platforms and tools available for developing mobile applications.
2. To realize the differences between the development of conventional applications and mobile applications.
3. To learn programming skills in Android SDK

**Course Outcomes**

On the successful completion of this course student will be able to:

1. Understand Android O.S & SDK.
2. Work with Android Studio for creating Android applications.
3. Create real life Android applications and deploy them.

**Syllabus**

To create a small Android based application.



## SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP623-2

Course: Linux System Administration &amp; Maintenance lab

L: 0 Hrs., P: 4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To know the role and responsibilities of a Linux system administrator.
2. To install and configure the Linux operating system.
3. To manage resources and security of a computer running Linux at a basic level.
4. To manage network services on a Linux system.

**Course Outcomes**

On the successful completion of this course student will be able to:

1. Install, maintain and support Linux servers in the corporate world.
2. Maintain typical applications on Linux servers.
3. Configure and manage networks in Linux environments.

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Getting started in LINUX.
- Linux Data Management
- Introduction to Linux System Administration
- User Accounts Management
- Security
- TCP/IP Network Management



## SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP623-3

Course : Ethical Hacking lab

L: 0 Hrs., P: 4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To learn the basics of Ethical Hacking.
2. To identify and analyze the stages an ethical hacker requires to take in order to compromise a target system.
3. To identify tools and techniques to carry out a penetration testing.

**Course Outcomes**

On the successful completion of this course student will be able to:

1. Discover existing security vulnerabilities in software and networks and recommend solutions.
2. Critically evaluate security techniques used to protect system and user data.
3. Demonstrate systematic understanding of the concepts of security at the level of policy and strategy in a computer system.
4. Demonstrate the ability to attack and defend a network.

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Ethical Hacking Basics
- Foot printing and Scanning
- Enumeration
- System Hacking
- Trojans and Backdoors
- Web Application Vulnerabilities
- SQL Injection
- Linux and Automated Assessment Tools



## SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP623-4

Course : System Programming Lab

L: 0 Hrs., P: 4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To learn the process of writing system programming from code writing to compilation and linking.
2. To learn how to handle tools like Lex and Yacc

**Course Outcomes**

At the end of the course student will be able to:

1. Implement system programs using C language.
2. Use tools like Lex & Yacc.

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics :

- System Programs using C.
- Using tools Like LEX & YACC.



## SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT624-1

Course : Development Frameworks &amp; Virtual Machines

L: 4 Hrs.,P: 0 Hrs., Per week

Total Credits: 4

**Course Objectives**

1. Understand and apply a framework to a design.
2. Design virtual machines to run applications in a virtual infrastructure.
3. Recognize and analyze best-practice recommendations.

**Course Outcomes**

At the end of this course student will be able to:

1. Develop web services using different technologies.
2. Analyze the intricacies of server, storage, network, desktop and application virtualizations.
3. Design new models for virtualization.
4. Design and develop cloud applications on virtual machine platforms.
5. Familiarize the memories and cache subsystem

**Syllabus****UNIT I**

**Java Server Pages** - Servlet, Features of Java Servlet, Servlet API, Servlet Life Cycle, Creating a Servlet, Session Handling in Servlets, Java Server Pages, JSP Technology, Architecture of a JSP Page, Life Cycle of a JSP Page, JSP Basic Tags and Implicit Objects, Working with Action Tags in JSP, Expression Language, JSP Tag Library, Introduction-XML Tag Library, Internationalization Tag Library, SQL Tag Library, Functions Tag Library, Java Server Faces, Features and Architecture of JSF, JSF Elements, JSF Request Processing Life Cycle, JSF Tag Libraries and UI components.

**UNIT II**

**Remote Method Invocation** - Java mail - EJB Architecture - Session Bean - stateless session bean - stateful session bean - Message Driven Bean - Transaction Management - Entity Bean - Java persistence API - Entity life cycle - entity relationship

**UNIT III**

**Hibernate** - Architecture - HQL - Object relation mapping - Seam framework - Java EE Connector Architecture (JCA) - life cycle and workflow management - comparing JDBC with JCA - Java EE Design patterns - Java web service - role of SOAP and WSDL - JAX\_WS - JAXB - SAAJ - JAXR

**UNIT IV**

**Struts** - Architecture - Actions in struts - Interceptors - OGNL support - Integrating struts with Hibernate - Spring framework - architecture - Managing transaction - Security in J2EE - JAAS.

**UNIT V****Virtualization Technologies**

Introduction, Virtual machines, Networking, Storage, Access Control, Resource Monitoring, Data Protection, Scalability, High Availability, Patch Management.

**UNIT VI****Applying Virtualization**

Practical Virtualization Solutions : Comparison of Virtualization Technologies : Guest OS/Host OS - Hypervisor - Emulation - Kernel Level - Shared Kernel, Enterprise Solutions : VMWare Server - VMWare ESXi - Citrix Xen Server - Microsoft Virtual PC - Microsoft Hyper - V- Virtual Box, Server Virtualization, Desktop Virtualization, Network and Storage Virtualization.

**References :**

1. Kogent Learning Solutions Inc, "Java Server Programming Java EE6 (J2EE 1.6) Black Book", Dreamtech Press, 2010.
2. "Virtual Machines", James E. Smith and Ravi Nair (Morgan Kaufmann), ISBN 1558609105, April 2005.
3. Related *IEEE / ASME / ASCE / EBSCO Papers*

**SYLLABUS OF SEMESTER -III, M.C.A. (Master in Computer Application)**

Course Code: MCT624-2

Course : Advanced Computer Architecture

L: 4 Hrs., P:0 Hrs., Per week

Total Credits : 4

**Course Objectives**

1. To study fundamentals of quantitative and memory hierarchy designs.
2. To study different techniques of parallelism.
3. To study Vector, SIMD, and GPU Architectures.

**Course Outcomes**

On successful completion of the course students will be able to:

1. Synthesize the concept of quantitative designs.
2. Conceptualize the optimization techniques to improve cache performance.
3. Conceptualize the different architectures of processors for parallelism.

**Syllabus****UNIT-I****Fundamentals of Quantitative Design and Analysis**

Classes of Computers, Defining Computer Architecture, Dependability, Measuring, Reporting and Summarizing Performance, Quantitative Principles of Computer Design.

**UNIT-II****Memory Hierarchy Design**

Ten Advanced Optimizations of Cache Performance, Memory Technology and Optimizations, Protection: virtual Memory and Virtual Machines, Crosscutting Issues.

**UNIT-III****Instruction-Level Parallelism and Its Exploitation**

Instruction-Level Parallelism: Concepts and Challenges, Reducing Branch Costs with Advanced Branch Prediction, Overcoming Data Hazards with Dynamic Scheduling, Dynamic Scheduling, Advanced Techniques for Instruction Delivery and Speculation, Multithreading.

**UNIT-IV****Data-Level Parallelism in Vector, SIMD, and GPU Architectures**

Vector Architecture, SIMD Instruction Set Extensions for Multimedia, Graphics Processing Units, Detecting and Enhancing Loop-Level Parallelism.

**UNIT-V****Thread-Level Parallelism**

Centralized Shared-Memory Architectures, Performance of Symmetric Shared-Memory Multiprocessors Contents, Distributed Shared-Memory and Directory-Based Coherence, Synchronization, Models of Memory Consistency

**UNIT-VI****Warehouse-Scale Computers to Exploit Request-Level and Data-Level Parallelism**

Programming Models and Workloads for Warehouse-Scale Computers, Computer Architecture of Warehouse - Scale Computers, Physical Infrastructure and Costs of Warehouse - Scale Computers

**Text Books :**

1. Computer Architecture A Quantitative Approach : John L. Hennessey, David A. Patterson 5th ed.

**Reference Books :**

1. Advanced Computer Architecture (Parallelism, Scalability, Programmability): Hwang, K McGraw Hill.
2. Parallel Computer: V. Rajaranam & C.S.R.Murthy, PHI.
3. Related *IEEE/ASME/ASCE/EBSCO* Papers.

**SYLLABUS OF SEMESTER - III, MCA (MASTER IN COMPUTER APPLICATION)**

**Course Code: MCT624-3**

**Course: Image Processing**

**L: 4 Hrs., P:0 Hrs., Per week**

**Total Credits : 4**

**Course Objectives:**

1. To learn the fundamental concepts and applications of digital image processing.
2. To learn the concepts of and how to perform Intensity transformations and spatial filtering.
3. To understand the concepts of and how to perform Image segmentation, restoration and reconstruction, color image processing, image compression and watermarking.

**Course Outcomes :****On successful completion of the course, students will be able to :**

1. Acquire and relate the fundamental concepts of a digital image processing system.
2. Understand and apply different image Filtering Models, segmentation algorithms and image compression standards for Computer vision & image analysis.
3. Understand and demonstrate the role of Image restoration, reconstruction, representation and description Techniques.

**Syllabus****UNIT-I**

**Introduction** – Fundamental steps in Digital Image Processing, Components of an Image Processing System. Digital Image Fundamentals – A Simple Image Formation Model, Image Sampling and Quantization, Basic relationship between pixels, Neighbors of pixel, Adjacency, Connectivity, Regions, Boundaries: Labeling of connected components, Distance measure, Application of image processing.

**UNIT-II**

**Intensity Transformations and Spatial Filtering :** Some Basic Intensity Transformation Functions, Histogram equalization and histogram matching, Fundamentals of Spatial Filtering, Introduction to Smoothing and Sharpening Spatial Filters.

**Filtering in the Frequency Domain :** Discrete Fourier Transform (DFT), The Basics of Filtering in the Frequency Domain.

**Image Smoothing Using Frequency Domain Filters :** Ideal Lowpass Filters, Butterworth Lowpass Filters, Gaussian Lowpass Filters.

**Image Sharpening Using Frequency Domain Filters :** Ideal Highpass Filters, Butterworth Highpass Filters, Gaussian Highpass Filters.

**UNIT-III**

**Image Restoration and Reconstruction :** Degradation model, Restoration in the Presence of Noise Only- Spatial domain, Periodic Noise Reduction by Frequency Domain, Inverse filtering, Weiner filtering, Geometric Mean Filter.



**Color image processing :** Color Models, Pseudo Color Image Processing,

**UNIT-IV**

**Image Compression :** Coding Redundancy, Spatial and Temporal Redundancy, Fidelity Criteria, Image Compression Models, Huffman Coding, LZW Coding, Lossy Compression, Digital Image Watermarking.

**UNIT-V**

**Image Segmentation :** Detection of Discontinuities, Edge Linking and Boundary Detection.

**Thresholding :** Foundation, Basic Global Thresholding.

**Region Based Segmentation :** Region Growing, Region Splitting and Merging.

**UNIT-VI**

**Representation and Description**

Representation Schemes like Chain Coding, Polygonal Approximation Approaches, Signatures, Boundary Segments, Skeletons, Boundary Descriptors, Regional Descriptors.

**Text Books:**

1. Digital Image Processing : R.C.Gonzalez & R.E. Woods, Addison Wesley Pub.
2. Fundamentals of Digital Image Processing: A.K.Jain, PHI Pub.
3. Fundamentals of Electronic Image Processing: A.R.Weeks.

**Reference Books :**

1. Digital Image Processing: S.Sridhar, Oxford Uni. Press.
2. Related *IEEE/ASME/ASCE/EBSCO* Papers



**SYLLABUS OF SEMESTER - III, MCA (MASTER IN COMPUTER APPLICATION)**

**Course Code: MCT624-4**

**Course: Introduction to Real Time Operating Systems**

**L: 4 Hrs., P:0 Hrs., Per week**

**Total Credits: 4**

**Course Objectives:**

1. To get familiar with the principles and design methods of real-time operating systems.
2. To learn how to address the fundamental problems of real-time operating systems.
3. To study various scheduling techniques of real-time operating systems.
4. To learn about resource allocation and resource access control.

**Course Outcomes:**

On successful completion of the course, students will be able to:

1. Describe the basic concepts and identify the issues that arise in designing real-time operating systems.
2. State various scheduling as well as resource allocation techniques and check their correctness.
3. Apply Real Time scheduling theory to solve the Real world problems.

**Syllabus**

**UNIT-I**

**Real time applications :** Hard and soft real time systems, timing constraints, A Reference model of Real-time systems, temporal parameters, precedence constraints & dependencies, scheduling Hierarchy, Commonly used approaches to scheduling, cyclic and priority drive approaches, Optimality of EDF and LST.

**UNIT-II**

**Clock Driven Scheduling :** Static timer driven scheduler, Cyclic Executives, Improving Average Response times of Aperiodic Jobs, Scheduling Sporadic jobs, Practical Considerations, Pros and Cons of Clock Driven Scheduling.

**UNIT-III**

**Priority-driven scheduling of periodic tasks :** Fixed priority vs Dynamic Priority schemes, Maximum schedulable Utilization, Optimality of the RM and DM algorithms, As Schedulable Test for Fixed Priority Tasks, Practical Factors.

**UNIT-IV**

**Scheduling Aperiodic and Sporadic Jobs in Priority - driven scheduling :** Deferrable Servers, Sporadic Servers, Constant Utilization, Total Bandwidth and Weighted Fair-Queuing Servers, Scheduling of Sporadic Jobs.

**UNIT-V**

**Resources and resource access control :** Non-preemptive critical sections, basic priority-inheritance, ceiling protocol, multiprocessor scheduling, predictability and validation of dynamic multiprocessor systems flexible applications, tasks with temporal distance constraints.

**UNIT-VI**

**Real time Operating systems :** Overview, Time Services and Scheduling Mechanisms, Basic Operating System Functions, Processor Reserves and Resource Kernel, Open System Architecture, Capabilities of Commercial RTOS.

**Text Book:**

1. Real-Time Systems: Jane W.S. Liu, Pearson Education Asia Pub.

**Reference Books:**

1. Real time Systems: C.M. Krishna & Kang G. Shin, McGraw Hills.
2. Related *IEEE/ASME/ASCE/EBSCO* Papers



**SYLLABUS OF SEMESTER -III, M.C.A. (Master in Computer Application)**

**Course Code: MCT624-5**

**Course: Pattern Recognition**

**L: 4 Hrs, P: 0 Hrs, per week**

**Total Credits: 4**

**Course Objectives**

1. To learn Pattern recognition basics to gain knowledge about statistical decision theory, classification and clustering.
2. To understand how to generate pattern features using various transforms based on data.
3. To emphasize on different algorithms of artificial neural networks and various transformation techniques.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Understand the basics of pattern recognition.
2. Analyze & study different pattern recognition technique.
3. Apply the pattern recognition theories to real time applications of interest.
4. Understand different algorithms of artificial neural networks and various transformation techniques.

**Syllabus:**

**UNIT-I**

Applications of pattern recognition, statistical decision theory, probability of events, Random variables, moments of random variables, Estimation of parameters, Minimum Risk Estimators.

**UNIT-II**

Bay's Theorem, conditionally independent features. Decision boundaries, Estimation of error rates, characteristics curves.

**UNIT-III**

Histograms, Kernel and window estimators, Nearest Neighbor classification techniques, Adaptive Decision boundaries

**UNIT-IV**

Artificial Neural Networks: Biological Motivation and Back-Propagation, Non-Metric Methods: Recognition with Strings, String Matching.

**UNIT-V**

Introduction to Clustering, hierarchical clustering, partition clustering, fuzzy c-means clustering.

**UNIT VI**

Problem of dimensionality, Principal component analysis, Hidden Markov models, Support vector machines, Expectation Maximization, Applications of Pattern Recognition.

**Text Books:**

1. Pattern Classification : *Richard O.Duda, Peter E.Hart, David G.Shork, John Wiley & Sons* 200, 2nd Edition
2. Pattern Recognition and Image Analysis: *Earl Gose, Richard Johnsonbough, Steve Jost, Prentice Hall of India*
3. Pattern Recognition and Image Processing : *Sing Tze bow; Marcel Dekker*

**Reference Books:**

1. Pattern Recognition and Machine Learning: C.M. Bishop
2. Related IEEE/ASME/ASCE/EBSCO Papers.

## SYLLABUS OF SEMESTER -III, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: HUT601-1

Course : Business Correspondence &amp; Report Writing

L: 2 Hrs., P: 0 Hrs., Per week

Total Credits : 2

## Course outcomes:

CO1: Students will develop understanding the fundamental requirements for effective professional writing

CO2: Students will learn the strategies for effective business correspondence

CO3: Students will learn the strategies for creating effective reports and technical proposals

## Syllabus

## Unit 1: Mechanics of writing and drafting skills

Writing process, Objectives of writing, audience recognition, basic grammar and mechanics: articles, prepositions, capitalization, punctuations, abbreviations

## Unit 2: Business correspondence

Letters: components, Types –sales, enquiry, order, complaint, cover and application, appreciation, acceptance letter, e-mails: Components and etiquettes

## Unit 3: Report and Proposal writing

Format and general contents of a report, event/trip report, progress report, feasibility, report, meeting minutes, technical proposals

## Reference Books:

1. Sanjay Kumar, PushpaLata, *Communication Skills*, Oxford Higher Education Publication
2. Sharon J. Gerson, Steven M. Gerson *Technical Writing: Process and Product*, Pearson Publication
3. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford Higher Education Publication



## SYLLABUS OF SEMESTER - III, M.C.A. (Master in Computer Application)

Course Code: HUT601-2

Course : Constitution of India &amp; Human Rights

L: 2 Hrs., P: 0 Hrs., Per week

Total Credits: 2

## Course Outcomes

CO1: Students will gain general knowledge, and legal literacy about the provisions in the Indian Constitution

CO2: Students will understand the structure and function of the Executive, legislature and judiciary

CO3: Students will learn about basic human rights in India and their intended outcome

## Syllabus

**Unit -I: Introduction:** Indian Constitutional Philosophy, Features of the Constitution and Preamble, Fundamental Rights and Fundamental Duties, Directive Principles of State Policy

**Unit- II: Union and State Executive, Legislature and Judiciary:** Union Parliament and State Legislature: Powers and Functions, President, Prime Minister and Council of Ministers, State Governor, Chief Minister and Council of Ministers, The Supreme Court and High Court: Powers and Functions

**Unit-III: Human Rights in India:** Meaning Scope and Development of Human Rights, Protection of Human Rights Act, 1993 (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and Human Rights, Human rights of marginalized communities: Issues and challenges.

## Text Books

1. Durga Das Basu, *Introduction to the Constitution of India*, Prentice –Hall of India Pvt. Ltd. New Delhi
2. Durga Das Basu, *Human Rights in Constitutional Law*, Prentice –Hall of India Pvt.Ltd.. New Delhi

## Reference books

1. SubashKashyap, *Indian Constitution*, National Book Trust
2. J.A. Siwach, *Dynamics of Indian Government & Politics*.
3. D.C. Gupta, *Indian Government and Politics*, Vikas Publishing House Pvt. Ltd.
4. H.M.Sreevai, *Constitutional Law of India*, 4th edition in 3 volumes (Universal Law Publication).
5. V.N.Shukla, *Constitution of India*, (Eastern Book Co).
6. J.C. Johari, *Indian Government and Politics*, Vishal Publications.
7. Hans J. Raj, *Indian Government and Politics*, Surjeet Publications
8. M.V. Pylee, *Indian Constitution*, Vikas Publishing
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), *Challenges to Civil Rights Guarantees in India*, Oxford University Press 2012
10. S.K. Kapoor, *International Laws and Human Rights*, Central Law Agency

**Semester - IV****SYLLABUS OF SEMESTER - IV, MCA (MASTER IN COMPUTER APPLICATION)****Course Code: MCT625****Course : Compiler Construction****L: 4 Hrs., P:0 Hrs., Per week****Total Credits : 4****Course Objectives**

1. To teach students the basic techniques that underlies the practice of Compiler Construction.
2. To understand the design tradeoffs involved in each phase of compilation: lexical analysis, parsing, intermediate form, and code generation.
3. To learn introduction to Compiler Construction and to understand the concepts of scanning, parsing and code generation.
4. To identify application areas where we need a syntax-directed analysis of symbolic expressions and languages as well as their translation into a lower-level description.

**Course Outcomes****At the end of the course student will be able to :**

1. Students understand concepts and principles of compiler design.
2. Basic understanding of grammars and language definition.
3. Know the various phases of designing a compiler.

**Syllabus****UNIT-I**

Introduction Compilers and translators, Phases of compiler design, cross compiler, Bootstrapping, Design of Lexical analyzer.

**UNIT-II**

**Syntax Analysis** : Specification of syntax of programming languages using CFG, Top-down parser, design of LL(1) parser, bottom up parsing technique, LR parsing, Design of SLR, CLR, LALR parsers.

**UNIT-III**

**Syntax directed translation** : Study of syntax directed definitions & syntax directed translation schemes, implementation of SDTS, intermediate notations- postfix, syntax tree, TAC, translation of expressions, controls structures, declarations, procedure calls, Array reference.

**UNIT-IV**

**Introduction to Lex and YACC** : Lex-A scanner Generator, Structure of Lex specification file, Lex Regular Expressions, Lex Source Definition Program, Left Context Sensitivity: Start Conditions and sample program for use of start conditions. YACC-A Parser generator, Structure of YACC specification file, YACC Grammar Rules, YACC sample program.

Storage allocation & Error Handling- Run time storage administration stack allocation, symbol table management, Error detection and recovery- lexical, syntactic, semantic.

**UNIT-V**

**Code optimization** : Important code optimization techniques, loop optimization, control flow analysis, data flow analysis, Loop invariant computation, Induction variable removal, Elimination of Common subexpression.

**UNIT-VI**

**Code generation** : Problems in code generation, Simple code generator, Register allocation and assignment, Code generation from DAG, Peephole optimization.

**Text Books:**

1. Compilers Principles Techniques and Tools : A.V.Aho, Sethi, Ullman, Pearson education.
2. Principles of Compiler Design : Alfred V. Aho & Jeffery D. Ullman, Narosa Pub. House.

**Reference :**

1. Related IEEE/ASME/ASCE/EBSCO Papers

## SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT626

Course : Internet &amp; Web Technologies

L:4 Hrs, P: 0 Hrs, Per week

Total Credits : 4

## Course Objectives

1. To understand the current industrial data modeling and representation concepts
2. To learn server side programming skills with market leading technologies along with relevant programming language.
3. To learn different technologies involved in MEAN stack.
4. To understand the latest authentication & authorization protocols.

## Course Outcomes

On successful completion of the course, students will be able to:

1. Understand the importance and usage of different data models and schemas.
2. Grasp essential knowledge for creation of web applications using server side programming.
3. To understand different technologies involved in MEAN stack.
4. To grasp various authentication & authorization protocols on web arena.

## Syllabus

## UNIT - I

**Data modeling and representation :** Introduction of XML, XMLDTD validation, Introduction to JSON,JSON Schema, JSON Format, Thrift Language Reference, Thrift Protocol stack, type system.

## UNIT – II

C#-.NET languages overview, C# Language basics, Variables, Datatypes, Strings, Types, Objects, Namespaces, Enumerations, C# Preprocessor Directives, Delegates, Events, Exception Handling, Defining Classes.

## UNIT – III

**Server Side Programming with ASP.NET :** DotNet Framework Introduction, ASP .NET file Types, Page Class, WebControls, Validation Controls, Master Pages, web.config, State Management techniques, User Controls, ADO.NET Connectivity, Caching.

## UNIT – IV

**MEAN Stack:** Introduction to MEAN, Getting started with Node.js, Node modules, Introduction to Express, the application-request-response objects, Implementing the MVC pattern.

## UNIT –V

**MEAN stack (Contd) :** Introduction to MongoDB, keyfeatures, databases, collections, MongoDB CRUD operations, Introduction to AngularJS, AngularJS modules, Two-way data binding, AngularJS Directives.

## UNIT – VI

**Authentication and Authorization protocols :** OAuth model, Relationship to other standards, using Tokens, SAML architecture, SAML components, SAML Assertions, Architecting an Identity Federation.

## Text Books :

1. Asp.Net Complete Reference – *Mathew McDonald*.
2. Beginning AngularJS, Andrew Grant – *Apress*.
3. Professional C# - *Simon Robinson Christian Nagel, Wrox*.
4. Thrift: The Missing Guide – *Diwakar Gupta*
5. Mean Web Development - *Amos Q. Haviv, PACKT Publishing*.
6. Getting Started with OAuth 2.0-*Ryan Boyd, O'Reilly*.

**SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)**

Course Code: MCP626

Course : Internet and Web Technologies Lab

L:0 Hrs, P: 4 Hrs, per week

Total Credits : 2

**Course Objectives**

1. To understand different webdata modeling approaches using XML, JSON, Thrift.
2. To understand a server side programming implementation in web technologies.
3. To learn latest full stack implementations

**Course Outcomes**

On successful completion of the course, students will be able to :

1. Implement basics of XML, JSON and Thrift.
2. Learn server side scripting techniques using ASP.NET
3. Do the practical implementation of MEAN stack.

**Syllabus**

At least 8 practicals based on theory contents



**SYLLABUS OF SEMESTER - IV, MCA (Master in Computer Application)**

Course Code: MCP628-1

Course: Software Documentation

L: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To learn various software documentation writing tools
2. To understand various guidelines for successful software documentation

**Course Outcomes**

On successful completion of the course students will be able to:

1. To be able to create successful software documentation using various documentation guidelines.
2. To be able to use various software documentation tools.

**Syllabus**

Minimum 8 Practical's based on Software Documentation writing tools but not limited to the following topics:

- Planning and Writing your documentation
- Designing for task orientation
- Laying out pages and screens
- Using graphic effectively



**SYLLABUS OF SEMESTER - IV, MCA (Master in Computer Application)**

Course Code: MCP628-2

Course: Multimedia and Its Applications

L: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To generate practical aspects of designing multimedia for the development of multimedia technologies.
2. To understand the concepts, techniques and tools for creating and editing the interactive multimedia applications.

**Course Outcomes**

On the successful completion of this course student will be able to:

1. Create and edit the interactive multimedia applications
2. Learn the basic of multimedia tools for developing a web and mobile application

**Syllabus**

Minimum 8 Practicals based on Multimedia tools but not limited to the following topics:

- Graphic designing
- Audio and Video editing
- Web designing



**SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)**

Course Code: HUT602-1

Course: Human Resource Management

L: 4 Hrs., P: 0 Hrs., Per week

Total Credits: 4

**Course Objectives**

1. To explore the perspectives in human resource management
2. To identify employees' related problems and their solutions.
3. To study the importance of training, performance evaluation and control process

**Course Outcomes**

On successful completion of the course students will be able to:

1. Understand the origin and evolution of HRM.
2. Understand the training & executive development.
3. Understand the interest & welfare of employees.
4. Understand the concept of performance evaluation and control process.

**Syllabus**

**UNIT I : Perspectives In Human Resource Management :** Evolution of human resource management – The importance of the human factor – Challenges – Inclusive growth and affirmative action - Role of human resource manager – Human resource policies – Computer applications in human resource management – Human resource accounting and audit.

**UNIT II : The Concept Of Best Fit Employee :** Importance of Human Resource Planning – Forecasting human resource requirement –matching supply and demand - Internal and External sources - Recruitment - Selection – induction – Socialization benefits.

**UNIT III : Training And Executive Development :** Types of training methods – purpose - benefits- resistance - Executive development programmes – Common practices - Benefits – Self development – Knowledge management.

**UNIT IV : Sustaining Employee Interest :** Compensation plan – Reward – Motivation – Application of theories of motivation – Career management – Development of mentor – Protégé relationships.

**UNIT V : Performance Evaluation :** Method of performance evaluation – Feedback – Industry practices – Promotion – Demotion - Transfer and Separation – Implication of job change

**UNIT VI : Control Process :** The control process – Importance – Methods – Requirement of effective control systems grievances – Causes – Implications – Redressal methods.

**References :**

1. Dessler, "Human Resource Management", Pearson Education Limited, 2007.
2. Decenzo and Robbins, "Human Resource Management", 8th Edition, Wiley, 2007.
3. Luis R.Gomez-Mejia, David B.Balkin, Robert L Cardy, "Managing Human Resource", PHI Learning, 2012.
4. Bernadin, "Human Resource Management", 8th edition, Tata Mcgraw Hill, 2012.
5. Wayne Cascio, "Managing Human Resource", McGraw Hill, 2007.

**SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)****Course Code: HUT602-2****Course: Organizational Behavior****L: 4 Hrs., P: 0 Hrs., Per week****Total Credits: 4****Course Objectives**

1. To provide basic knowledge of key approaches and Models relating to Organizational Behavior.
2. To identify specific steps managers can take to motivate the employees.
3. To understand ways of acting effectively and finding ways for controlling human behavior.
4. To apply different concepts relating to managing of conflicts, change, time and stress.

**Course Outcomes****On successful completion of the course students will be able to:**

1. Analyze the behavior of individuals and groups in organizations in terms of the key factors that influence organizational behavior.
2. Assess the potential effects of organizational level factors on organizational behavior.
3. Critically evaluate the potential effects of important developments in the external environment on organizational behavior.
4. Analyze organizational behavioral issues in the context of organization behavior theories, Models and concepts.

**Syllabus****UNIT-I****Fundamentals of Organizational Behaviour**

Nature, Scope, Definition and Goals of Organizational Behaviour; Fundamental Concepts of Organizational Behaviour; Models of Organizational Behaviour; Emerging aspects of Organizational Behaviour: Meaning Cultural Diversity, Managing the Perception Process

**UNIT-II****Perception, Attitude, Values and Motivation**

Concept, Nature, Process, Importance, Management Behavioural aspect of Perception. Effects of employee attitudes; Personal and Organizational Values; Job Satisfaction; Nature and Importance of Motivation; Achievement Motive; Theories of Work Motivation: Maslow's Need Hierarchy Theory McGregor's Theory 'X' and Theory 'Y'

**UNIT-III****Personality**

Definition of Personality, Determinants of Personality; Theories of Personality- Trait and Type Theories, The Big Five Traits, Myer-Briggs Indicator; Locus of Control, S Type A and Type B Assessment of Personality.

**UNIT-IV****Work Stress**

Meaning and definition of Stress, Symptoms of Stress; Sources of Stress: Individual Level, Group Level, Organizational Level; Stressors, Extra Organizational Stressors; Effect of Stress – Burnouts; Stress Management – Individual Strategies, Organizational Strategies; Employee Counselling

**UNIT-V****Group Behaviour and Leadership**

Nature of Group, Types of Groups; Nature and Characteristics of team; Team Building, Effective Teamwork; Nature of Leadership, Leadership Styles; Traits of Effective Leaders

**UNIT-VI****Conflict in Organizations**

Nature of Conflict, Process of Conflict; Levels of Conflict – Intrapersonal, Interpersonal; Sources of Conflict; Effect of Conflict; Conflict Resolution, Meaning and types of Grievances & Process of Grievances Handling.

**Text Books**

1. Organizational Behavior Text, Cases and Games- By K.Aswathappa, Himalaya Publishing House, Mumbai, Sixth Edition (2005)
2. Organizational Behavior Human Behavior at Work By J.W. Newstrom, Tata McGraw Hill Publishing Company Limited, New Delhi, 12th Edition (2007)
3. Organizational Behavior – By Fred Luthans

**Reference Books**

1. Organizational Behavior – By Super Robbins
2. Organizational Behavior – Anjali Ghanekar
3. Organizational Behavior Fundamentals, Realities and Challenges By Detra Nelson, James Campbell Quick Thomson Publications
4. Organizational Behavior through Indian Philosophy, By N.M.Mishra, Hikalaya Publication
5. Related *IEEE/ASME/ASCE/EBSCO* Papers



## SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT629-1

Course: Advanced Databases

L: 4 Hrs, P: 0 Hrs, Per week

Total Credits: 4

## Course Objectives

1. To understand various database architectures.
2. To get familiar with the concepts of data storage structures.
3. To learn various types of advanced databases and their issues.

## Course Outcomes

On successful completion of the course, students will be able to:

1. Examine types of database architectures.
2. Learn to implement different storage structures for different business applications.
3. Grasp deeper understanding of advanced databases.

## Syllabus

## UNIT-I

**Introduction: Database System Architectures:** Centralized and Client-Server Architectures**Server System Architectures:** Transaction Servers, Data Servers, Cloud-Based Servers.**Parallel Databases:** Introduction, Speedup and Scale up, I/O Parallelism, Interquery & Intraquery parallelism, Interoperational & Intraoperational parallelism.**Cloud Based Databases:** Data storage systems on cloud, Data Representation, Partitioning and Retrieving, Transactions and Replication, Challenges.

## UNIT-II

**Data Storage for Modern High-Performance Business Applications:** Implementing a Relational Database, Implementing a Key/Value Store, Implementing a Document Database, Implementing a Document Database, Implementing a Column-Family Database, Implementing a Graph Database.

## UNIT-III

**Object-Based Databases:** Overview, Complex Data Types, Structures Types and Inheritance in SQL Table Inheritance, Array and Multiset Types in SQL, Object-Identity and Reference Types in SQL, implementing O-R features, Object-Relational Mapping, Object-Oriented versus Object Relational Databases.

## UNIT-IV

**Temporal Databases:** Time in Databases: Time Specification in SQL, Temporal Query Languages.**Mobility and Personal Databases:** A Model of Mobile Computing, Routing and Query Processing, Broadcast Data, Disconnectivity and Consistency.

## Case studies on Temporal &amp; Mobile Databases

## UNIT-V

**NoSQL Databases :** Introduction, Differences from Relational Databases, Basic Schema and data types, Types of NoSQL Databases, Concepts of replication, distribution, sharding, and resilience, Use of NoSQL in Industry.

## UNIT-VI

**Spatial and Geographic Data :** Representation of Geometric Information, Design Databases, Applications of Geographic Data, Representation of Geographic Data, Spatial Queries, Indexing of Spatial Data Multimedia Databases, Mobility and Personal Databases.

## Text Books:

1. Database Systems Concepts : *Silberschatz, Korth, Sudarshan, McGraw-Hill (6th Edition)*
2. Data Access for Highly-Scalable Solutions : Using SQL, NoSQL, and Polyglot Persistence Microsoft MSDN.

## Reference Books :

1. Fundamentals of Database Systems : *R. Elmasri, S.B. Navathe, Pearson Education (4th Edition)*
2. Modern Database Management : *McFadden, Prescott and Hoffer (10th Edition)*  
Related *IEEE/ASME/ASCE/EBSCO* Papers.

## SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT629-2

Course : Introduction to Internet of Things

L:4 Hrs, P: 0 Hrs, Per week

Total Credits: 4

## Course Objectives:

1. To understand the vision and purpose of IoT.
2. To learn Data and Knowledge Management using Devices in IoT Technology.
3. To understand State of the Art – IoT Architecture.
4. To get familiar with real world IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

## Course Outcomes

At the end of the course students will be able to:

1. Understand the vision of IoT from a global context and its Market perspective.
2. Analyze and study different H/W devices, Gateways and Data Management in IoT.
3. Built state of the art architecture in IoT.
4. Conceptualize applications of IoT in industrial and commercial building automation and real world design constraints.

## Syllabus:

## UNIT-I

**Introduction to Internet of Things :** IoT basics, Connected devices evolution, Introduction to communication mechanisms in IoT, Challenges with IoT, Applications of IoT.

## UNIT-II

**Hardware in IoT:** Introduction to RFID, Types of RFID, Simple and programmable Beacons, Various sensors prominently used in mobile devices.

## UNIT-III

**Communication in IoT:** Physical layer protocols used in IoT communication. IP Protocols used in communication such as HTTP based protocols - CoAP and MQTT, Specific aspects of protocols covering IoT communication.

## UNIT-IV

**Sensor networks and M2M Architecture :** High level M2M requirements, ETSI M2M services architecture, ZigBee network and its architecture. 6LoWPAN related standards.

## UNIT-V

**IoT Reference Architecture** - Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views. **Real-World Design Constraints** - Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization, Interaction and remote control.

## UNIT-VI

**Applications of IoT:** Case Studies of IoT Applications : IoT in Cities/Transportation, IoT in the Home, IoT in Retail, IoT in Healthcare and IoT in Sports.

## Text Books :

1. Learning Internet of Things By: Peter Waher Publisher: Packt Publishing

## Reference Books:

1. The Internet of Things : Key Applications and Protocol By: Olivier Hersent; David Boswarthick; Omar Elloumi, Publisher : John Wiley & Sons
2. M2M Communications: A Systems Approach By: David Boswarthick; Omar Elloumi; Olivier Hersent, John Wiley & Sons
3. Related *IEEE/ASME/ASCE/EBSCO* Papers.

**SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)****Course Code: MCT629-3****Course : Operations Research****L: 4 Hrs., P:0 Hrs., Per week****Total Credits : 4****Course Objectives**

1. To acquaint with the applications of Operations research to formulate and optimize business and industry related problems.
2. To realize the need for mathematical tools to take decisions in a complex environment.
3. To improve the analytical thinking, algorithmic approach and modeling abilities related to programming, networking, queuing models.

**Course Outcomes**

On the successful completion of the subject students will be able to:

1. Demonstrate the models of Operations research.
2. Implement the tools of decision making and network scheduling.
3. Solve the real life problems of Inventory control and queuing theory.

**Syllabus****Unit-I**

Introduction to Operations Research (OR): Origin and Development of OR, Nature of OR, Characteristics of OR, Classification of Problems in OR, Models in OR, Phases of OR, Uses and Limitations of OR, Methodologies in OR, Applications in OR. Linear Programming – Concept of Linear Programming Model, Mathematical Formulation of the Problem, Graphical solution Methods. Linear Programming Methods - Simplex Methods, Big M methods, Dual Simplex Method, Two Phase Methods, Duality Rules, Formulation of Dual Problem.

**Unit-II**

Transportation Problem: Mathematical Model for Transportation Problem, Types of Transportation Problem. North-West Corner Rule, Least Cost Cell Method, Vogel Approximation Method, MODI Method. Assignment Problem – Zero-One programming model for Assignment Problem, Types of assignment Problem, Hungarian Method, Branch and Bound Technique for Assignment Problem, Travelling Salesman Problem.

**Unit-III**

Decision Theory: Introduction, Decision under Certainty, Decision under Risk, Decision under Uncertainty, Decision Tree. Game Theory – Terminologies of Game Theory, Two person Zero-Sum Games, The Maximin-Minimax Principle, Saddle Point, Game of Mixed Strategies, Dominance Property, Graphical Solution of  $2 \times n$  and  $m \times 2$  Games.

**Unit-IV**

Network Scheduling By CPM/PERT: Introduction, Basic Concept, Constraints in Network, Critical Path Methods (CPM), PERT Network, PERT calculations, PERT vs. CPM., Project Cost, Crashing Algorithm, Resource Allocation and Scheduling Concept of MOST, GERT, LOB and Precedence Planning.

**Unit-V**

Inventory Control: Introduction, Inventory Control, Selective Control Techniques, Types of Inventory, Economic Lot Size Problem, Problem of EOQ without and with shortage (Purchase and Manufacturing Models), Inventory Control with Price Breaks.

**Unit-VI**

Queuing Theory: Introduction, Terminologies of Queuing System, Operating Characteristics of Queuing System, Poisson Process and Exponential Distribution, Classification of Queues, Definition of Transient and Steady States, Poisson Queues ( $M/M/1:\infty/FCFS$ ) and ( $M/M/N:\infty/FCFS$ ) models, Non-Poisson Queuing System ( $M/E_k/1:\infty/FCFS$ ), Cost-Profit Models in Queuing, Queuing Control.

**Text Books:**

1. Operations Research: Kanti Swarup, P.K.Gupta, Man Mohan, Sultan Chand.
2. Operations Research: R. Panneerselvam, PHI.
3. Operations Research: Hira and Gupta, S. Chand.

**Reference Books:**

1. Introduction to Operations Research: Billy Gillett, Tata McGrawHill
2. Operations Research Theory & Application: Sharma J. K, MacMillan.
3. Operations Research: Hemdy Taha, IEEE.
4. Related IEEE/ASME/ASCE/EBSCO Papers

## SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)

Course Code: MCT629-4

Course : Computer Graphics &amp; its Applications

L: 4 Hrs., P: 0 Hrs., Per week

Total Credits : 4

## Course Objectives

1. To acquaint with the applications of operations research to formulate and optimize business and industry related problems.
2. Realize the need for mathematical tools to take decisions in a complex environment.
3. To improve the analytical thinking, algorithmic approach and modeling abilities related to programming, networking, queuing models.

## Course Outcomes

On successful completion of the course students will be able to :

1. Specify, design and implement 2D and 3D computer graphics algorithms.
2. Implement 2D and 3D transformations, projection and viewing.
3. Demonstrate advanced computer graphics including modeling, curves & surfaces, etc.

## Syllabus

## UNIT-I

**Scan Conversion** - Geometry & Line generation, Points, Lines, Planes, Pixels and Frame buffers, Types of Display Devices, Line algorithms-DDA line generation algorithm, Bresenham's Line generation Algorithm, Circle generation-DDA circle generation algorithm, Midpoint circle generation algorithm, Bresenham's circle generation algorithm, Antialiasing.

## UNIT-II

**Polygons, Segments, 2D Transformations** - Graphics primitives, Display files, Polygon generation, Polygon filling, 2D transformations Segment tables, Operations on Segments.

## UNIT-III

**Windows and Clipping** - Clipping Window, Viewport, Viewing Transformations, Line clipping- Cohen Sutherland algorithm, Midpoint subdivision algorithm, Cyrus Beck Line Clipping Algorithm. Polygon Clipping-Sutherland Hodgman Polygon clipping algorithm.

## UNIT-IV

**3D Transformations and 3D Projections** - 3D Graphics, 3D primitives, Projections : Parallel, Perspective, viewing transformations, viewing parameters.

## UNIT-V

**Hidden lines and Surfaces** - Hidden Surfaces and Line removal : Backface removal algorithm, Z-buffer algorithm, A-buffer Algorithm, Warnock's algorithm, Painters Algorithm, scan line algorithm, Hidden line methods.

## UNIT-VI

**Curve generation and Raster graphics** - Curves and Surfaces, Cubic Bezier and cubic B-Spline curves, Raster Graphics Architecture, Standard Graphics Pipeline. Introduction to Image File format Standards.

## Text Books :

1. Computer Graphics: *Steven Harrington, TMH.*
2. Procedural Elements for Computer Graphics : *David F. Rogers, McGraw-Hill.*
3. Multimedia System Design: *Prabhat K. Andleigh and Kiran Thakrar, PHI publication.*

## Reference Books :

1. Principles of Interactive Computer Graphics: *Newman & Sproul, McGraw-Hill.*
2. Mathematical Elements for Computer Graphics: *David F Rogers & Adams, McGraw-Hill.*
3. Multimedia making it works: *Vaughan, Tata McGraw-Hill.*
4. Computer Graphics : *Hearn Baker [PHI]*
5. Related *IEEE/ASME/ASCE/EBSCO* Papers

## SYLLABUS OF SEMESTER -IV, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCT629-5

Course : High Performance Computing

L: 4 Hrs., P: 0 Hrs., Per week

Total Credits : 4

**Course Objectives**

1. To understand fundamental concepts and techniques in parallel computation structuring and design.
2. To study various architectures of high - performance computing systems.
3. To demonstrate the principles of Parallel Algorithm Design.

**Course Outcomes**

At the end of this course student will be able to:

1. Investigate modern design structures of pipelined and multiprocessors systems.
2. Understand the algorithms using parallel programming principle.
3. Design architectures to perform parallel processing

**Syllabus****Unit I****Modern Processors**

Stored-program computer architecture – General-purpose cache-based microprocessor architecture – Memory hierarchies - Multicore processors - Multithread processors - Vector processors - Basic optimization techniques for serial code - Common sense optimizations - Simple measures - large impact - Role of compilers.

**Unit-II****Parallel Computers**

Data access optimization - Balance analysis and lightspeed estimates - Storage order - Taxonomy of parallel computing paradigms - Shared memory computers - Distributed memory computers - Hierarchical systems – Networks - Basics of parallelization- Parallelism – Parallel scalability.

**Unit III****Introduction to Parallel Computing**

Motivating parallelism - Scope of parallel computing - Parallel programming platforms: Implicit parallelism trends in microprocessor architectures - Limitations - Dichotomy - Physical organizations - Communication costs - Routing mechanisms for interconnected networks- Impact of process.

**Unit IV****Principles of Parallel Algorithm Design**

Preliminaries - Decomposition techniques - Characteristics of tasks and interactions - Mapping techniques for load balancing - Methods for containing interaction overheads - Parallel algorithm models – Basic communication operations.

**Unit V****Sorting and Graph Algorithms**

Dense matrix Algorithm: Matrix-vector multiplication - Matrix- matrix multiplication- Issues in sorting on parallel computing - Sorting networks - Bubble sorts and its variants - Quick sort - Graph algorithms - Definition and representation - Prims algorithm - Dijkstra's algorithm - All pairs shortest path - Transitive closure – Connected components.

**Unit VI****Shared-Memory Parallel Programming with OpenMP**

Short introduction to OpenMP, Advanced OpenMP: Wavefront parallelization, Profiling OpenMP programs Performance pitfalls, Case study : OpenMP-parallel Jacobi algorithm & Parallel sparse matrix-vector multiply.

**References**

1. Georg Hager and Gerhard Wellein, Introduction to High Performance Computing for Scientists and Engineers, Chapman & Hall, 2010.
2. Ananth Grama and George Karypis, Introduction to parallel computing, Addison-Wesley 2009.
3. John Levesque and Gene Wagenbreth, High Performance Computing: Programming and Applications, Chapman & Hall, 2010.
4. Related *IEEE/ASME/ASCE/EBSCO* Papers.

**SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)**

Course Code: MCP629-1

Course : Programming in Python Lab

L: 0 Hrs., P:4 Hrs., Per week

Total Credits : 2

**Course Objectives**

1. To learn basic concepts of Python programming
2. To explore the advantages of Python programming over other programming languages.
3. To implement GUI using Python Programming.

**Course Outcomes**

On successful completion of the course students will be able to:

1. Use basic concepts in programming
2. Construct and execute basic programs in Python
3. Design and implement basic algorithms in Python
4. Use external libraries with Python

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Introductory programming concepts.
- Interactive programming.
- Procedural programming
- OOPs programming.
- GUI



**SYLLABUS OF SEMESTER -IV, M.C.A. (Master in Computer Application)**

Course Code: MCP629-2

Course : Web Development Lab

L: 0 Hrs., P:4 Hrs., Per week

Total Credits : 2

**Course Objectives**

1. To explore the DotNet Framework.
2. To implement real life problems using DotNet Framework.
3. To analysis and interpret the solutions of the problems.

**Course Outcomes**

On successful completion of the course students will be able to:

1. Evaluate programs implemented using DotNet Framework.
2. Debug windows, web, WCF based programs using DotNet Framework.

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Introduction to DotNet Framework.
- Implementation of windows, web, WCF based programs using DotNet Framework.



**Semester - V****SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)****Course Code: MCT720-1****Course: Artificial Intelligence****L: 4 Hrs., P:0 Hrs., Per week****Total Credits : 4****Course Objectives**

1. To study various search, heuristic techniques for solving AI problems.
2. To learn various knowledge representation techniques.
3. To understand various reasoning and learning techniques.
4. To discuss the learned concepts for designing and solving AI related problems.

**Course Outcomes :**

At the end of the course students will be able to

1. Identify and specify a problem definition for a given real world problem domain.
2. Apply and analyze both deterministic and non-deterministic Artificial Intelligence search techniques to a well defined problem domain.
3. Formulate a problem description for CSP, Understand and apply knowledge representation, reasoning, machine learning techniques and Uncertainty methods to solve real-world problems.

**Syllabus****UNIT-I**

**Introduction To Artificial Intelligence :** Definition and Concepts, History, Overview, Intelligent Agents, Performance Measure, Rationality, Structure of Agents, Problem-solving agents, Problem Formulation, Uninformed Search Strategies

**UNIT-II**

**Search and Exploration :** A\* search, Memory bounded heuristic search, Heuristic functions, inventing admissible heuristic functions, Local Search algorithms, Hill-climbing, Simulated Annealing, Genetic Algorithms, Online search

**UNIT-III**

**Constraint Satisfaction Problems :** Backtracking Search, variable and value ordering, constraint propagation, intelligent backtracking, local search for CSPs.

**Adversarial Search :** Games, The minimax algorithm, Alpha- Beta pruning.

**UNIT-IV**

**Knowledge and Reasoning :** Knowledge Based Agents, Logic, Propositional Logic, Inference, Equivalence, Validity and satisfiability, Resolution, Forward and Backward Chaining, Local search algorithms.

First Order Logic: Syntax and Semantics of FOL, Inference in FOL, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution

**UNIT-V****Learning and Uncertainty :**

Rote Learning, learning by taking advice, learning in problem solving, learning from examples: Induction, Explanation based learning, Discovery, Analogy. Basic Probability Notations, Axioms of Probability, Baye's Rule and its use.

**UNIT-VI**

**Applications of Artificial Intelligence :** Introduction to Neural networks-supervised, unsupervised learning algorithms, Introduction to Deep Learning, Introduction to Robotics, Case studies.

**Text Books:**

1. Artificial Intelligence : A Modern Approach: Stuart Russel and Peter Norving, Prentice Hall
2. Artificial Intelligence : E.Rich and Knight, Tata McGraw Hill.

**Reference Books/links :**

1. Artificial Intelligence : E. Charniack and D. Mcdermott, Addison Wesley.
2. Introduction to Knowledge Systems: Mark Stefik, Morgan Kaufmann.
3. <https://www.coursera.org/learn/gcp-big-data-ml-fundamentals>
4. <https://www.coursera.org/learn/natural-language-processing>
5. Related *IEEE/ASME/ASCE/EBSCO* Papers

## SYLLABUS OF SEMESTER –V, M.C.A. (Master In Computer Application)

Course Code: MCT720-2

Course : Data Mining

L: 4 Hrs., P:0 Hrs., Per week

Total Credits : 4

## Course Objectives

1. To learn basics of Data Mining.
2. To understand the data used in Data Mining.
3. To learn Data Mining as a cutting edge business intelligence method and use Data Mining techniques for building competitive advantage through proactive analysis, predictive modeling, and identifying new trends and behaviors.
4. To describe and demonstrate basic data mining algorithms, methods, and tools.

## Course Outcomes

On the successful completion of the subject students will be able to:

1. Conceptualize need and utility of Data Mining.
2. Familiarize with the concepts of various types of data used in Data Mining.
3. Discover interesting patterns from large amounts of data to analyze and extract patterns to solve problems, make predictions of outcomes.
4. Conceptualize latest technologies & techniques in Data Mining.

## Syllabus

## UNIT –I

**Data Mining :** Introduction, Importance of Data Mining, Kinds of Data and Patterns to be Mined, Technologies used in Data Mining, Data Mining Applications, Major issues in Data Mining.

## UNIT-II

**Getting to Know Your Data :** Data Objects and Attribute Types, Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity.

**Data Preprocessing :** Data Preprocessing : An overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization.

## UNIT –III

**Mining Frequent Patterns, associations and Correlations :** Basic Concepts, Frequent Itemset Mining Methods, Pattern Evaluation Methods.

**Advanced Pattern Mining :** Pattern Mining in Multilevel and Multidimensional Space, Constraint-Based Frequent Pattern Mining.

**Introduction :** Mining High-Dimensional Data and Colossal Patterns, Mining Compressed Patterns, Pattern Exploration and Application.

## UNIT –IV

**Classification :** Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule Based Classification, Model Evaluation & Selection, Techniques to Improve Classification Accuracy.

**Advanced Methods :** Bayesian Belief Networks, Classification by Backpropagation, Introduction: Support Vector Machines, Classification using Frequent Patterns, Lazy Learners, Other Classification Methods.

## UNIT-V

**Cluster Analysis :** Cluster Analysis basic concepts, Partitioning Methods: k-Means and k-Medoids, Hierarchical Methods: BIRCH, CHAMELEON, Probabilistic Hierarchical Clustering, Density-Based Methods: DBSCAN, OPTICS, DENCLUE, Grid-Based Methods: STING, CLIQUE, Evaluation of Clustering.

## UNIT-VI

**Data Mining Trends and Research Frontiers :** Mining Complex Data Types, Other Methodologies of Data Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends.

## Text Books :

1. Data Mining- Concepts and Techniques: Jiawei Han, Micheline Kamber Morgan Kaufmann Publishers, Third Edition.
2. Mining of Massive Datasets: Anand Rajaraman, Jeff Ullman, Jure Leskovec.

## Reference Books :

1. Advances In Knowledge Discovery And Data Mining,: Usama M.Fayyad, Gregory Piatetsky - Shapiro, Padhraí Smyth And Ramasamy Uthurusamy, The M.I.T Press, 1996.
2. The Data Warehouse Life Cycle Toolkit : Ralph Kimball, John Wiley & Sons Inc., 1998.



**SYLLABUS OF SEMESTER –V, M.C.A. (Master in Computer Application)**

Course Code: MCP720-1

Course: Artificial Intelligence Lab

L: 0 Hrs. P: 4 Hrs. Per week

Total Credits: 2

**Course Objectives**

1. To learn various AI search algorithms.
2. To learn the fundamentals of knowledge representation, inference and theorem proving.
3. To learn how to build simple knowledge based systems.

**Course Outcome**

On successful completion of the course students will be able to:

1. Use key logic-based techniques in a variety of research problems.
2. Communicate scientific knowledge at different levels of abstraction.
3. Build knowledge based systems.

**Syllabus**

Minimum 8 practical implemented using Tensor flow/Torch Tools/Python.



**SYLLABUS OF SEMESTER –V, M.C.A. (Master in Computer Application)**

Course Code: MCP720-2

Course : Data Mining Lab

L: 0 Hrs. P: 4 Hrs. Per week

Total Credits : 2

**Course Objectives**

1. To learn various tools used in Data Mining.
2. To implement real life problems of Data Mining.

**Course Outcome**

On successful completion of the course students will be able to:

1. Identify various live scenarios of Data Mining
2. Analyze and implement various concepts of Data Mining in Weka/Orange tool

**Syllabus**

Minimum 8 practical implemented using Weka/Orange Tool.



## SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT721-1

Courses: Network Security

L:4 Hrs, P: 0 Hrs, Per week

Total Credits: 4

**Course Objectives**

1. To understand the basic concept of cryptography and their mathematical foundation required for various cryptographic algorithms.
2. To study signature schemes using well-known signature generation and verification algorithms.
3. To be able to describe and analyze existing authentication protocols for two party communications and analyze key agreement algorithms.

**Course Outcomes**

At the end of the course students will be able to:

1. Describe and apply appropriate encryption techniques to solve problems.
2. Develop a mathematical model and implement security schemes designed to protect the network systems.
3. Differentiate between private and public key cryptography.

**Syllabus****Unit – I**

**Classical Encryption Techniques:** Substitution Cipher, Transposition Ciphers, Stream and block Ciphers;  
**Modern Symmetric Key Ciphers:** Modern Block cipher, Modern Stream Ciphers;

**Data Encryption Standards (DES) :** Structure of DES, Analysis of DES, Strength of DES, Differential and Linear Cryptanalysis., 3-DES, IDEA, Blowfish

**Unit-II**

**Number Theory and Finite Fields:** Integer Arithmetic, Modular Arithmetic, Polynomial Arithmetic, Euclidean Algorithm, Groups, Rings and Fields,  $GF(p)$ ,  $GF(2^n)$ .

**Mathematics of Asymmetric Key Cryptography:-** Prime Numbers, Fermat's and Euler's Theorems, Testing of Primality, Chinese Remainder Theorem,

**Unit-III**

**Public Key Cryptography:-** Principles of Public Key Cryptosystem, RSA algorithm. Diffie-Hellman Key Exchange, ElGamal Cryptographic System, Elliptic Curve Cryptograph,

**Key Management and Distribution :** Key Distribution using Symmetric Encryption and Asymmetric Encryption, Distribution of public key, X.509 Certificates, Public key Infrastructures.

**Unit-IV**

**Cryptographic Hash Function:** Application of Hash Function, Description of MD and SHA family, cryptanalysis

**User Authentication:** Authentication principles, Remote user Authentication using Symmetric and Asymmetric Encryption, Kerberos, Federated Identity Management,

**Unit-V**

**Message Authentication Codes (MAC):** Requirements, Functions, Security of MAC, HMAC. CMAC

**Digital Signature:** Process, Services, Attacks on digital Signature, RSA Digital Signature Scheme, ElGamal Digital Signature Scheme, Digital Signature Standard (DSS).

**Unit - VI**

**Transport Layer Security:** SSL Architecture, Four Protocols, Message Formats. IP Security: Security Overview, Policy, Encapsulating Security Payload (ESP). **E-Mail Security:-** Pretty Good Privacy, S/MIME. **System Security:** Intruders, Malicious Software, Firewalls.

**Text Book:**

1. Cryptography and Network Security Principles and Practice: Fifth Edition, William Stallings.

**Reference Book:**

1. Cryptography and Network Security: 2<sup>nd</sup> Edition, Behrouz A. Forouzan and Debdeep Mukhopadhyay.
2. Cryptography and Network Security: 2<sup>nd</sup> Edition, Atul Kahate, Mc Graw Hill.

## SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)

Course Code : MCT721-2

L: 4 Hrs., T: 0 Hrs., P:0 Hrs., Per week

Course : Soft Computing

Total Credits : 4

**Course Objectives :**

1. To introduce soft computing concepts and techniques and foster their abilities in designing appropriate technique for a given scenario.
2. To implement soft computing based solutions for real - world problems.
3. To give students knowledge of non-traditional technologies and fundamentals of artificial neural networks, fuzzy sets, fuzzy logic, genetic algorithms.
4. To provide student and hand-on experience on MATLAB to implement various strategies.

**Course Outcomes :**

On successful completion of the course, students will be able to :

1. Identify and describe soft computing techniques and their roles in building intelligent machines.
2. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
3. Apply genetic algorithms to combinatorial optimization problems.
4. Evaluate and compare solutions by various soft computing approaches for a given problem.

**Syllabus**

**Unit - I : Introduction to Soft Computing and Neural Networks :** Evolution of Computing : Soft Computing Constituents, From Conventional AI to Computational Intelligence : Machine Learning Basics.

**Unit- II : Fuzzy Logic :** Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions : Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.

**Unit - III : NEURAL NETWORKS :** Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advance in Neural networks.

**Unit IV :** Genetic Algorithms : Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.

**Unit V : Matlab / Python Lib :** Introduction to Matlab / Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic.

**Unit VI : Recent Trends and Techniques :** Recent Trends in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.

**Reference Books :**

1. Jyh : Shing Roger Jang, Chuen : Tsai Sun, Eiji Mizutani, Neuro : Fuzzy and Soft Computing, Prentic : Hall of India, 2003.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic : theory and Applications, Prentice Hall, 1995.

## SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT721-3

L:4 Hrs, P: 0 Hrs, Per week

Courses: Introduction to Web Development

Total Credits: 4

**Course Objectives**

1. To understand the basics of HTTP protocol & HTML language syntax.
2. To learn the CSS, JavaScript & usage for basic web development.
3. To learn the client side frameworks with market leading technologies.

**Course Outcomes**

On successful completion of the course, students will be able:

1. To get the basic knowledge of HTTP and markup code creation using HTML/HTML5 tags.
2. To apply the formatting and dynamic interaction techniques on the webpages.
3. To use the current industrial client side frameworks for web development.

**Syllabus**

**UNIT- I : Introduction to Web :** History of the Web, Protocols Governing the Web, Web Architecture, Hypertext Transfer Protocol, Web servers and Clients, URL and its anatomy, Request and Response message formats, HTTP Status codes.

**UNIT- II : HTML :** HTML Basics, Elements, Attributes, Basic Tags, Advanced Tags, HTML Forms, Form elements, Frames.

**HTML5 :** Canvas, Audio and Video elements, Local Storage, Graphics, Geolocation.

**UNIT- III : CSS :** Advantages of CSS, Types, Selectors, Multicolumn Layouts, Web Fonts, Colors and Opacity, Transformations, Viewport, Responsive websites using Media Queries.

**UNIT- IV : Javascript :** History of Javascript, Variables, Literals, Operators, Functions, Objects, Validating User Input with Javascript, Introduction to JSON, JSON Objects, JSON Schema, AJAX

**UNIT- V : Client side Frameworks :** JQuery Introduction, JQuery Syntax, JQuery Selectors, JQuery Events, JQuery Effects; Introduction to MVC Framework, Introduction to AngularJS, AngularJS modules, Two-way data binding, Angular JS Directives.

**UNIT- VI : MEAN Stack :** Introduction to MEAN, Introduction to MongoDB, key features, databases, collections, MongoDB CRUD operations, Getting started with Node.js, Node modules.

**Text Books :**

1. Beginning HTML, XHTML, CSS, and JavaScript– *Jon Duckett (Wrox)*
2. Getting MEAN with Mongo, Express, Angular and Node - *Simon Holmes (Manning)*.

**Reference Books :**

1. PHP, MySQL, Javascript & HTML5 All-in-one for Dummies - *Steven Suehring, Janet Valade (Wiley)*
2. HTML5, JavaScript and jQuery 24-Hour Trainer - *Dane Cameron (Wrox)*
3. Mean Web Development - *Amos Q. Haviv, PACKT Publishing.*
4. Related IEEE/ASME/ASCE/EBSCO Papers

**SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)**

Course Code : MCP721-1

Course : Technical Seminar

L: 0 Hrs., P:4 Hrs., Per week

Total Credits : 2

**Course Objectives**

1. To learn how to evaluate research papers.
2. To learn what makes papers good.
3. To learn how papers are refereed and published.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Critically evaluate a well defined set of research subjects.
2. Summarize the findings concisely in a paper of scientific quality

**Syllabus**

The students will have to perform the following tasks :

1. Every student selects a topic of current trends and the same should be approved by a committee of faculty mentors.
2. Every student must write a short review of the topic and present it to fellow students and faculty members (discuss the topic–expose the flaws–analyze the issues) every week.
3. Every student should re-submit and present the review article including issues/comments/conclusions which had arisen during the previous discussion.
4. Every student should submit a final paper as per his/her topic along with all short review reports (at least 4 internal reviews) and corresponding evaluation comments.



**SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)**

Course Code: MCP721-2

Course : Mini Project

L: 0 Hrs., P:4 Hrs., Per week

Total Credits : 2

**Course Objectives:**

1. To learn application of knowledge and techniques learnt in theoretical classes for developing the s/w for real problems.
2. To gain deeper understanding of specific functional areas.
3. To learn professional approach towards documentation, report writing and presentation skills.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Get much practical exposure of coding the projects.
2. Understand basics of the project creation process and flow.
3. Avoid the coding pitfalls.

**Syllabus**

Mini Project based on subjects studied till current semester using latest tools and technologies.



**SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)****Course Code: MCT722-1****Course : Distributed Database Management Systems****L: 4 Hrs., P:0 Hrs., Per week****Total Credits : 4****Course Objectives**

1. To understand the need for distributed database technology to tackle deficiencies of the centralized database systems.
2. To get familiar with the currently available models, technologies and approaches to build distributed database systems and services.
3. To learn basic principles and implementation techniques of distributed database systems.

**Course Outcomes**

At the end of the course students will be able to:

1. Learn basic concepts of Distributed DBMS and analyze various complexities & dimensions of its architecture and design issues.
2. Acquire various concepts of transaction management, fragmentation, replication and allocation related to Distributed DBMS.
3. Understand concurrency control techniques and distributed object management.

**Syllabus****UNIT-I**

**Introduction :** Distributed data processing, Definition and Concepts, Advantages and disadvantages of DDBMS, Transparencies in a distributed DBMS, Problem areas, Overview of RDBMS and Computer Network Concepts.

**UNIT-II**

**Distributed Database Management System Architecture and Database Design :** Distributed DBMS architecture, Global directory issues, Alternative design strategies, Distributed design issues, Fragmentation, Data allocation.

**UNIT-III**

**Query Processing :** Overview of query processing- Problem, Objectives, Complexity of relational algebra, Characterization of processors, Layers, Query decomposition, Localization of distributed data.

**UNIT-IV**

**Optimizing Distributed Queries and Transaction Management :** Query optimization, Centralized and Distributed query optimization, Algorithms.

**Transaction Concepts - Model, Definition, Properties, Characterization, Goals of transaction management, Types of transactions, Distributed execution monitor.**

**UNIT-V**

**Distributed Concurrency Control :** Serializability Theory, Taxonomy of Concurrency Control Mechanisms, Two-Phase Locking, Timestamp-Based Concurrency Control, Optimistic Concurrency Control, Deadlock Management- Detection, Prevention, Avoidance.

**UNIT-VI**

**Distributed Object Management :** Object Concepts and Object Models, Object Distribution Design, Architectural Issues, Object Management, Object Storage, Object Query Processing, Object DBMSs Transaction Management.

**Text Books :**

1. Principles of Distributed Database Systems : M.T. Ozsu and P. Valduriez, Prentice-Hall.
2. Distributed Databases Principles and Systems : S. Ceri and G. Pelagatti, McGraw Hill.

**Reference Books :**

1. Advances in Object-Oriented Database Systems : A. Dogac, M.T. Ozsu, A. Billiris, and T. Sellis, Springer-Verlag.
2. Related *IEEE/ASME/ASCE/EBSCO* Papers.



## SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT722-2

Course: Distributed Systems

L: 4 Hrs, P: 0 Hrs, Per Week

Total Credits: 4

## Course Objectives

1. To understand the differences between concurrent, networked and distributed systems.
2. To understand the concept of resource allocation and distributed deadlock detection and avoidance techniques.
3. To study and analyze the commit and voting protocols for the fault tolerance.
4. To study the importance of implemented modules through case studies.

## Course Outcomes

On the successful completion of the subject students will be able to:

1. The architectures and components of distributed computing environment.
2. The correlation between the various distributed algorithms and recent programming aspects.
3. The importance of the resource management, recovery and fault tolerance issues in distributed systems.
4. The implementation of distributed computation services using case studies.

## Syllabus

## UNIT I :

**Introduction :** Examples of Distributed System, Resource Sharing and the Web-Challenges, case study on World Wide Web.

**System Models :** Introduction, Architectural Models, Fundamental Models, Remote Invocation: Remote Procedure Call.

## UNIT II :

**Distributed Operating Systems :** Introduction, Issues, Inherent Limitation, Clock Synchronization, Lamport's Logical Clock; Vector Clock; Causal Ordering; Global State; Cuts; Termination Detection.

**Distributed File Systems :** Architecture, Mechanisms, Design Issues, Case Study: Sun Network File System.

## UNIT III:

**Distributed Shared Memory :** Architecture, Algorithms, Memory Coherence: Protocols, Design Issues.

Distributed Scheduling: Issues, Components, Load Distributing Algorithms, Load Sharing Algorithms.

## UNIT IV :

**Distributed Deadlock Detection :** Issues, Centralized Deadlock, Detection Algorithms, Distributed Deadlock, Detection Algorithms.

Distributed Mutual Exclusion-Non-Token based Algorithms, Token based Algorithms, consensus and related problems.

## UNIT V :

**Recovery :** Introduction, Basic Concepts, Classification of Failures, Backward Error Recovery: Basic Approaches, Recovery in Concurrent Systems.

Fault Tolerance: Introduction, Issues, Commit Protocols, Non-Blocking Commit Protocols, Voting Protocols, Dynamic Voting Protocols.

**Agreement Protocols :** The System model, Classification of Agreement Problems, Solution to the Byzantine agreement problem.

## UNIT VI :

**Designing Distributed System :** Google Case Study: Introducing the Case Study : Google-Overall architecture and Design Paradigm, Communication Paradigm, Data Storage and Coordination Services, Distributed Computation Services.

## Text Books :

1. Distributed Systems Concepts and Design : George Coulouris, Jean Dellimore and Tim Klndberg, Pearson Education, 5th Edition.
2. Advanced Concepts in Operating Systems : Mukesh Singhal and N.G.Shivaratri, McGraw-Hill.
3. Distributed Operating Systems : Pradeep K. Sinha, PHI, 2005

## References Books :

1. Distributed Computing-Principles, Algorithms and Systems: Ajay D.Kshemkalyani and Mukesh Singhal Cambridge University Press.
2. Distributed Algorithms, Nancy A.Lynch, Morgan Kaufmann Publishers.
3. Grid Computing: Joshy Joseph and Craig Fellenstein , IBM Press.
4. Related IEEE/ASME/ASCE/EBSCO Papers.



## SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT722-3

Course : Big Data &amp; Analytics

L:4 Hrs, P: 0 Hrs, Per week

Total Credits : 4

## Course Objectives

1. To understand the complexity and volume of Big Data and their challenges.
2. To analyze the various approaches of data collection for Big Data analytics.
3. To explore the Hadoop architecture and ecosystem tools.
4. To study modern technical tools based on MongoDB and Apache Spark.

## Course Outcomes

On the successful completion of the subject students will be able to:

1. Identify the various sources of Big Data.
2. Demonstrate the applications using Hadoop architecture and ecosystem tools.
3. Design and build MongoDB based Big data Applications and learn MongoDB query language.
4. Design and build APIs for large-scale data processing.

## Syllabus

## UNIT I:

**Introduction to Big Data :** Big data definition, Big Deal about Big Data under 8V, Big Data Sources, Industries using Big Data, Big Data challenges, Big data applications.

## UNIT II :

**Big Data Collection :** Strategies, Types of Data Sources, Structured Vs Unstructured data, ELT vs ETL ,storage infrastructure requirements , Collection methods, Log files, Sensors.

## UNIT III :

**Hadoop Architecture :** Big Data – Apache Hadoop & Hadoop EcoSystem – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce - Data Serialization. Hadoop Architecture- NameNode, Secondary NameNode, and DataNode, Hadoop MapReduce paradigm, Map and Reduce tasks, Job, Task trackers.

## UNIT IV :

**Hadoop Ecosystem :** Hadoop ecosystem components - Schedulers - Fair and Capacity, Hadoop 2.0 New Features- NameNode High Availability, HDFS Federation, MRv2, YARN, Running MRv1 in YARN. Hadoop tools -Avro, Flume, Hive, HBase , PIG, Zookeeper and Mahut. Sqoop, Oozie.

## UNIT V :

**Data Base for the Modern Web :** Introduction to MongoDB key features, Core Server tools, MongoDB through the JavaScript's Shell, Creating and Querying through Indexes, Document-Oriented, principles of schema design, Constructing queries on Databases, collections and Documents , MongoDB Query Language.

## UNIT VI :

**Apache Spark APIs for large-scale data processing :** Overview, Linking with Spark, Initializing Spark, Resilient Distributed Datasets (RDDs), External Datasets, RDD Operations, Passing Functions to Spark, Working with Key-Value Pairs, Shuffle operations, RDD Persistence, Removing Data, Shared Variables, Deploying to a Cluster.

## Text Books :

1. Chris Eaton, Dirk deRoos et al. , "Understanding Big data ", McGraw Hill, 2012.
2. Bart Baesens," Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", John Wiley & Sons, 2014.
3. MongoDB in Action, Kyle Banker, Piter Bakkum , Shaun Verch, Dream tech Press .
4. Learning Spark: Lightning-Fast Big Data Analysis, Holden Karau, Andy Konwinski, Patrick Wendell, Matei Zaharia, O Reilly, 2015.

## References Books :

1. BIG Data and Analytics, Sima Acharya, Subhashini Chhellappan, Willey .
2. HADOOP: The definitive Guide, Tom White, O Reilly 2012.
3. Spark in Action, Petar Zecevic, Marko Bonaci, Manning Publications Company, 2016.
4. Related *IEEE/ASME/ASCE/EBSCO* Papers.

## SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT722-4

Course: Information Retrieval

L:4 Hrs, P: 0 Hrs, Per week

Total Credits: 4

## Course Objectives

1. To understand the basic concepts of Information Retrieval Systems like Boolean retrieval, vocabulary and dictionaries.
2. To emphasize on different index construction and compression techniques, different score computing techniques.
3. To Analyze and study evaluation in IR, Probabilistic Information retrieval techniques, classification techniques and Latent Semantic Index.
4. To understand Web basics for IR and Link Analysis.

## Course Outcomes

At the end of the course students will be able to:

1. Understand the basics of Information Retrieval Systems.
2. Learning different index construction and compression techniques, different score computing techniques.
3. Analyze and study evaluation in IR, Probabilistic Information retrieval techniques, Classification technique and Latent Semantic Index.
4. Understand web basics for IR and Link Analysis.

## Syllabus:

## UNIT-I

**Boolean Retrieval** : An example information retrieval problem, A first take at building an inverted index, Processing Boolean queries. **The term vocabulary and postings lists** : Document delineation and character sequence decoding. **Determining the vocabulary of terms** : Tokenization, Dropping common terms: stop words, Stemming and lemmatization

## UNIT-II

**Dictionaries and tolerant retrieval** : Search structures for dictionaries, Wildcard queries, Spelling correction, Phonetic correction. **Introduction to index construction and index compression** : Hardware basics, Blocked sort-based indexing, Single-pass in-memory indexing, Heaps' law: Estimating the number of terms, Zipf's law: Modeling the distribution of terms, Dictionary compression

## UNIT-III

**Scoring, term weighting and the vector space model** : Term frequency and weighting, Inverse document frequency, The vector space model for scoring, **Computing scores in a complete search system** : Efficient scoring and ranking, Components of an information retrieval system.

## UNIT-IV

**Evaluation in information retrieval** : Information retrieval system evaluation. Evaluation of unranked retrieval sets, **A broader perspective : System quality and user utility** : System issues, User utility.

## UNIT-V

**Probabilistic information retrieval** : Review of basic probability theory, The Probability Ranking Principle, The Binary Independence Model. **Text classification and Naïve Bayes** : The text classification problem, Naive Bayes text classification. **Feature selection** : Mutual information,  $\chi^2$  Feature selection

## UNIT-VI

**Matrix decompositions and latent semantic indexing** : Linear algebra review, Term-document matrices and singular value decompositions, Latent semantic indexing. **Web search basics** : Web characteristics, Search user experience. Web crawling and indexes: Overview, Crawling. **Link analysis** : The Web as a graph, PageRank

## Text Books :

1. An Introduction to Information Retrieval: Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, Cambridge University Press, Cambridge, England, 2009
2. Information Retrieval: Implementing and evaluating search engines: Stefan Büttcher, Charles L. A. Clarke, Gordon V. Cormack, MIT Press, 2010

## Reference Books :

1. Information Retrieval: Algorithms and Heuristics: David A. Grossman, Ophir Frieder, Springer.
2. Information Retrieval: Data Structures and Algorithms by Frakes, Pearson.
3. Related *IEEE/ASME/ASCE/EBSCO* Papers



## SYLLABUS OF SEMESTER - V, MCA (MASTER IN COMPUTER APPLICATION)

Course Code: HUT701-1

Course: Presentation &amp; Interview Skills

L: 2 Hrs., P:0 Hrs., Per week

Total Credits: 2

**Course outcomes:****CO1:** Students will be able to build credibility and confidence as a speaker**CO2:** Students will be able adopt different techniques for preparing and delivering presentation well**CO3:** Students will learn how to prepare and face interviews and earn success**Syllabus****Unit 1: Presentations**

Importance of professional presentations, planning, audience analysis, deciding and organizing the content, presentation structure and design

**Unit 2: Delivering Presentations**

Slide design, Tips for effective presentations (Body language, communication skills, venue, dressing), post presentation strategies, mock sessions

**Unit 3: Interview Skills**

Different types of PIs, How to prepare for the Interview (KYC, resume, dressing, update Resume), Interview questions and answers, Body language, follow up, mock PI session

**Reference Books:**

1. Meenakshi Raman, Sangeeta Sharma *Technical Communication: Principles and Practice*, Oxford Higher Education Publication
2. Sanjay Kumar, PushpaLata, *Communication Skills*, Oxford Higher Education Publication

## SYLLABUS OF SEMESTER -V, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP722-1

Course: API Level Programming Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To learn the basics of API level Programming.
2. To implement real life problems using API level Programming

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Learn the basics of API level Programming
2. Implement API's in Procedural as well as Object oriented languages.

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Introduction to API Level Programming.
- API Environments
- API Parameters
- API in Procedural Languages
- API in OO Languages
- API libraries & frameworks
- Web APIs
- Building an efficient & agile digitally enabled business using API
- RESTful web APIs & Amazon API

**Reference Books :**

1. API for Dummies: Clans T. Jenson, By John Wiley & Sons, Inc.

## SYLLABUS OF SEMESTER -V, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP722-2

Course: R Programming Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To learn the basics of R Programming.
2. To implement real life problems using R Programming.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Apply Predictive Analytics to predict outcomes.
2. Explore data manipulation using R.
3. Apply Data Visualization to create fancy plots

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Basics of R programming
- Control structures & functions
- Vectors & matrices
- Reading and Writing Data
- Data Mining & Predictive Analysis using R
- Data Visualization
- Debugging Tools
- Simulation
- R Profiler.

**Reference Book**

1. W. N. Venables, D. M. Smith, An Introduction to R, R-core team, 2015.
2. R Programming- By Tutorials Point



## SYLLABUS OF SEMESTER -V, M.C.A. (MASTER IN COMPUTER APPLICATION)

Course Code: MCP722-3

Course: Big Data &amp; Analytics Lab

L: 0 Hrs., T: 0 Hrs., P:4 Hrs., Per week

Total Credits: 2

**Course Objectives**

1. To understand and apply technologies for Big Data.
2. To perform data analytics on different types of data like structured, semi-structured and unstructured data.
3. To study modern technical tools based on MongoDB and Apache Spark.

**Course Outcomes**

On successful completion of the course, students will be able to:

1. Demonstrate the applications using Hadoop architecture and ecosystem tools.
2. Design and build MongoDB based Big data Applications and learn MongoDB query language.
3. Design and build APIs for large-scale data processing.

**Syllabus**

Minimum 8 practicals and assignments based on but not limited to the following topics:

- Simple program using Map Reduce Frame-work
- HDFS command set for distributed file systems
- Data Ingestion using Flume/Avro
- Simple program using Pig Scripting
- Simple program using Hive
- Basic CRUD operations in MongoDB
- Load and Inspect Data in RDD using Apache Spark
- Mini Project by integrating any of above topics.



## SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT723-1

L:2 Hrs, P: 0 Hrs, Per week

Course : Business Intelligence

Total Credits : 2

**Course Objectives**

1. To get familiar with the basics of Business Intelligence and its components.
2. To understand technology and processes associated with Business Intelligence framework.
3. To understand Data Warehouse implementation methodology and project life cycle.
4. To learn various open source tools used in Business Intelligence.

**Course Outcomes**

On successful completion of the course, students will be able to :

1. Differentiate between Transaction Processing and Analytical applications and understand the need of Business Intelligence.
2. Apply technology and processes associated with Business Intelligence framework.
3. Model and analyze multidimensional data.
4. Design an enterprise dashboard that depicts the key performance indicators which helps in decision making.

**Syllabus:****UNIT-I**

**Introduction to Business Intelligence :** Evolution of BI, BI value chain, introduction to business analytics, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components -BI Process, BI Technology, BI Roles & Responsibilities.

**UNIT-II**

**Basics of Data Integration :** Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, data integration technologies, Introduction to data quality, data profiling concepts and applications.

**UNIT-III**

**Multi-Dimensional Data Modeling :** Introduction to data and dimension modeling, multidimensional data model, ER Modeling vs. multi-dimensional modeling, concepts of dimensions, facts, cubes, attribute, hierarchies, star and snowflake schema, introduction to business metrics and KPIs.

Basics of Enterprise Reporting: Introduction to enterprise reporting, concepts of dashboards, balanced scorecards, Study of open source BI tools.

**Text Books:**

1. Fundamentals of Business Analytics : RNPrasad and S Acharya ; Wiley India, 2011.
2. Business Intelligence : A Managerial Approach : Ephraim Turban et.al; 2nd Edition, Prentice Hall, 2010.

**Reference Books:**

1. Business intelligence for the enterprise by Mike Biere
2. Business intelligence roadmap by Larissa Terpeluk Moss, Shaku Atre.
3. Related IEEE/ASME/ASCE/EBSCO Paper

## SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)

Course Code: MCT723-2

L:2 Hrs, T: 0 Hrs., P: 0 Hrs, Per week

Course : Software Testing

Total Credits : 2

**Course Objectives**

1. To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies and methods.
2. To understand software test automation problems and solutions.

**Course Outcomes**

On successful completion of the course, students will be able to :

1. Perform a complete testing process taking into account practical considerations.
2. Employ correct testing terminology throughout the testing process.

**Syllabus:****UNIT-I**

- Introduction to Software Development and Testing process (Need & role of testing in software development, testing Objective, principles, What to test?, Verification & Validation testing, Inspections & Walkthroughs)
- Testing Types & Phases, Testing Workflow, Concept of Software Quality related to testing.
- Test Planning
- Test design process, test desing techniques.

**UNIT-II**

- Key measures of Test, Defect Analysis, Reporting and Defect Management, tester's Characteristics
- Test Reports, Test Metrics and Test execution management
- Non functional Testing
- Concept of Specialized Testing

**UNIT-III (Supported by hands-on sessions)**

- Fundamentals of Test Automation
- Test Automation Process
- Traceability Matrix, Test Effort Estimation, Test Point Analysis
- Test case writing (Test Specification and Test Suits), test execution and analysis of results
- Case Studies, Automation Tools Introduction (Selenium, JUNIT, NUNIT), Recent Trends.

**Text Books:**

1. Software Testing: PATTON; 2nd Edition, SAMS Publication.
2. Software Testing: Principal and Practices: SrinivasanDesikan; Pearson publication.

**Reference Books:**

1. Foundation of Software Testing ISTQB Certification by Rex Black.

**SYLLABUS OF SEMESTER -V, M.C.A. (Master in Computer Application)**

Course Code: MCT723-3

Course : API Development using Spring Data Mongo

L:2 Hrs, P: 0 Hrs, Per week

Total Credits : 2

**Course Objectives**

1. To understand the current industrial Mongo DB community edition.
2. To learn server side programming skills with market leading technologies along with relevant programming language.
3. To learn different technologies involved in Spring Framework.
4. To understand the latest authentication & authorization protocols.

**Course Outcomes**

On successful completion of the course, students will be able to :

1. Understand the importance and usage of different design patterns.
2. Grasp essential knowledge for creation of android development.
3. To understand different technologies involved in Spring Data Mongo.
4. To grasp various authentication & authorization protocols with spring security.

**Syllabus:****UNIT-I****Spring Framework- MVC**

Spring Overview, Environment Setup, Spring Core, Spring Annotations, Spring Java Configuration, Spring AOP, Spring MVC.

**UNIT-II****Spring Framework - BOOT**

Spring Initializr, Spring Boot CLI, Spring Boot Example, SB Annotations, Spring Boot DM, Spring Boot Properties, Spring Boot Starters, Spring Boot Actuator.

**UNIT-III****Spring Data Mango**

Mongo Overview, Mongo setup, Spring Data Mango CRUD, Spring Data Mongo Template Criteria, Spring Data Mongo Template Aggregation & lookup, Mongo DB administration with ROBO Mongo, Spring MVC and Spring Data Mongo CRUD real-time project.

**Unit - IV****Spring Data Mongo - Project Training**

Spring Boot and Spring Data Mongo CRUD real -time project, Spring Security with boot (with password encryption in the database), Spring REST with jersey and Rest Controllers (with full database CRUD real -time project), Maven

**Text Books :**

1. Mongo DB : The Definitive Guide, 3rd Edition by Shannon Bradshaw & Kristina Chodorow.
2. 2.0, 2nd Edition by Greg L. Turnquist
3. Building RESTful Web Services with Spring 5: Leverage the power of Spring 5.0, Java SE 9, and Spring Boot 2.0, 2nd Edition by Raja CSP Raman & Ludovic Dewailly

**Links :**

1. Mongo DB - <https://university.mongodb.com/>
2. Spring - <https://spring.io/>



