



**RAMAIAH**  
Institute of Technology

# **CURRICULUM**

**For the Batch 2020 - 2022**

**MASTER OF COMPUTER APPLICATIONS**

**I - IV Semester MCA**

**RAMAIAH INSTITUTE OF TECHNOLOGY**  
(Autonomous Institute, Affiliated to VTU)  
Bangalore – 560054.

## **About the Institute**

Dr. M. S. Ramaiah a philanthropist, founded ‘Gokula Education Foundation’ in 1962 with an objective of serving the society. M S Ramaiah Institute of Technology (MSRIT) was established under the aegis of this foundation in the same year, creating a landmark in technical education in India. MSRIT offers 13 UG programs and 15 PG programs. All these programs are approved by AICTE. All the UG programs & 09 PG programs are accredited by National Board of Accreditation (NBA). The institute is accredited with ‘A’ grade by NAAC in 2014. University Grants Commission (UGC) & Visvesvaraya Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs till the year 2029. The institute is a participant to the Technical Education Quality Improvement Program (TEQIP), an initiative of the Government of India. The institute has 380 competent faculty out of which 60% are doctorates. Some of the distinguished features of MSRIT are: State of the art laboratories, individual computing facility to all faculty members, all research departments active with sponsored funded projects and more than 300 scholars pursuing Ph.D. To promote research culture, the institute has established Centre of Excellence for Imaging Technologies, Centre for Advanced Materials Technology & Schneider Centre of Excellence. **M S Ramaiah Institute of Technology has obtained “Scimago Institutions Rankings” All India Rank 65 & world ranking 578 for the year 2020.**

The Centre for Advanced Training and Continuing Education (CATCE), and Entrepreneurship Development Cell (EDC) have been set up on campus to incubate startups. **M S Ramaiah Institute of Technology secured All India Rank 8<sup>th</sup> for the year 2020 for Atal Ranking of Institutions on Innovation Achievements (ARIIA), an initiative of Ministry of Human Resource Development(MHRD), Govt. of India.** MSRIT has a strong Placement and Training department with a committed team, a good Mentoring/Proctorial system, a fully equipped Sports department, large air-conditioned library with good collection of book volumes and subscription to International and National Journals. The Digital Library subscribes to online e-journals from Elsevier Science Direct, IEEE, Taylor & Francis, Springer Link, etc. MSRIT is a member of DELNET, CMTI and VTU E-Library Consortium. MSRIT has a modern auditorium and several hi-tech conference halls with video conferencing facilities. It has excellent hostel facilities for boys and girls. MSRIT Alumni have distinguished themselves by occupying high positions in India and abroad and are in touch with the institute through an active Alumni Association.

**As per the National Institutional Ranking Framework, MHRD, Government of India, M S Ramaiah Institute of Technology has achieved 59<sup>th</sup> rank among 1071 top Engineering institutions of India for the year 2020 and 1<sup>st</sup> rank amongst Engineering colleges(VTU) in Karnataka.**

## **About the Department**

The Department of Master of Computer Applications was established in 1997 with the objective of producing high quality professionals to meet the demands of the emerging field of Computer Applications. The department got academic autonomy in the year 2007 and is accredited by NBA. The department is recognized as a Research Centre under Visvesvaraya Technological University in 2012.

## **VISION OF THE INSTITUTE**

To be an Institution of International Eminence, renowned for imparting quality technical education, cutting edge research and innovation to meet global socio economic needs

## **MISSION OF THE INSTITUTE**

MSRIT shall meet the global socio-economic needs through

1. Imparting quality technical education by nurturing a conducive learning environment through continuous improvement and customization
2. Establishing research clusters in emerging areas in collaboration with globally reputed organizations
3. Establishing innovative skills development, techno-entrepreneurial activities and consultancy for socio-economic needs

## **QUALITY POLICY**

We at M. S. Ramaiah Institute of Technology strive to deliver comprehensive, continually enhanced, global quality technical and management education through an established Quality Management System complemented by the synergistic interaction of the stake holders concerned

## **VISION OF THE DEPARTMENT**

To be a nationally prominent and internationally recognized department in academics and research activities with the aim of developing competitive software professionals to serve the society and ever changing industry

## **MISSION OF THE DEPARTMENT**

1. To enable the students to be knowledgeable and creative through state-of-the-art curriculum and innovative teaching methodologies
2. To provide training programs that bridges the gap between academia and industry to produce competitive software professionals
3. To inculcate ethical values in students enabling them to become socially committed professionals
4. To enhance the research quality and productivity by providing required facilities

## **PROGRAM EDUCATIONAL OBJECTIVES (PEOs):**

- PEO1.** Excel in professional career in the field of Computer Applications and contribute to research and development activities.
- PEO2.** Provide software solutions that are socially acceptable and adapt emerging technologies and tools.
- PEO3.** Exhibit ethical and communication skills and engage in lifelong learning.

## **PROGRAM OUTCOMES (POs):**

- PO1:** Apply knowledge of mathematics and computing principles appropriately to develop conceptual model for real world problems.
- PO2:** Identify and formulate problem definition for real world problems, analyse the literature of the domain and provide solutions using mathematics and computing.
- PO3:** Design, develop and assess a software system, process, component, or program of varying complexity that meet specified needs with appropriate consideration for public health and safety and societal considerations.
- PO4:** Use research based knowledge to analyse and interpret data and synthesize information to provide valid conclusions.
- PO5:** Adapt to understand, select, use and create modern tools and technologies necessary for computing practices.
- PO6:** Adopt professional ethics, principles of professional computing practices, cyber regulations and responsibilities.
- PO7:** Recognize the need and engage in self-learning for continual development as a computing professional.
- PO8:** Apply the management principles for managing projects as an individual, as a member and as a leader in a team under multidisciplinary environments.
- PO9:** Communicate effectively about computing activities in both verbal and written form with the computing community and with society.
- PO10:** Assess the local and global impact of software solutions on individuals, organizations and society.
- PO11:** Perform effectively as an individual and as a member or leader in diverse teams and in multidisciplinary environments.
- PO12:** Adopt standardized software engineering practices with innovative ideas to succeed as an employee or entrepreneur.

### Curriculum Course Credits Distribution

Semester	Mathematics (MTH)	Management (MGT)	Humanities & Social Sciences (HSS)	Professional Courses		Project Work / Internship (PW /IN)	Seminar (SEM)	Total credits in a Semester
				Core (Hard core, Soft core, Lab) (PC- C)	Electives (PC-E)			
<b>First</b>	4		2	19				25
<b>Second</b>		3		16	6		1	26
<b>Third</b>				16	9			25
<b>Fourth</b>						22	2	24
<b>Total</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>51</b>	<b>15</b>	<b>22</b>	<b>3</b>	<b>100</b>

## SCHEME FOR 2020-2022 BATCH

### I SEMESTER

S. No	Course Code	Course Name	Credits*			
			L	T	P	Total
1.	MCA11	Programming with 'C' and C++	3	1	1	5
2.	MCA12	Computational Mathematics	3	1	0	4
3.	MCA13	Computer Organization	3	0	0	3
4.	MCA14	Operating System and LINUX	3	0	1	4
5.	MCA15	Data Structures	3	0	1	4
6.	MCA16	Professional Communication and Ethics	2	0	0	2
7.	MCA17 <sup>#</sup>	Web Programming	0	1	2	3
<b>Total</b>			<b>17</b>	<b>3</b>	<b>5</b>	<b>25</b>

### II SEMESTER

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCA21	Programming in Python	MCA11	3	0	1	4
2.	MCA22	Design and Analysis of Algorithms	MCA15	3	0	1	4
3.	MCA23	Database Systems		3	0	1	4
4.	MCA24	Software Engineering		4	0	0	4
5.	MCAE1-	Elective I					3
6.	MCAE2-	Elective II					3
7.	MCAE3-	Elective III					3
8.	MCAS1	Seminar I					1
<b>Total</b>							<b>26</b>

### III SEMESTER

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1	MCA31	Programming with Java	MCA11	3	0	1	4
2	MCA32	Computer Networks		3	0	1	4
3	MCA33	Information Security		3	0	1	4
4	MCA34	Machine Learning	MCA12	3	0	1	4
5	MCAE4-	Elective IV					3
6	MCAE5-	Elective V					3
7	MCAE6-	Elective VI					3
<b>Total</b>							<b>25</b>

### IV SEMESTER

S. No	Course Code	Course Name	Credits*			
			L	T	P	Total
1.	MCA41	Project Work				20
2.	MCAS2	Seminar II				2
3.	MCAIN	Industry Internship				2
<b>Total</b>						<b>24</b>

### ELECTIVE I

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE11 <sup>#</sup>	MEAN Stack Development	MCA17	0	1	2	3
2.	MCAE12 <sup>#</sup>	Hadoop Ecosystem		0	1	2	3
3.	MCAE13 <sup>#</sup>	User Interface and User Experience Design	MCA17	0	1	2	3
4.	MCAE14 <sup>#</sup>	Computer Graphics and Animation		0	1	2	3
5.	MCAE15 <sup>#</sup>	Web Programming with PHP and AJAX	MCA17	0	1	2	3

### ELECTIVE II

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE21	Digital Forensics		2	0	1	3
2.	MCAE22	UNIX Systems Programming	MCA11 MCA14	2	0	1	3
3.	MCAE23	Secure Coding in C and C++	MCA11	2	0	1	3
4.	MCAE24	Programming with C#.Net	MCA11	2	0	1	3
5.	MCAE25	Operations Research		2	1	0	3



### ELECTIVE III

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE31	Software Project Management		3	0	0	3
2.	MCAE32	Management and Entrepreneurship		3	0	0	3
3.	MCAE33	Design Thinking		3	0	0	3
4.	MCAE34	Enterprise Resource Planning		3	0	0	3
5.	MCAE35	Management Information System		3	0	0	3

### ELECTIVE IV

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE41 <sup>#</sup>	Programming IoT	MCA21	0	1	2	3
2.	MCAE42 <sup>#</sup>	ASP.Net with C#	MCA11 MCA17	0	1	2	3
3.	MCAE43 <sup>#</sup>	Introduction to Big Data Analytics using SPARK		0	1	2	3
4.	MCAE44 <sup>#</sup>	Cloud Computing		0	1	2	3
5.	MCAE45 <sup>#</sup>	Software Testing	MCA24	0	1	2	3

### ELECTIVE V

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE51 <sup>#</sup>	Web Component Development with J2EE		0	1	2	3
2.	MCAE52 <sup>#</sup>	Mobile Application Development		0	1	2	3
3.	MCAE53	Blockchain Technology		2	0	1	3
4.	MCAE54 <sup>#</sup>	Introduction to Microservices		0	1	2	3
5.	MCAE55	Virtual and Augmented Reality		2	0	1	3

### ELECTIVE VI

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE61	Storage Area Networks	MCA23	2	0	1	3
2.	MCAE62	Soft Skills and Personality Development		2	1	0	3
3.	MCAE63	Agile Software Development and DevOps	MCA24	2	0	1	3
4.	MCAE64	System Modeling and Simulation		2	0	1	3
5.	MCAE65	Deep Learning		2	0	1	3

**#Semester End Examination will be conducted for Laboratory**

**\* L: Lecture**

**T: Tutorial**

**P: Practical**

# Programming Using C and C++

**Course Code: MCA11**

**Credits: 3:1:1**

**Prerequisite: Nil**

**Contact Hours:42L 28T 28P**

**Course Coordinator:**

## UNIT I

**Introduction:** Introduction, Structure of C/C++ Program, comments, keywords and identifiers, constants, data types, variables, variable declaration and initialization, reference variables defining symbolic constants, const keyword.

**Operators and Expressions:** Arithmetic, relational, logical, assignment, increment and decrement, conditional, bitwise, comma, shorthand operators, scope resolution operator, arithmetic/relational expressions. **Managing Input and Output Operations:** Formatted input and output functions: scanf() and printf(), cin and cout statements. Sample C and C++ programs using above concepts.

## UNIT II

**Decision Making and Branching:** Decision making with if statement, simple if, if..else , nesting of if..else, the else..if ladder, the switch, the ?: operator, the break statement, Sample C/C++ programs.

**Decision Making and Looping:** The while, do..while, for loops, nested loops, the continue, Sample C and C++ programs.

## UNIT III

**Arrays:** Introduction, one dimensional and two dimensional arrays, declaration and initialization of arrays, reading, writing and manipulation of above types of arrays, programming examples. Sample C and C++ programs.

**Functions:** Introduction, types of functions, Function declaration, function definition, function calls, parameter passing techniques, category of functions, function with default arguments. Function overloading, inline function, Sample C and C++ programs.

## UNIT IV

**Structures:** Defining a structure, declaring structure variables, accessing structure members.

**Classes and Objects:** Introduction to classes, objects, Difference between structure and classes. Member Function definition, function overloading, Inline functions, Static class members, Returning objects, Array of objects. Friend functions.

## **Constructors and destructors**

Introduction, default constructors, parameterized constructors, copy constructors, Destructors, overloading constructors.

## **UNIT V**

**Inheritance:** Introduction, Base class access control, inheritance and protected members, types of Inheritances, constructors, destructors, passing arguments to base class constructor, granting access, virtual base classes.

**Pointers and Dynamic Memory Allocation:** Introduction to pointers, declaring and initialization pointer variables, accessing a variable through its pointer, example programs. Dynamic Memory Allocation using new and delete operators.

**Exception Handling:** Exception handling fundamentals, catching all exceptions.

## **Laboratory**

Students shall implement programs which supplement the theory concepts (Platform Linux; GCC Compiler)

### **Text Books:**

1. Balagurusamy: Programming in ANSI C, 6<sup>th</sup> Edition, Tata McGraw Hill, 2010.
2. Herbert Schildt: The Complete Reference C++, 4<sup>th</sup> Edition, Tata McGraw Hill, 2003.
3. E Balagurusamy, Object Oriented Programming with C++, 6<sup>th</sup> Edition, Tata McGraw Hill Publishing Company Limited. NEW DELHI.

### **Reference Books:**

1. V Rajaraman: Computer Programming in C, Prentice Hall India, 2000.
2. Herbert Schildt: C The Complete Reference, 4<sup>th</sup> Edition, Tata McGraw Hill, 2000.
3. Stanley B.Lippmann, JoseeLajore: C++ Primer, 4<sup>th</sup> Edition, Addison Wesley, 2005.
4. Bjarne Stroustrup: The C++ Programming Language, Pearson Education, 2000.

### **Course Outcomes (COs):**

1. Develop C and C++ programs using basic constructs. (PO-1,2,3,5,9)
2. Identify the suitable control statements and implement the solution. (PO-1,2,3,5)

3. Implement operations on arrays and develop user defined functions.  
(PO-1,2,3,5)
4. Apply concepts of structures, classes, objects and constructor to solve problem. (PO-1,2,3,5)
5. Develop classes by applying suitable type of inheritance, demonstrate dynamic memory allocation using pointers, new and delete. (PO-1,2,3,5).

# Computational Mathematics

**Course Code: MCA12**

**Credits: 3:1:0**

**Prerequisite: Nil**

**Contact Hours: 42L 28T**

## UNIT I

### **Fundamentals of Logic**

Basic Connectives and Truth Tables, Logic Equivalence - the laws of Logic, Logical Implications, Rules of Inference, The use of Quantifiers.

## UNIT II

### **Set Theory**

Sets and Subsets, Set Operations and the Laws of Set Theory, Counting and Venn Diagrams

### **Probability**

A First word on Probability, The Axioms on Probability, Conditional Probability: Independence

## UNIT III

### **Graph Theory**

Definitions and Examples, Subgraphs, Complements, and Graph Isomorphism, Vertex Degree: Euler Trails and Circuits, Planar Graphs, Hamilton Paths and Cycles, Graph Coloring and Chromatic Polynomials

## UNIT IV

### **Statistics Analysis**

Descriptive Statistics, Data exploration (histograms, bar chart, box plot, line graph, scatter plot), Qualitative and Quantitative Data, Measure of Central Tendency (Mean, Median and Mode), Measure of Positions (Quartiles, Deciles, Percentiles and Quantiles), Measure of Dispersion (Range, Median, Absolute deviation about median, Variance and Standard deviation, Skewness and Kurtosis)

## UNIT V

### **Hypothesis Testing**

Continuous and discrete distributions, Hypothesis Testing: t-Test, z-Test, F-Test

### **Reference Books:**

1. Ralph P Grimaldi, B V Ramana: Discrete and Combinatorial Mathematics, An Applied Introduction, 5<sup>th</sup> Edition, Pearson Education, 2007.

2. Larsen, Richard J., and Morris L. Marx: An Introduction to Mathematical Statistics and its Applications, Pearson Education, 2017.

**Course Outcomes (COs):**

1. Apply the fundamentals of logic to provide proof for a given situation. (PO-1,2)
2. Formulate a concise structure using set theory and apply probability for uncertainty. (PO-1,2)
3. Evaluate the given problem by applying the concepts of graph theory. (PO-1,4)
4. Examine the data characteristics through visualization. (PO-1,4)
5. Analyze various data patterns using hypothesis testing. (PO-1,4)

# Fundamentals of Computer Organization

**Course Code: MCA13**

**Credits: 3:0:0**

**Prerequisite: Nil**

**Contact Hours: 42L**

**Course Coordinator:**

## UNIT I

**Binary Systems:** Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, Complements, Signed Binary Numbers, Binary Codes.

**Boolean Algebra and Logic Gates:** Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Digital Logic gates

## UNIT II

**Basic Structure of Computers:** Basic Operational Concepts, Bus Structures, Performance: Processor Clock, Basic Performance Equation, Clock Rate, Performance Measurement.

**Machine Instructions and Programs:** Memory Location and Addresses, Memory Operations, Instructions & Instruction Sequencing, Addressing Modes, Assembly Language.

## UNIT III

**Input/output organization:** Accessing I/O Devices, Interrupts – Interrupt Hardware, Enabling and Disabling Interrupts, Handling Multiple Devices, Direct Memory Access.

**Memory:** Some Basics concepts, Semiconductors RAM Memories, Read-Only Memories, Cache Memories-Mapping Functions.

## UNIT IV

**Arithmetic Unit:** Addition & Subtraction of Signed Numbers, Design of Fast adders, Floating – Point Numbers and Operations.

**Basic Processing Unit:** Fundamental Concepts, Execution of a Complete Instruction, Multiple Bus Organization.

## UNIT V

**Control Signals:** Hard-Wired Control, Micro Programmed Control.

**Embedded Systems and Large Computer Systems:** Examples of Embedded Systems, Processor chips for embedded applications, Simple Microcontroller.



**Text Books:**

1. M. Morris Mano: Digital Logic and Computer Design, 4th Edition, Pearson Education, 2008.  
Chapters: 1.1 to 1.6, 2.1 to 2.4, 2.7.
2. Carl Hamacher, Z Varnesic and S Zaky: Computer Organization, 5<sup>th</sup> Edition, McGraw Hill, 2002.  
Chapters: 1.3, 1.4, 1.5, 1.6.1, 1.6.2, 1.6.4, 1.6.7, 2.2, 2.3, 2.4, 2.5, 2.6.1, 2.6.2, 4.1, 4.2.1, 4.2.2, 4.2.3, 4.4, 5.1, 5.2.1, 5.2.2, 5.3, 5.5.1, 6.1, 6.2, 6.7, 7.1, 7.2, 7.3, 7.4, 7.5.1, 7.5.2, 7.5.3, 9.1, 9.2, 9.3

**Course Outcomes (COs):**

1. Apply number system conversion and Boolean algebra. (PO1,2,3)
2. Explain the structure of computers and concept of programs as sequences of machine instructions. (PO1,2,3)
3. Acquire knowledge of Input/output Organization and design of Memory systems. (PO1,2)
4. Analyze Arithmetic operations and execution of instructions. (PO1,2,3)
5. Describe the concepts of control signals and embedded system architecture. (PO1,2,3)

# **Operating System and LINUX**

**Course Code: MCA14**

**Credits: 3:0:1**

**Pre requisite: Nil**

**Contact Hours: 42L28P**

**Course Coordinator:**

## **UNIT I**

### **Introduction to Operating Systems, System Structure**

What operating systems do, Operating System Operations, Operating System Services, System Calls, Types of System Calls, Virtual Machines.

### **Overview of Process**

Process Concept, Process Scheduling.

## **UNIT II**

### **Process Management**

Basic Concepts, Scheduling Criteria, Scheduling Algorithms.

### **Process Synchronization**

Synchronization: The Critical Section Problem: Semaphores, Dining Philosopher's Problem using Semaphores.

## **UNIT III**

### **Deadlocks**

Deadlocks: System model, Deadlock Characterization, Methods for handling deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and Recovery from deadlock.

## **UNIT IV**

### **Memory Management**

Memory Management Strategies: Basic hardware, Swapping, Contiguous Memory Allocation, Paging, Segmentation.

Virtual Memory: Demand Paging, Page Replacement.

## **UNIT V**

### **File System, File System Implementation**

File System: File concepts, Access methods, Directory overview, Allocation methods, Free space management.

### **Secondary Storage Structures**

Magnetic disks, Disk Management, Disk Scheduling, Swap Space Management.

## Laboratory

### Linux Laboratory covering the following topics:

- The LINUX Architecture, Features of LINUX
- General Purpose Utilities: man, cal, date, echo, printf, bc, script, who, uname, tty
- File and Directory Handling commands: cat, cp, rm, mv, file, wc, pwd, cd, mkdir, rmdir, File Permissions, Hard Links, Symbolic Links
- Understanding the Shell: Wild cards, Escaping, Quoting, Redirection, Pipes, tee, Command Substitution, Shell Variables
- Simple Filters: pr, head, tail, cut, paste, sort, uniq, tr
- Filters using Regular Expressions: grep, sed
- The Process: Process status, Process Creation, Running and Killing Processes, at, batch, cron
- Simple Shell scripts.

### Text Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating Systems Principles, 8<sup>th</sup> Edition, Wiley – India, 2009.  
Chapters: 1.1, 1.5, 2.1, 2.3, 2.4, 2.8.1, 2.8.2, 3.1, 3.2, 5.1, 5.2, 5.3, 6.2, 6.5, 6.5.1, 6.5.2, 6.5.3, 6.6, 7, 8.1.1, 8.2, 8.3, 8.4, 8.4.1, 8.6, 8.6.1, 8.6.2, 9.2.1, 9.4.1, 9.4.2, 9.4.3, 9.4.4, 10.1.1, 10.1.2, 10.1.3, 10.3.2, 11.4.1, 11.4.2, 11.4.3, 11.5, 12.1.1, 12.4, 12.6
2. Sumitabha Das: UNIX Concepts and Applications, 4<sup>th</sup> Edition, Tata McGraw Hill, 2006.

### Reference Books:

1. D M Dhamdhare: Operating Systems – A Concept Based Approach, 2<sup>nd</sup> Edition, Tata McGraw – Hill, 2002.
2. Harvey M Deital: Operating Systems, 3<sup>rd</sup> Edition, Addison Wesley, 1990.
3. LINUX: The Complete Reference: Kenneth Roson et al, Osborne/McGraw Hill, 2000.
4. Behrouz A Forouzan and Richard F Gilberg: LINUX and Shell Programming, 1<sup>st</sup> Edition, Thomson Course Technology, 2005.

**Course outcomes (COs):**

1. Describe the elements and various functionalities of the operating system and process (PO - 1,2,3)
2. Apply the techniques of process scheduling and demonstrate Process synchronization (PO - 1,2,3)
3. Demonstrate deadlock handling and Process control. (PO – 1,2,3)
4. Demonstrate various memory allocation strategies, virtual memory techniques (PO - 1,2,3)
5. Explain the physical and logical structure of the storage media and illustrate various algorithms for storage management (PO - 1,2,3)
6. Manage LINUX file system and apply basic and advanced filters for text processing. (PO-1,2,3,5,9)

# Data Structures

**Course Code: MCA15**

**Credits: 3:0:1**

**Prerequisite:**

**Contact Hours: 42L 28P**

## UNIT I

**Introduction to Data Structures:** Need of Data Structure, Basic Concepts, Types

**Recursion:** Recursive definition and processes, Example on recursion: Factorial, Fibonacci numbers, Towers of Hanoi problem

**Stack:** Introduction to Stacks, Operations on a Stack, Applications of Stacks: infix to postfix, evaluation of a postfix expression

## UNIT II

**Queues:** Introduction to Queues, Array Representation of Queues, Types of Queues: Circular Queues, Deques, Priority Queues.

**Linked list:** Introduction, Singly Linked Lists, Doubly Linked List, Circular Linked Lists.

## UNIT III

**Trees:** Basic Tree Concepts, Binary Tree - Traversals, Expression Tree,

**Binary Search Tree:** Binary Search Trees – Basic Concepts, Operations, Threaded Trees

## UNIT IV

**Advanced concepts in Trees:** AVL Search trees - Basic concepts, implementations, Heaps - Basic Concepts, implementation.

## UNIT V

**Multi-way trees:** Multi-way trees, B-trees – Basic Concepts, Implementation, Simplified B-Trees: 2-3 tree, 2-3-4 tree

**Graphs:** Basic concepts, operations - traversals, storage structures, graph algorithms.

## Laboratory

Students shall implement programs that supplement the theory concepts

### Text Books:

1. Behrouz A Forouzan, Data Structures - A Pseudocode Approach with C, Richard F Gilberg and Cengage Learning, 6<sup>th</sup> Indian Reprint, 2009.

2. Data Structures using C and C++ by Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenenbaum, 2<sup>nd</sup> Edition, Pearson Education Asia, 2004.

**Reference Books:**

1. Reema Thareja: Data Structures Using C, 2<sup>nd</sup> Edition, Oxford University Press, 2018.

**Course Outcomes (COs):**

1. Apply the concepts of recursion and stack. (PO-1,3,5,9)
2. Implement the queue and list for real world applications. (PO-1,2,3,5,9)
3. Demonstrate the usage and operation of binary search trees. (PO-1,2,3,5,9)
4. Demonstrate the operations of AVL tree and heap. (PO-1,2,3,5,9)
5. Exhibit the construction of Multi way Trees and traversal of graphs. (PO-1,3,5,9)

# Professional Communication and Ethics

**Course Code: MCA16**

**Credits: 2:0:0**

**Prerequisite: Nil**

**Contact Hours: 28L**

**Course Coordinator:**

## UNIT I

**Basics of Technical Communication:** Introduction, Importance of Technical Communication, General and Technical Communication, Objectives and Characteristics of Technical Communication, Process of Communication, Levels of Communication, Flow of Communication, Visual Aids in Technical Communication

## UNIT II

**Active Listening:** Introduction, Types of Listening, Listening for General Content and specific Information.

**Effective Speaking:** Introduction, Achieving Confidence, Clarity, and Fluency, Vocal Cues

**Conversations and Dialogues:** Introduction, Conversation, Telephonic Conversations and Etiquette

## UNIT III

**Formal Presentations:** Introduction, Planning, Outlining and Structuring, Nuances of Delivery, Guidelines for Effective Delivery, Visual Aids in Presentations

**Group Communication:** Introduction, Use of Body Language in Group Communication, GD as part of a Selection

## UNIT IV

**Interviews:** Introduction, Objectives of Interviews, Types of Interviews, Job Interviews, **Resumes:** Resume, biodata and curriculum vitae, Resume Design and Structure

**Formal Letters, Email and Research Papers:** Introduction, Letter Writing, Email, Research Papers

## UNIT V

**Ethics:** Professional Ethics, Ethical Dilemmas, Emotional Intelligence, Responsibilities and Rights of professionals

Professional Responsibilities, Professional Rights, Computer Ethics, Intellectual Property Rights, Professionals and Ethics Ethical Codes, Need for Ethical Codes

**Text Books:**

1. Meenakshi Raman and Sangeeta Sharma: Technical Communication – Principles and Practices, 3<sup>rd</sup> Edition, Oxford University Press, 2015.
2. R. Subramanian: Professional Ethics, Oxford University Press, 2013.

**Reference Books:**

1. George Reynolds: Ethics in Information Technology, 5<sup>th</sup> Edition, Cengage, 2015.
2. M.Ashraf Rizivi: Effective Technical Communication, 1<sup>st</sup> Edition, Tata McGraw Hill, 2005.
3. Mike W Martin and Ronald Schinzinger: Ethics in Engineering, 4<sup>th</sup> Edition, Tata McGraw Hill, 2005.

**Course Outcomes (COs):**

1. Describe the basic definitions and techniques of effective technical communication. (PO-5,6,9,11)
2. Demonstrate the skills of active listening and effective speaking in professional situations. (PO-6,9,11)
3. Demonstrate the skills of presentation and group discussion etiquettes. (PO-6,9,11)
4. Apply the skills of generating business letters and research papers and the techniques of performing good in interviews. (PO-6,9,11)
5. Adapt ethical practices in day to day life and profession and explain the legal process of acquiring an Intellectual Property Rights. (PO-6,9,10,11)



# Web Programming

**Course Code: MCA17**

**Prerequisite: Nil**

**Course Coordinator:**

**Credits: 0:1:2**

**Contact Hours: 28T 56P**

## Topics to be covered in Tutorial

- Introduction to HTML5, Basic HTML Tags
- HTML Forms, Graphics and Media
- Designing HTML pages using CSS
- Basics of XML and DTD
- Introduction to Bootstrap
- Developing web pages using Bootstrap
- Introduction to JavaScript, JavaScript variables, operators
- Conditional and loop statements in JavaScript
- Functions and Arrays in JavaScript
- Event Handling and Document Object model in JavaScript
- Handling strings and working with window object

## Laboratory

- Programs supplementing the concepts covered in tutorial.
- Students are expected to build a website using HTML5, Bootstrap and JavaScript.

## Reference Books:

1. KOGENT Learning Solutions Inc.: HTML5BLACK BOOK, Dream tech Press, 2011.
2. Robert W. Sebesta: Programming the World Wide Web, 4<sup>th</sup> Edition, Pearson Education, 2008.
3. BOOTSTRAP Responsive Web Development by Tutorials Point.

## Course Outcomes (COs):

1. Develop web pages using HTML5, CSS and XML. (PO-3)
2. Develop interactive web pages using JavaScript. (PO-3)
3. Develop web pages using Bootstrap framework. (PO-3,6)

## **II SEMESTER**

# Programming with Python

**Course Code: MCA21**

**Credits: 3:0:1**

**Prerequisites: MCA11**

**Contact Hours: 42L 28P**

**Course Coordinator:**

## UNIT I

### **Introduction to Python**

#### **Python Basics**

Data Types, Operators, Input/Output Statements, Creating Python Programs.

#### **Python Flow Control statements**

Decision making statements, Indentation, Conditionals, loops, break, continue, and pass statements.

#### **Core Data Structures**

Strings, Lists, Tuples, and Dictionaries.

## UNIT II

### **Python Functions**

Defining functions, DOC strings, Function parameters: default, keyword required and variable length arguments, key-word only parameters, local and global variables, pass by reference versus value, Recursion.

#### **Functional Programming**

Mapping, Filtering and Reduction, Lambda Functions, List Comprehensions.

## UNIT III

### **Object Oriented Programming**

Definition and defining a class, Constructor, Destructor, self and del keywords, Access to Attributes and Methods, getattr and setattr attributes, Data Attributes and Class Attributes, Data Hiding, Inheritance, Static Members.

## UNIT IV

### **Regular Expressions**

Defining Regular Expressions and String Processing

#### **File I/O**

File object attributes, Read and Write into the file, Rename and Delete a File.

#### **Exceptions Handling**

Handling Exceptions, Built-in Exceptions and User defined Exceptions.

## UNIT V

### **GUI Programming**

Introduction to Python GUI Programming, Tkinter Programming, Tkinter widgets, Events and Bindings.

### **CGI Programming**

Introduction to CGI, Architecture of CGI, HTTP Header, CGI Environment Variables, Form Processing with GET and POST Methods, Working with the Database- CRUD operations

### **Laboratory**

Programs that supplement the theory concepts are to be implemented.

### **References:**

1. Timothy A. Budd: Exploring Python, Tata McGraw-Hill, 2011.
2. Ascher, Lutz: Learning Python, 4thEdition, O'Reilly, 2009.
3. Jeff Forcier, Paul Bissex, Wesley Chun: Python Web Development with Django, Addison-Wesley (e-book), 2008.
4. Wesley J Chun: Core Python Applications Programming, Pearson Education, 3rd Edition, 2013.
5. <https://www.tutorialspoint.com/python/>

### **Course Outcomes (COs):**

1. Apply the basic and core data structures of Python programming. (PO-1,2,3,5,9)
2. Develop modular programs using functions. (PO-1,2,3,5,9)
3. Implement object oriented concepts in Python. (PO-1,2,3,5,9)
4. Demonstrate regular expressions, files and exception handling. (PO-1,2,3,5,9)
5. Create graphical user interface using Tkinter and web applications using CGI programming. (PO-1,2,3,5,9)

# Design and Analysis of Algorithms

**Course Code: MCA22**

**Credits: 3:0:1**

**Prerequisite: MCA15**

**Contact Hours: 42L 28P**

**Course Coordinator:**

## UNIT I

**Introduction:** Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types, Basics of data Structures.

**Fundamentals of the Analysis of Algorithm Efficiency:** Analysis Framework, Asymptotic Notations and Basic efficiency classes, Mathematical analysis of Recursive and Non recursive algorithms, Examples.

## UNIT II

**Brute Force:** Selection Sort, String Matching, Exhaustive Search.

**Divide-and-Conquer:** Merge sort, Quick sort, Binary Search, Multiplication of large integers.

**Principles of Parallel Algorithm Design:** Preliminaries-Decomposition, tasks, and Dependency graphs, Granularity, Concurrency and Task-Interaction, Decomposition Techniques.

## UNIT III

**Decrease-and-Conquer:** Insertion Sort, Depth First and Breadth First Search, Topological sorting, Algorithms for Generating Combinatorial Objects.

**Transform-and-Conquer:** Presorting, Heaps and Heap Sort.

## UNIT IV

**Space and Time Tradeoffs:** Sorting by Counting, Input Enhancement in String Matching, Hashing.

**Dynamic Programming:** Warshall's and Floyd's Algorithms.

**Greedy Technique:** Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees.

## UNIT V

**Backtracking:** n-queens problem, Hamiltonian Circuit Problem, Subset-Sum Problem, General Remarks.

**Branch-and-Bound:** Knapsack problem, Traveling Salesman Problem.

**P, NP-Completeness and Approximation Algorithms:** Introduction, P and NP Problems, NP-complete problems, Approximation algorithms for the traveling salesman problem, Approximation algorithms for Knapsack problem.

### **Laboratory**

Programs that supplement the theory concepts are to be implemented.

### **Text Books:**

1. Anany Levitin: Introduction to the Design and Analysis of Algorithms, 2nd Edition, Pearson Education, 2009.  
Chapters 1.1-1.4, 2.1-2.4, 3.1, 3.2, 3.4, 4.1-4.3, 4.5, 5.1-5.4, 6.1, 6.4, 7.1-7.3, 8.2, 9.1-9.4, 11.3, 12.1-12.3
2. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar: Introduction to Parallel Computing, 2nd Edition, Pearson Education, 2003.  
Chapters 3.1.1, 3.1.2, 3.2

### **References:**

1. Horowitz E., Sahani S., Rajasekharan S.: Fundamentals of Computer Algorithms, 2<sup>nd</sup> Edition, Universities Press, 2007.
2. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction to Algorithms, 3<sup>rd</sup> Edition, PHI, 2010.

### **Course Outcomes (COs):**

1. Derive the time complexity of algorithms in terms of asymptotic notations.  
(PO-1,2,4,5,9)
2. Apply the brute force, divide and conquer and parallel algorithm approaches for designing algorithm and determining the order of growth.  
(PO-1,2,3,4,5,9)
3. Implement the decrease and conquer and transform and conquer approach for designing and determining the order of growth of algorithms.  
(PO-1,2,3,4,5,9)
4. Demonstrate the design techniques dynamic programming and greedy technique to solve problems and determine the time complexity. Describe the space and time tradeoffs for algorithms. (PO-1,2,3,4,5,9)
5. Apply the branch and bound and backtracking approach for solving problem and describe the concepts of NP-hard problem. (PO-1,2,3,4,5,9)

# Database Systems

**Course Code: MCA23**

**Prerequisite: Nil**

**Course Coordinator:**

**Credits: 3:0:1**

**Contact Hours: 42L 28P**

## UNIT I

**Introduction:** Introduction, Database Architecture

**Relational Model:** Relational Model Concepts; Relational Model Constraints and Relational Database Schemas; Update operations, Transactions, and Dealing with Constraint Violations

**SQL:** SQL Data Definition and Data Types; Specifying constraints in SQL, Schema Modification

## UNIT II

**SQL:** Basic Retrieval Queries in SQL; INSERT, DELETE and UPDATE statements in SQL; Additional features of SQL, Complex Queries

**PL/SQL:** Introduction to PL/SQL, Procedures and Functions, Triggers

## UNIT III

**Entity-Relationship Model:** Using High-Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes and Keys; Relationship Types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; Refining the ER Design; ER Diagrams

**Database Design:** Functional Dependencies; Normal Forms Based on Primary Keys.

## UNIT IV

**Advanced Databases**

**Object Oriented Databases:** Object Database Concepts

**Distributed Databases:** Distributed Database Concepts, Types of Distributed Database Systems, Distributed Database Architectures, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design

**Big Data:** Introduction to big data, NoSQL Databases and their Benefits - MongoDB, CouchDB, HBase, Cassandra DB, InfiniteGraph

## UNIT V

**MongoDB**

Introduction: Features, Database, Collection, Documents, Data Types

CRUD Operations: Create, Read, Update, Delete, Bulk Write

Aggregation: Aggregation Pipeline, Map-Reduce, Single Purpose Aggregation Operations

### **Laboratory**

Programs that supplement the theory concepts are to be implemented.

#### **Text Book:**

1. Ramez Elmasri and Shamkanth B Navathe: Fundamentals of Database Systems, 6<sup>th</sup> Edition, Pearson Education, 2011.  
Chapters: 1.1, 1.4, 2.1, 2.2, 2.4.1, 3, 4, 5.1, 7.1 to 7.7, 7.9, 11.1, 15.1 to 15.3, 25.1 to 25.4
2. Kristina Chodorow: MongoDB: The Definitive Guide: Powerful and Scalable Data Storage, 3<sup>rd</sup> Edition, O'Reilly, 2020.

#### **Web Links:**

1. <http://plsql-tutorial.com>
2. <http://k.web.umkc.edu/kumarv/cs471/oracle-arch.htm>
3. <https://docs.mongodb.com/>

#### **Reference Books:**

1. Abraham Silberschatz, Henry F Korth and S Sudarshan: Data base System Concepts, 6<sup>th</sup> Edition, Mc-Graw Hill, 2011.
2. Raghuram Ramakrishnan and Johannes Gehrke: Database Management Systems, 3<sup>rd</sup> Edition, McGraw-Hill, 2003.
3. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8<sup>th</sup> Edition, Pearson education, 2006.

#### **Course Outcomes (COs):**

1. Describe the basic architecture of the database management system and database schema with constraints. (PO-1,3,5,9)
2. Execute SQL queries to access data and implement triggers, PL/SQL procedures and functions. (PO-1,3,4,5,7,9,11)
3. Design ER model and relational database schema for real world application. (PO-1,2,3,7,9,11,12)
4. Explain different databases and Compare the significance of different NoSQL databases. (PO-1)
5. Perform mongodb crude operations and aggregation. (PO- 1,2,3,5)



# Software Engineering

**Course Code: MCA24**

**Prerequisite: Nil**

**Course Coordinator:**

**Credits: 4:0:0**

**Contact Hours: 56L**

## UNIT I

**Introduction:** Professional software development, software engineering ethics, **Socio-technical systems:** Complex systems, System engineering, System procurement, System development, System operation, **Dependability and security:** Dependability properties, Availability and reliability, Safety, Security, **Software Process:** Software process model, Process activities, Coping with change, The rational unified process. **Product Life Cycle-** Product Life Cycle Stages, Product Life Cycle Case Study.

## UNIT II

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

**System modeling:** Context models, Interaction Models, Structural Models, Behavioral models, Model-driven engineering.

## UNIT III

**Software Design and Development, Architectural Design:** Architectural design decisions, Architectural views, Architectural patterns, Application architectures, **Design and implementation:** Object-Oriented design using the UML, Design patterns, implementation issues, Open source development, **Agile software development:** Agile methods, Plan-driven and agile development, Extreme programming, Agile project management, scaling agile methods.

## UNIT IV

**Software Evolution:** Evolution processes, Program evolution dynamics, Software maintenance, Legacy system management, **Software Reuse:** The reuse landscape, Application frameworks, Software product lines, COTS product reuse, **Software Testing:** Development testing, Test-driven development, Release testing, User testing.

## UNIT V

**Software Management, Project Management:** Risk Management, Managing people, Teamwork, **Project Planning:** Software pricing, Plan-driven development, Project scheduling, Agile planning, Estimation techniques, **Quality Management:** Software quality, Software standards, Software measurement and metrics. **Configuration Management:** Change management, version management, system building, release management.

- *Assignment – Documentation covering phases of Software Development Life Cycle for real world problem.*
- *Internet resources or any relevant books can be used for Product Life Cycle.*

### Text Books:

1. Ian Sommerville: Software Engineering, 9<sup>th</sup> Edition, Pearson Education Publications, 2013.  
Chapters: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 16, 22, 23, 24,25

### Reference Books:

1. Roger. S. Pressman: Software Engineering-A Practitioners approach, 7<sup>th</sup> Edition, McGraw-Hill, 2010.
2. Shari Lawrence Pfleeger, Joanne M. Atlee: Software Engineering Theory and Practice, 4<sup>th</sup> Edition, Pearson Education, 2009.
3. Ali Behforooz, Frederick J. Hudson: Software Engineering Fundamentals, 1<sup>st</sup>Indian Edition, Oxford University Press, 2006.

### Course Outcomes (COs):

1. Exemplify the software engineering process, systems and security.  
(PO-1,2,4,6,8,10,11)
2. Explain the software engineering process by identifying the requirements and system modeling. (PO-1,2,3,4,6,8,10,11,12)
3. Design, develop and implement software based on requirements.  
(PO-1,2,3,4,8,10,11,12)
4. Illustrate the evolution process, reuse and testing for giving a quality software to customer. (PO-1,2,3,4,8,10,11,12)
5. Describe the software management, project management, and planning and configuration management. (PO-1,3,4,8,11,12)

# **ELECTIVE I**

# MEAN Stack Development

**Course code: MCAE11**

**Credits: 0:1:2**

**Prerequisites: MCA17**

**Contact Hours:28T 56P**

**Course Coordinator:**

## Concepts to be covered in Tutorial

1. Introduction to Angular JS, Express JS and Node.js.
2. Angular JS Directives Expressions and Controllers.
3. Angular JS Filters, Tables Modules, Forms,Services.
4. Node.js First Application, REPL Terminal, Package Manager(NPM).
5. Node.js Callbacks, Even Loop, Event Emitter.
6. Node.js Buffers, Streams and File System.
7. Express JS Routing, HTTP Methods.
8. Express JS URL Building, Templating, Static Files.
9. Express JS Cookies, Sessions and Authentication.
10. Connecting MongoDB, insert documents, update/delete documents, Query Database.

## Laboratory

- Programs supplementing the concepts covered in Tutorial.
- Building of small applications using above Frameworks

## Reference Books:

1. Mean Web Development Second Edition, PACKT
2. <http://www.tutorialpoint.com/angularjs/>
3. <http://www.tutorialpoint.com/nodejs/>
4. <http://www.tutorialpoint.com/expressjs/>

## Course outcomes (COs):

1. Demonstrate programs using Angular JS. (PO-1,2,3,5,6,9)
2. Develop programs using Express JS. (PO-1,2,3,5,6,9)
3. Demonstrate programs using Node JS. (PO-1,2,3,5,6,9)
4. Develop an Application using MEAN Stack. (PO-1,2,3,5,6,7,9)

# Hadoop Ecosystem

**Course Code: MCAE12**

**Credits: 0:1:2**

**Prerequisite: Nil**

**Contact Hours: 28T 56P**

**Course Coordinator:**

## Topics to be covered in Tutorial:

- Hadoop Distributed File System and Hadoop Architecture
- Moving the Data into Hadoop and Moving the Data out from Hadoop
- MapReduce & HDFS
- Reading and Writing the files in HDFS using java program
- The Hadoop Java API for MapReduce: Mapper Class, Reducer Class and Driver Class
- Writing Basic MapReduce Program in java and Understanding the MapReduce Internal Components
- Hive Overview and Working with Hive
- Pig Overview and Working with Pig
- Sqoop Overview
- Moving the Data from RDBMS to Hadoop
- Moving the Data from RDBMS to HBase
- Moving the Data from RDBMS to Hive
- Flume Overview and Moving the Data from Web Server into Hadoop
- Real Time Example in Hadoop

## Laboratory

- Programs supplement the tutorial concepts will be based on the latest version of Apache Hadoop

## Reference Books:

1. Tom White: Hadoop The Definitive Guide, Fourth Edition, 4<sup>th</sup> Edition, O'Reilly Media, 2015.
2. Edward Capriolo, Dean Wampler, and Jason Rutherglen: Programming Hive, 1<sup>st</sup> Edition, O'Reilly Media, 2012.
3. Alan Gates: Jason Ostrander: Programming Pig, 1<sup>st</sup> Edition, O'Reilly Media, 2011.
4. Lars George: HBase The Definitive Guide, 1<sup>st</sup> Edition, O'Reilly Media, 2011.

**Course Outcomes (COs):**

1. Describe the Hadoop development framework and demonstrate the Hadoop shell commands. (PO-1,2,3,5)
2. Develop MapReduce programs in Java. (PO-1,2,3,4,5)
3. Implement Hadoop Ecosystem to manage data (PO-1,2,3,4,5,6,10)

# User Interface and User Experience Design

**Course Code: MCAE13**

**Credits: 0:1:2**

**Prerequisite: MCA17**

**Contact Hours: 28T 56P**

**Course Coordinator:**

## Topics to be covered in Tutorial

- Usability of Interactive Systems
- Guidelines, Principles, and Theories
- Managing Design Processes
- Direct Manipulation and Virtual Environments
- Collaboration and Social Media Participation
- Balancing Function and Fashion
- UX- What is UX Designs? Why is UX so important? Full stack design, UX Design Process, Discovery and Planning, The UX STRATEGY, UX Research. UX analysis
- User Behavior Basics and User Research
- Designing Behavior.
- UI Design and Implementation

## Laboratory

Students have to design the User Interface components based on the theory concepts and Design Website template and Navigation using: Adobe Photoshop and Adobe Image Ready, Adobe XD. Microsoft Visio

**CASE Tools:** Introduction to Adobe Photoshop, Adobe Image Ready, Adobe XD. Microsoft Visio, etc.

## List of Projects (Domain)

- Interface for online shopping website
- Mall Map
- e learning web site
- Tele-shopping
- Video/ Audio on demand web site
- Online banking
- ATM interface
- Automatic vending machine for Drinks
- Travel reservation system

- Booking of movie tickets
- Route finder
- Railway enquiry
- Students' Kiosk for institute's information
- Interface for waiter for billing (table wise etc.)
- Online buying of books.
- Online trading on Stock market
- Web site for buying Car
- University web site
- Week end holidays
- Pass port application tracking system
- Zoo information kiosk
- Museum Information Center
- Help desk for Hotel
- Hospital Management
- Servicing center for Automobile
- Patients information storage
- Website for Tuition class
- Catering Service (on-line chef)
- Marriage burro
- Placement agency
- Event management
- Web site for Device drivers and service center
- Just Dial type web site
- Website for promotions of new construction projects.

**Text Book:**

1. Shneiderman Plaisant Cohen Jacobs: Designing the User Interface, 5<sup>th</sup> Edition, Pearson Education, 2010.
2. Elvis Canziba - Hands-On UX Design for Developers: Design, prototype, and implement compelling user experiences from scratch. Packt Publishing, 2018.

**Course Outcomes (COs):**

1. Design the Usability of Interactive systems. (PO-3)
2. Develop Design process of Direct manipulation and Collaboration systems. (PO-3)
3. Design and Develop the UI of particular domain. (PO-3,6)



# Computer Graphics and Animation

**Course code: MCAE14**

**Credits: 0:1:2**

**Prerequisites:**

**Contact Hours:28T 56P**

## **Concepts to be covered in Tutorial**

### **1. Computer Graphics Basics:**

Computer Graphics and Its Types, Application of Computer graphics, Basic functions used for Graphics.

### **2. Output Primitives and Attributes of Output Primitives:**

Output Primitive Points and Lines, Line Drawing Algorithms, Circle Generating Algorithms, Scan-Line Polygon Fill Algorithm

### **3. 2D Transformations**

Basic Transformations, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing.

### **4. 3D Transformations**

Three-Dimensional Scaling, Three-Dimensional Shearing, Rotation, Reflection and Translation.

### **5. Viewing and Clipping**

The viewing Pipeline, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping, Text Clipping, Exterior Clipping

### **6. Computer Animation**

Introduction to animation techniques and concepts. Simple Key-framed Animation

### **7. Lighting & Shading**

Rendering Shading Surfaces Rigid bodies and constraints Expressions

### **8. Motion capture based animation**

Inertial Motion Capture Body Suit System, Shaders, Material Palettes and Rendering

## **Exercises for Laboratory:**

Programs Supplementing the concepts covered in Tutorial

Students are expected to build an application using Graphics and Animation.

## **References:**

1. Edward Angel: Interactive Computer Graphics - A Top-Down Approach using OpenGL, 5<sup>th</sup> Edition, Pearson Education, 2014.
2. Hearn and Baker: Computer Graphics with OpenGL, 3<sup>rd</sup> Edition, Pearson 2009.

3. Malay K Pakhira: Computer Graphics Multimedia and Animation, 2<sup>nd</sup> Edition, PHI, 2010.

**Course Outcomes (COs):**

1. Design and develop programs using the concepts of Computer Graphics.  
(PO-1,2,3,5)
2. Design and develop programs using the concepts Animation. (PO-1,2,3,5)
3. Design and develop an application using features of Graphics and Animation.  
(PO-1,2,5,8,9,10)

# Web Programming with PHP and AJAX

**Course Code: MCAE15**

**Credits: 0:1:2**

**Prerequisites: MCA17**

**Contact Hours: 28T 56P**

**Course Coordinator:**

## Concepts to be covered in Tutorial

1. Overview of PHP, WAMP, LAMP, Syntactic characteristics, Primitives, Variables and Operators
2. Controlling program flow, Arrays, Strings, Dates and Times in PHP
3. Using functions and classes
4. Working with HTML forms and php
5. PHP and MySQL
6. Working with Cookies, Sessions and Headers
7. Overview of AJAX and its applications, Creating a simple AJAX example, XMLHttpRequest Object, Server side programming
8. Sending data to server using GET and POST
9. Demonstration of handling multiple XMLHttpRequest Objects
10. Demonstration of accessing XML data

## Laboratory

- Programs that supplement the tutorial concepts are to be implemented.
- Mini Project to be developed by the students.

## Reference Books:

1. Vikram Vaswani: PHP: A Beginner's Guide, Tata McGraw-Hill, 2017.
2. Steven Holzner: Ajax: A Beginner's Guide, Tata McGraw-Hill, 2017.
3. James Mallison: Mastering PHP 7, Packt Publishing Limited, 2017.
4. Antonio Lopez: Learning PHP 7, Packt Publishing Limited, 2016.

## Course Outcomes (COs):

1. Implement various programming constructs of PHP. (PO-1,2,3,5,9)
2. Demonstrate the concept of AJAX. (PO-1,2,3,5,9)
3. Create web applications using PHP and AJAX. (PO-1,2,3,5,9,10,11,12)

## **ELECTIVE II**

## Digital Forensics

**Course Code: MCAE21**

**Credits: 2:0:1**

**Prerequisite: Nil**

**Contact Hours: 28L 28P**

**Course Coordinator:**

### UNIT I

**Understanding Cyber Crimes, Indian IT Act 2008, and its amendments, Computer Forensic and Investigations as a Profession:** Understanding Computer Forensics.

**Understanding Computer Investigations:** Preparing a Computer Investigation, Taking a Systematic Approach, Procedures for Corporate High-Tech Investigations, Understanding Data Recovery Workstations and Software.

### UNIT II

**Working with Windows and DOS Systems:** Understanding File Systems, Exploring Microsoft File Structures, Examining NTFS Disks, Understanding Whole Disk Encryption, Understanding the Windows Registry, Understanding Microsoft Startup Tasks, Understanding MS-DOS Startup Tasks, Understanding Virtual Machines.

**Macintosh and Linux Boot Processes and File Systems:** Understanding the Macintosh File Structure and Boot Process, Examining UNIX and Linux Disk Structures and Boot Processes, Understanding Other Disk Structures.

### UNIT III

**Current Computer Forensics Tools:** Evaluating Computer Forensic Tool Needs, Computer Forensics Software Tools, Computer Forensics Hardware Tools, Validating and Testing Forensics Software.

**Data Acquisition:** Understanding Storage Formats for Digital Evidence, Determining the best Acquisition Method, Contingency Planning for Image Acquisitions, Using Acquisition Tools, Validating Data Acquisitions, Performing RAID Data Acquisitions, Using Remote Network Acquisition Tools, and Using Other Forensic Acquisition Tools.

### UNIT IV

**Computer Forensics Analysis and Validation:** Determining What Data to Collect and Analyze, Validating Forensic Data, Addressing Data-Hiding Techniques, Performing Remote Acquisitions.

**Recovering Graphics Files:** Recognizing a Graphics File, Understanding Data Compression, Locating and Recovering Graphics Files, Identifying Unknown File Formats, Understanding Copyright Issues with Graphics.

## UNIT V

**Network Forensics:** Network Forensic Overview, Performing Live Acquisitions, Developing Standard Procedures for Network Forensics, Using Network Tools. **E-mail Investigations:** Exploring the Role of E-mail in Investigations, Exploring the Roles of the Client and Server in E-mail, Investigating E-mail Crimes and Violations, Understanding E-mail Servers, Using Specialized E-mail Forensics Tools.

*\*Assignment Based on Case Study*

### Laboratory

Lab exercises using forensic software and case study.

#### Textbooks:

1. Nelson, Phillips, Frank, Enfinger and Steuart: Computer Forensics and Investigations, Cengage Learning, 2008.  
Chapters: 1, 2, 4, 6, 7, 8, 9, 10, 11, 12

#### Reference Books:

1. Marjie T. Britz: Computer Forensics and Cyber Crime - An Introduction, 2<sup>nd</sup> Edition, Pearson Education, 2012.
2. Pawan Duggal: Cyber Law- An exhaustive section wise Commentary on The Information Act along with Rules, Regulations, Policies, Notifications etc., Universal Law Publishing Co. Pvt. Ltd., 2014.
3. Harish Chander: Cyber Laws and IT Protection, PHI, 2012.

#### Course Outcomes (COs):

1. Recall the Indian IT Act 2008, its amendments and describe various types of computer crime and its investigation techniques. (PO-6,10)
2. Describe the file system and process handling concept of MS-DOS, Windows, and Macintosh and Linux operating system. (PO-3,5,10)
3. Analyze and validate evidences using forensic tools. (PO-4,5,6,9,10)
4. Extract, analyze hidden information from graphics, images and other files using forensic tools. (PO-4,5,9,10)
5. Apply network forensic tools for network forensic, email investigation and live data forensic analysis. (PO-4,5,9,10)

# UNIX Systems Programming

**Course Code: MCAE22**

**Credits: 2:0:1**

**Prerequisite: MCA11, MCA14**

**Contact Hours:28L 28P**

**Course Coordinator:**

## UNIT I

### Introduction

**UNIX and ANSI Standards:** The ANSI C Standard, The POSIX Standards, POSIX feature test macros, Limits Checking at Compile Time and at Run Time. The POSIX APIs, API Common Characteristics.

### UNIX Files

File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Hard and Symbolic Links.

## UNIT II

### UNIX File APIs

General File APIs (open, read, write, close, link, unlink, chmod, lseek, fcntl, access), File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs.

## UNIT III

### UNIX Processes

The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions.

### Process Control

Introduction, Process Identifiers, fork, vfork, Zombie Process, wait, waitpid, Race Conditions, exec Functions.

## UNIT IV

**Process Relationships:** Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp, tcsetpgrp, and tcgetsid Functions, Job Control.

## **Signals**

Introduction, The UNIX Kernel Support for Signals, signal (), signal sets, Signal Mask, sigaction, Kill, Alarm.

## **UNIT V**

### **Daemon Processes**

Introduction, Daemon Characteristics, daemon Coding Rules, Error Logging,

### **Interprocess Communication**

Introduction, Pipes, popen, pclose Functions; Coprocesses; FIFOs; Stream Pipes, Introduction to sockets, socket descriptors and connection establishment.

### **Laboratory:**

Programs that supplement the theory concepts are to be implemented.

### **Text Books:**

1. Terrence Chan: UNIX System Programming Using C++, PHI, 1999.  
Chapters: 1, 5, 6, 7, 8, 9
2. W. Richard Stevens, Stephen A. Rago: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005.  
Chapters: 7, 8, 9, 13, 15

### **Reference Books:**

1. Marc J. Rochkind: Advanced UNIX Programming, 2<sup>nd</sup> Edition, Pearson Education, 2005.
2. Maurice J. Bach: The Design of the UNIX Operating System, Pearson Education, 1987.
3. Uresh Vahalia: UNIX Internals: The New Frontiers, Pearson Education, 2001.

### **Course outcomes (COs):**

1. Describe UNIX file system, UNIX/POSIX standards and POSIX API's.  
(PO-1, 2, 4, 5)
2. Implement API's required to perform various file operations on different file types.  
(PO-1, 2, 3, 5, 9)
3. Implement API's required to create, run and control processes. (PO-1, 2, 3, 5, 9)
4. Describe API's required for process relationships and signals. (PO-1, 2, 3, 5, 9)
5. Describe various methods for handling daemon process and inter-process Communication. (PO1, PO2, PO4, PO5)



# Secure Coding in C and C++

**Subject Code: MCAE23**

**Credits: 2:0:1**

**Prerequisite: MCA11**

**Contact Hours: 28L 28P**

**Course Coordinator:**

## UNIT I

**Running with Scissors**, Gauging the Threat, Security Concepts, Development Platforms, **Strings**, Character Strings, Common String Manipulation Errors, String Vulnerabilities and Exploits, Mitigation Strategies for Strings, String-Handling Functions, Runtime Protection Strategies, Notable Vulnerabilities.

## UNIT II

**Pointer Subterfuge**, Data Locations, Function Pointers, Object Pointers, Modifying the Instruction Pointer, Global Offset Table, The .dtors Section, Virtual Pointers, The atexit() and on\_exit() Functions, The longjmp() Function, Exception Handling, Mitigation Strategies. **Dynamic Memory Management**, C Memory Management, Common C Memory Management Errors, C++ Dynamic Memory Management, Common C++ Memory Management Errors.

## UNIT III

Memory Managers, Doug Lea's Memory Allocator, Double-Free Vulnerabilities Mitigation Strategies, Notable Vulnerabilities. **Integer Security**, Introduction to Integer Security, Integer Data Types, Integer Conversions, Integer Operations,

## UNIT IV

Integer Vulnerabilities, Mitigation Strategies. **Formatted Output**, Variadic Functions, Formatted Output Functions, Exploiting Formatted Output Functions, Stack Randomization, Mitigation Strategies, Notable Vulnerabilities.

## UNIT V

**File I/O**, File I/O Basics, File I/O Interfaces, Access Control, File Identification, Race Conditions, Mitigation Strategies, **Recommended Practices**, The Security Development Lifecycle, Security Training, Requirements Design, Implementation, Verification.

### Text Books:

1. Robert C. Seacord: Secure Coding in C and C++, 2<sup>nd</sup> Edition, Pearson, 2013. (Chapter 1,2,3,4,5,6,8,9)

**References:**

1. SEI CERT Coding Standards

**Course Outcomes (COs):**

1. Identifying the vulnerability associated with Sting Handling and Mitigation strategies. (PO-3)
2. Describe the threats associated with Runtime Memory Management and Pointers. (PO-3)
3. Apply the mitigation techniques for vulnerable memory management and data type's conversion. (PO-3)
4. Identify the vulnerability associated with Formatted Output and Concurrency. (PO-3)
5. Describe the vulnerability mitigation techniques for File I/O and recommended practices for security development lifecycle. (PO-3)

# Programming with C#.Net

**Course Code: MCAE24**

**Credits: 2:0:1**

**Prerequisite: MCA11**

**Contact Hours: 28L 28P**

**Course Coordinator:**

## UNIT I

**Introduction to .NET Framework:** The.Net Strategy, The Origins of .Net technology, the .Net Framework, The Common Language Runtime, Framework Base Classes, user and Program Interfaces, Visual Studio .Net, .Net Languages, Benefits of the .Net Approach.

**Overview of C#:** Introduction, a Simple C# Program, Namespaces, Adding Comments.

**Introducing Classes and Objects:** Class Fundamentals, Reference Variables and Assignment, Methods, Constructors, Garbage Collection and Destructors, This Keyword.

## UNIT II

**Managing Console I/O Operations:** Introduction, The Console Class, Console Input, Console Output, Formatted Output, Numeric Formatting, Standard Numeric format, Custom Numeric Format.

**Arrays and Strings:** Jagged Arrays, Assigning Array References, Using the Length Property, Implicitly Typed Arrays, For each Loop, Strings.

**A Closure Look at Methods and Classes:** Controlling Access to Class Members, pass references to Methods, Use ref and out Parameters, use a variable Number of Arguments, The Main() Method, Understanding Static, Static Classes

## UNIT III

**Indexer and Properties:** Indexers, Properties.

**Inheritance:** Basics, Member Access and Inheritance, Constructors and Inheritance, Inheritance and Name hiding, Creating a Multilevel Hierarchy, Base Class References and Derived Objects, Virtual Methods and Overriding, Using Abstract Classes, Using Sealed to Prevent Inheritance, the Object Class.

**Interfaces, Structures and Enumerations:** Interfaces, Enumerations

## UNIT IV

**Namespaces:** Declaring a Namespace, Resolving name conflict using namespace, using, A Second Form of using, Nested Namespaces, Global Namespace, Using the::Namespace Alias Qualifier.

**Exception Handling:** The System Exception Class, Exception Handling Fundamentals, Consequences of an Uncaught Exception, Using Multiple Catch Clauses, Catching All Exceptions, Nested Try Blocks, Throwing an Exception, Using Finally.

## UNIT V

**LINQ:** LINQ Fundamentals, Filter Values with where, Sort Results with Order-by, Select and Nested From Clauses, Group Results With Group, Use into to Create a Continuation, Use let to Create a Variable in a Query, Join Two Sequences with Join, Anonymous Types, Create a Group Join.

**Delegates, Events and Lamda Expressions:** Delegates, Anonymous Functions, Anonymous Methods, Lambda Expressions, Events.

### Laboratory

Programs supplementing the theory concepts.

#### Text Books:

1. Herbert Schildt: The Complete Reference C# 4.0, Tata McGraw Hill, 2010.  
Chapters:1,6,7,8,10,11,12,13,15
2. E. Balagurusamy: Programming in C#, Tata McGraw Hill, 4<sup>rd</sup> Edition, 2011.  
Chapters: 1,2,3

#### Reference Books:

1. Joseph Albahari and Ben Albahari: C# 6.0 in a NutShell A Definitive Reference, O'Reilly, 6<sup>th</sup> Edition, 2016.
2. Karli Watson, Christian Nagel, Jacob Hammer Pedersen, Jon D. Reid, Morgan Skinner: Beginning Visual C#®, 2010 Wrox Publishers.

#### Course Outcomes (COs):

1. Demonstrate the basic programming constructs of C# on .Net framework.  
(PO-1,2,3,5,9)
2. Apply object oriented concepts to develop dynamic interactive C# applications.  
(PO-1,2,3,5,9)
3. Demonstrate Indexers and Properties to manage access to class' instance data.  
(PO-1,2,3,5,9)
4. Apply C# exception handling model and using namespace to develop robust programs. (PO-1,2,3,5,9)
5. Implement delegate and events for method encapsulation and queries for processing in-memory data using LINQ. (PO-1,2,3,5,9)

# Operations Research

**Course Code: MCAE25**

**Credits: 2:1:0**

**Prerequisite: Nil**

**Contact Hours: 28L 28T**

**Course Coordinator:**

## UNIT I

**What is Operations Research?** Operations Research Models, Solving the OR models, Queuing & Simulation models, Art of Modelling, Phases of OR Study

**Modelling with Linear Programming:** Two variable LP model, Graphical LP solution, Formulation of LP problems.

## UNIT II

**The Simplex Method:** LP model in equation form, Transition from graphical to algebraic solution, The Simplex method.

**Artificial starting solution -M Method, Two-Phase Method, Special cases in simplex method.**

## UNIT III

**Duality and Dual Simplex Method:** Definition of Dual Problem, Primal-Dual Relationships

**Game theory:** Introduction to Game Theory, the formulation of two persons, Zero sum games, solving simple Zero sum games, Games with mixed strategies.

## UNIT IV

**Transportation model and its Variants:** Definition of the Transportation Model, Mathematical formation of Transportation problem, The Transportation Algorithm: Determination of the starting solution, Iterative computations of the Transportation Algorithm, The assignment model - The Hungarian Method.

## UNIT V

**PERT and CPM:** Network representation, Critical Path Method (CPM) Computations, Construction of the Time Schedule, PERT calculations.

### Text Books:

1. Operations Research: An Introduction, Hamdy A Taha, 8<sup>th</sup> Edition, Pearson Education, 2011.  
Chapters: 1.1-1.6, 2.1, 2.2, 2.3.1, 2.3.3, 2.3.4 (Single-Period Production Model), 2.3.6, 3.1-3.5, 3.6.1, 4.1, 4.2, 4.3, 4.4.1, 5.1, 5.3.1, 5.3.2, 5.4.1, 6.1- 6.3.2, 6.4.1,

6.4.2, 6.5.1-6.5.3, 6.5.5, 13.4 (Solution of Mixed Strategy Games using Graphical Method Only)

**Reference Books:**

1. S D Sharma: Operations Research, 15<sup>th</sup> Edition, KedarNath Ram Nath, Meerut, Delhi, 2005.
2. Fredrick S. Hiller, Gerald J Lieberman: Introduction to Operations Research, 9th Edition, McGraw Hill, India, 2008.

**Course Outcomes (COs):**

1. Formulate linear programming problems (LPP) and solve two-variable LPP graphically. (PO-1,2,4)
2. Solve LP problems using simplex methods. (PO-1,2,4)
3. Derive dual from a given primal problem and solve the LP problem using dual simplex method. Apply transportation and assignment model to obtain optimum solution. (PO-1,2,4)
4. Construct network models for a given real world problem and determine the optimal solution. (PO-1,2,4)
5. Apply PERT and CPM techniques for project management. Formulate and solve simple games to resolve competitive situations. (PO-1,2,4)

## **ELECTIVE III**

# Software Project Management

**Subject Code: MCAE31**

**Credits: 3:0:0**

**Prerequisite: Nil**

**Contact Hours: 42L**

**Course Coordinator:**

## UNIT I

**PROJECT EVALUATION AND PROJECT PLANNING:** Importance of Software Project Management, Activities, Methodologies, Categorization of Software Projects, Setting objectives, Management Principles, Management Control, Project portfolio Management, Cost-benefit evaluation technology, Risk evaluation, Stepwise Project Planning.

## UNIT II

**PROJECT LIFE CYCLE AND EFFORT ESTIMATION:** Software process and Process Models, Choice of Process models, Rapid Application development, Agile methods, Extreme Programming, SCRUM, Basics of Software estimation, Effort and Cost estimation techniques, COSMIC Full function points, COCOMO II A Parametric Productivity Model.

## UNIT III

**ACTIVITY PLANNING AND RISK MANAGEMENT:** Objectives of Activity planning, Project schedules, Activities, Sequencing and scheduling, Network Planning models, Forward Pass and Backward Pass techniques, Critical path (CRM) method, Risk identification, Assessment, Monitoring, PERT technique.

## UNIT IV

**RESOURCE ALLOCATION AND PROJECT MONITORING:** Resource Allocation, Creation of critical paths, Framework for Management and control, Collection of data Project termination, visualizing progress, Cost monitoring, Earned Value Analysis-Project tracking, Change control- Software Configuration Management.

## UNIT V

**TEAM WORK AND SOFTWARE QUALITY:** Team structures, Virtual teams, Communications genres, Software Quality in Project Planning, Software Quality Models, Product and Process Metrics and Quality Management, Quality Management Systems, Process Capability Models.



**Text Books:**

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management, 6<sup>th</sup> Edition, Tata McGraw Hill, New Delhi, 2018.  
Chapters: 1.1 to 1.16, 2.1 to 2.6, 3, 4.1 to 4.5, 4.13 to 4.16, 5.1 to 5.13, 6, 7.1 to 7.12, 8.1 to 8.5, 9, 12.1 to 12.7, 13.1 to 13.5, 13.7 to 13.10.2.

**Reference Books:**

1. Robert K. Wysocki: Effective Software Project Management, Wiley Publication, 2011.
2. Walker Royce: Software Project Management, Addison-Wesley, 1998.
3. Gopaldaswamy Ramesh: Managing Global Software Projects, McGraw Hill Education (India), Fourteenth Reprint, 2013.

**Course Outcomes (COs):**

1. Apply the software project evaluation and project planning. (PO-1,2,4,6,8,9,10)
2. Describe the software project life cycle and apply the software effort estimation techniques. (PO-1,4,6,8,9,12)
3. Plan the software activities and manage the risks. (PO-1,2,4,8)
4. Handle the resource allocation and manage the change control. (PO-2,4,8)
5. Coordinate the project team and practice the software quality metrics. (PO-6,8,9,11,12)

## Management and Entrepreneurship

**Subject Code: MCAE32**

**Credits: 3:0:0**

**Prerequisite: Nil**

**Contact Hours: 42L**

**Course Coordinator:**

### UNIT I

**Nature and Functions of Management;** Importance of management, Definition of management, Management Functions or the Process of Management, Levels of Management, Organisational or Business Functions, Roles of a Senior Manager, Managerial Skills, Managerial Effectiveness, Management and Administration.

**Planning:** Nature of Planning, Importance of Planning, Types of Plans, Steps in Planning, Organisation: What is an “Organisation”?, Process of Organising, Principles of Organising, Organisation Structure.

### UNIT II

**Coordination:** Distinction Between Coordination and Cooperation, Distinction Between Coordination and Control, Need for Coordination, Types of Coordination. Techniques of Coordination (Approaches to Coordination), Difficulty of Coordination.

**Staffing:** Importance and Need for Proper Staffing, Manpower Planning, Recruitment, Selection, Placement, Induction(Orientation).

**Direction and Supervision:** Requirements of Effective Direction, Giving Orders, Motivation, Job Satisfaction,

**Managerial Control:** Steps in Control Process, Need for Control System, Benefits of Control

### UNIT III

**Entrepreneur:** Introduction, Evolution of the Concept of Entrepreneur, Characteristics of successful Entrepreneurs, The charm of becoming an Entrepreneur, The Entrepreneurial Decision Process, Functions of Entrepreneur, Need for an Entrepreneur, Types of Entrepreneurs,

**Entrepreneurship:** Concept of Entrepreneurship, Growth of Entrepreneurship in India, Role of Entrepreneurship in Economic Development.

**Women Entrepreneurship:** Concept of Women Entrepreneur, Functions of Women Entrepreneurs, Problems of Women Entrepreneurs, Developing Women Entrepreneurship, Limitations of Women Entrepreneurship

### UNIT IV

**START-UP: Micro and Small Enterprises:** Small Enterprises: Meaning and Definition, Micro and Macro units, Essentials, features and characteristics, relationship

between Micro and Macro Enterprises, Role of Micro Enterprises in Economic Development, Package for Promotion of Micro and Small – Scale Enterprises, Problems of Micro and Small Enterprises.

**Opportunity Identification and Selection:** Need for opportunity Identification and Selection, Environmental Dynamics and Change, Business Opportunities in Various Sectors, Identification of Business Opportunity: Idea Generation, Opportunity/Product Identification, Opportunity Selection, Steps in setting up of a small Business Enterprise.

## UNIT V

**Forms of Business Ownership:** Sole Proprietorship, Partnership, Company, Cooperative, Selection of an Appropriate form of Ownership Structure, Ownership Pattern in Micro – Scale Enterprises in India: The Empirical Evidence.

**SUPPORT: Institutional Finance to Entrepreneurs:** Need for Institutional Finance, Institutional Finance: Commercial Banks, Other Financial Institutions.

**Institutional Support to Entrepreneurs:** Need for Institutional Support, Institutional Support to small Entrepreneurs: National Small Industries Corporation Ltd (NSIC), Small Industries Development Organization (SIDO), Small Scale Industries Board (SSIB). State Small Industries Development Corporations (SSID), District Industries Centers (DICs), Industrial Estates, Specialized Institutions, Technical Consultancy Organizations (TCOs)

### Text Books:

1. P C Tripathi, P N Reddy: Principles of Management. Tata McGraw Hill, 6th Edition, 2017.
2. Dr. S. S. Khanka: Entrepreneurial Development, Revised Edition, S Chand & Co., 2007.

### Course Outcomes (COs):

1. Discuss the Nature and Functions of Management and functions of manager. (PO-8,9,10,11,12)
2. Describe the role of Entrepreneur and Entrepreneurship. (PO-6,8,9,10,11,12)
3. Discuss the startups Micro and Small Enterprises. (PO-6,8,9,10,11,12)
4. Illustrate the Opportunity Identification, Selection and Forms of Business Ownership. (PO-6,8,9,10,11,12)
5. Discuss the support of Institutional Finance to Entrepreneurs and Institutional Support to Entrepreneurs. (PO-6,8,9,10,11,12)

## **Design Thinking**

**Subject Code: MCAE33**

**Credits: 3:0:0**

**Prerequisite: Nil**

**Contact Hours: 42L**

**Course Coordinator:**

### **UNIT I**

WHAT'S DESIGN THINKING? Why do we need design thinking? What makes design thinking unique?

DESIGN ACTION PLAN: 5 characteristics of action plan-- Empathize phase, Define phase, Ideate phase, Prototype phase, Test phase

### **UNIT II**

PROCESS OF DESIGN

Introduction – Product Life Cycle - Design Ethics - Design Process - Four Step – Five Step - Twelve Step - Creativity and Innovation in Design Process - Design limitation

### **UNIT III**

THINKING MINDSETS- Anatomy of a design thinker, Mindset 1: Think users first; Mindset 2: Ask the right questions; Mindset 3; Believe you can draw; Mindset 4: Commit to ideate; Mindset 5: Prototype to test

THINK USERS FIRST: What are your users inherent needs? How do you empathize your users? Ask questions—What you need to know; Steps to take for preparing an interview; Persona; Empathy map

### **UNIT IV**

ASK THE RIGHT QUESTIONS: Why ask the right questions? What are different type of questions? Who should you ask questions? How to align stakeholders in meetings? Why should we communicate by drawing? What is the value of drawing? How to start drawing?

### **UNIT V**

COMMIT TO IDEATE: Why do you need to ideate? What are the rules of ideation? How to facilitate an ideation session? How to build a creative culture? Divergent-common ideation techniques; Convergent—simple ways to converge

PROTOTYPE TO TEST: What you could use as a prototype? Why do we need a prototype? Why do we test? How to conduct a structured test? How to conduct the interview? How to conduct the observers' debrief?

## **References**

1. Daniel Ling: Complete Design Thinking Guide for Successful Professionals, Emerge Creatives Group LLP, 2015.
2. Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Bloomsbury Academic, 2016.
3. John R. Karsnitz, Stephen O'Brien, John P. Hutchinson: Engineering Design: An Introduction, Cengage Learning, 2<sup>nd</sup> Edition.
4. Yousef Haik, Sangarappillai Sivaloganathan, Tamer M. Shahin: Engineering Design Process, Cengage Learning, 2018.

## **Course Outcomes (COs):**

1. Define the idea and action plan of design thinking. (PO-3, 4)
2. Illustrate the process of design. (PO-3, 4, 10,12)
3. Explain various thinking mind sets. (PO-3, 4, 10)
4. Acquire verbal and drawing communication skills. (PO-3, 9)
5. Ideate the solutions for a given problem and Build prototype for testing. (PO-3, 4, 10, 12)

# Enterprise Resource Planning

**Course Code: MCAE34**

**Credits: 3:0:0**

**Prerequisite: NIL**

**Contact Hours: 42L**

**Course Coordinator:**

## UNIT I

Introduction to ERP Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering, Data Warehousing, Data Mining, On-line Analytical Processing, Supply Chain Management

## UNIT II

ERP Implementation: Implementation of Life Cycle, Implementation Methodology, Hidden Costs, Organizing Implementation, Vendors, Consultants and Users, Contracts, Project Management and Monitoring

## UNIT III

Business Modules: Business Modules in an ERP Package, Finance, Manufacturing, Human Resource, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution

## UNIT IV

ERP Market: ERP Market Place, SAP AG, People Soft, Baan Company, JD Edwards World Solutions Company, Oracle Corporation, QAD , System Software Associates.

## UNIT V

ERP–Present and Future: Turbo Charge the ERP System, EIA, ERP and E–Commerce, ERP and Internet, Future Directions in ERP.

### Textbooks:

1. Alexis Leon: ERP Demystified, Tata McGraw Hill, 1999.
2. Joseph A. Brady, Ellen F. Monk, Bret J. Wangner: Concepts in Enterprise Resource Planning, Thomson Learning, 2001.

### References:

1. Vinod Kumar Garg and N.K .Venkata Krishnan: Enterprise Resource Planning concepts and Planning, Prentice Hall, 1998.
2. Jose Antonio Fernandz: The SAP R /3 Hand book, Tata McGraw Hill.

**Course Outcomes (COs):**

1. Analyze the pros and cons of ERP, Data warehousing/Mining and OLAP for the given problem/application. (PO-1,2,3,4,8)
2. Analyze the implementation of ERP in the context of business of the different organization. (PO-2,3,8,9,11)
3. Analyze and apply ERP for different business modules. (PO-1,2,3,4,8)
4. With the help of a case study explain ERP marketing. (PO-2,3,8,9,11)
5. Analyze the design ERP with future E-commerce and internet. (PO-1,2,8,11)

# Management Information Systems

**Course Code: MCAE35**

**Credits: 3:0:0**

**Prerequisite: NIL**

**Contact Hours: 42L**

**Course Coordinator:**

## UNIT I

### **Information Systems in Global Business Today**

How Information Systems Are Transforming Business, What's new in Management Information System, Globalization Challenges and Opportunities: A Flattened World, what is an Information System, Dimensions of Information Systems, Technical Approach, Behavioural Approach.

### **Global E-Business and collaboration**

Business Process, how information Technology Improves Business Process, Systems for different management groups, Systems for linking the enterprise, The Information systems department, organizing the information systems function.

## UNIT II

### **IT infrastructure and Emerging Technologies**

Defining IT Infrastructure, Evolution of IT Infrastructure, Technology Drivers of Infrastructure Evolution, Computer Hardware Platforms, Enterprise Software applications, Data Management and storage, Networking/Telecommunication platforms, Internet platforms, Consulting and System Integration Services, Mobile Digital platform, Linux and open source software, Software for the web,

### **Foundation of Business Intelligence: Databases and Information Management**

File organization terms and concepts, Problems with the traditional file environment, Database Management Systems, Capabilities of DBMS, Designing databases, Non-relational databases, Cloud databases, Blockchain, Challenges of Bigdata, BI Infrastructure.

Organizing Data in a Traditional File Environment, The Database Approach to Data Management, Using Database to Improve Business Performance and Decision Making.

## UNIT III

### **Achieving Operational Excellence and Customer Intimacy: Enterprise Application**

Enterprise Systems, Enterprise software, Business value of enterprise systems, Supply Chain, Customer Relationship Management Systems, CRM software, Operational and analytical CRM, Business value of CRM



## **E-Commerce: Digital Markets, Digital Goods**

E-commerce today, The new E-commerce, why E-commerce is different, Key concepts in E-commerce, Types of E-commerce, E-commerce business models, Behavioral targeting, Social E-commerce and social network marketing, EDI, New ways of B2B Buying and selling

### **UNIT IV**

#### **Managing Knowledge and Artificial Intelligence**

Important Dimension of Knowledge, Knowledge Management value chain, Types of Knowledge management systems, Evolution of AI, Types of AI, Expert systems, Machine Learning, Neural Networks, Genetic algorithms, NLP, Computer vision systems and robotics, Intelligent Agents

#### **Enhancing Decision Making**

Business value of Improved Decision Making, Types of decisions, the decision making process, Managerial roles, Real world decision making, High velocity automated decision making, what is BI, BI environment, BI and analytic capabilities

### **UNIT V**

#### **Building and Managing Systems**

Systems Development and Organizational Change, Business process redesign, System Analysis, Systems design, Completing the systems development process, structured methodologies, Object oriented development, Computer Aided software engineering, Traditional systems life cycle, prototyping, End-user development, Application Software packages, Software services and out sourcing

#### **Managing Projects**

Runaway projects and System Failure, Project Management Objectives, Management structure for information systems projects, linking systems projects to the business plan, portfolio analysis, scoring models, Information system costs and benefits, capital budgeting for information systems, Limitations of Financial models, Dimensions of project risks, Change Management and the concept of Implementation, controlling risk factors, designing for the organization, project management software tools. .

#### **Case Study**

#### **Text books:**

1. Kenneth C.Laudon, Jane P.Laudon: Management Information Systems Managing the Digital Firm, 16<sup>th</sup> Edition, Pearson Education, 2020.  
Chapters: 1.1, 1.2, 1.3, 2.1, 2.2, 2.4, 5.1 to 5.4, 6.1 to 6.3, 9.1 to 9.4, 10.1 to 10.4, 11.1 to 11.3, 12.1 to 12.3, 13.1 to 13.4, 14.1 to 14.4.

**Reference Books:**

1. Kenneth C.Laudon, Jane P.Laudon: Management Information Systems Managing the Digital Firm, 13<sup>st</sup> Edition, Pearson Education, 2015.
2. Management Information Systems, Jawadekar, 5<sup>th</sup> Edition, McGraw Hill 2013.

**Course Outcomes (COs):**

1. Discuss the Role of Information Systems in Global Business Today.  
(PO-1,2,8,11)
2. Apply the foundations of Business Intelligence and describe the IT Infrastructure for Business. (PO-1,2,8,9,11)
3. Describe the Enterprise Systems and Digital Marketing in Industry. (PO- 2,8,9)
4. Describe managing knowledge and Analyze the Decision Making concepts for building and managing information systems in an organization. (PO-2,8,9,11)
5. Apply the Project Management principles for managing the system.  
(PO-1,2,8,11)

## **III SEMESTER**

# Programming in Java

**Course Code: MCA31**

**Prerequisite: MCA11**

**Course Coordinator:**

**Credits: 3:0:1**

**Contact Hours:42L 28P**

## UNIT I

**Introducing Classes:** Introduction to Java, Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this Keyword, Garbage, The finalize() Method, Exploring the String Class, Using Command-Line Arguments, Varargs, Scanner class.

**Inheritance:** Inheritance Basics, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance, The Object Class.

## UNIT II

**Packages and Interfaces:** Packages, Access Protection, An Access Example Importing Packages, Interfaces, Default Interface methods.

**Exception Handling:** Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions Using try and catch, multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses.

## UNIT III

**Multithreaded Programming:** The Java Thread Model, The Main Thread, Creating a Thread, Creating Multiple Threads, Using isAlive( ) and join( ), Thread Priorities, Synchronization, Inter-thread Communication, Suspending, Resuming, and Stopping Threads, Obtaining thread state, Using Multithreading

**Enumeration and Autoboxing:** Enumeration, Type Wrappers, Autoboxing.

**Generics:** What are Generics?, A Simple Generics Example, A Generics Class with two Type Parameters, The General Form of a Generic Class.

## UNIT IV

**The Collections Framework:** Collections Overview, The Collection Interfaces, The List Interface, The ArrayList Class, The LinkedList Class.

**Networking:** Networking Basics, Client server communication using TCP and UDP.

**Lambda Expressions:** Introducing Lambda Expressions, Block Lambda Expression.

## UNIT V

**Event Handling:** Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, The event class, The Key event, Class Sources of Events, Event Listener Interfaces, Using the Delegation Event Model, Adapter Classes, Inner Classes.

**JavaFX:** Introducing JavaFX GUI programming, Exploring JavaFX controls.

### Laboratory

Programs that supplement the theory concepts are to be implemented.

### Text Books:

1. Herbert Schildt: The Complete Reference JAVA, 9<sup>th</sup> Edition, TATA McGraw HILL, 2014.  
Chapters: 2, 6, 7, 8, 9, 10, 11, 12, 14, 15, 18, 22, 24, 34, 35

### Reference Books:

1. Paul Deitel and Harvey Deitel: Java How to Program, 9<sup>th</sup> Edition, PHI, 2012.
2. Y.Daniel Liang : Introduction to JAVA Programming, 6<sup>th</sup> Edition, Pearson Education, 2006
3. Cay S Horstmann, Gary Cornell: Core Java 2 volume 1 and volume 2, 7<sup>th</sup> Edition, Pearson Education, 2005.

### Course Outcomes (COs):

1. Develop programs using the OOP concepts and basic constructs in Java for a given problem. (PO-3,6)
2. Exemplify the usage of Packages, Interfaces and Exceptions for OO Programming. (PO-3, 6)
3. Apply Generics, Multithreading, Enumerations, and Auto boxing Concepts to develop robust programs. (PO-3, 6)
4. Implement the concepts of Networking, and analyze the usage of collection framework and lambda expression. (PO-3, 6)
5. Develop User Interfaces using JavaFX with Event Handling for Dynamic Applications. (PO-3, 6)

# Computer Networks

**Course Code: MCA32**

**Prerequisite: Nil**

**Course Coordinator:**

**Credits: 3:0:1**

**Contact Hours: 42L 28P**

## UNIT I

**Computer Networks and the Internet:** What Is the Internet? The Network Edge, The Network Core, Delay, Loss, and Throughput in Packet-Switched Networks, Protocol Layers and Their Service Models.

## UNIT II

**Application Layer:** Principles of Network Applications, The Web and HTTP, File Transfer: FTP, Electronic Mail in the Internet, DNS—The Internet's Directory Service, Peer-to-Peer Applications.

## UNIT III

**Transport Layer:** Introduction and Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP.

## UNIT IV

**Transport Layer:** Principles of Congestion Control, TCP Congestion Control.  
**The Network Layer:** Introduction, Virtual Circuit and Datagram Networks, What's Inside a Router? The Internet Protocol (IP): Forwarding and Addressing in the Internet, Routing Algorithms.

## UNIT V

**The Network Layer:** Routing in the Internet Broadcast and Multicast Routing.  
**The Link Layer and Local Area Networks:** Link Layer: Introduction and Services, Error-Detection and Correction Techniques, Multiple Access Protocols, Link-Layer Addressing.

## Laboratory:

Exercises to supplement the concepts using existing tools

**Text Books:**

1. James F. Kurose, Keith W. Ross: Computer Networking: A Top-Down Approach, 5<sup>th</sup> Edition, Addison-Wesley, 2012.  
Chapters: 1, 2.1 - 2.6, 3, 4.1- 4.7, 5.1 - 5.4

**Reference Books:**

1. Behrouz A. Forouzan: Data Communications and Networking, 4<sup>th</sup> Edition, Tata McGraw-Hill, 2006.
2. Alberto Leon-Garcia and Indra Widjaja: Communication Networks-Fundamental Concepts and Key architectures, 3<sup>rd</sup> Edition, Tata McGraw-Hill, 2004.
3. William Stallings: Data and Computer Communication, 8<sup>th</sup> Edition, Pearson Education, 2007.
4. Larry L. Peterson and Bruce S. David: Computer Networks – A Systems Approach, 4<sup>th</sup> Edition, Elsevier, 2007.
5. Wayne Tomasi: Introduction to Data Communications and Networking, Pearson Education, 2005.
6. Nader F. Mir: Computer and Communication Networks, Pearson Education, 2007.

**Course Outcomes (COs):**

1. Describe basic terminologies used for computer networking. (PO - 1,2,3,5)
2. Demonstrate application layer protocols used for process to Process Communication and illustrate using packet tracer and wire shark.  
(PO - 1,2,3,5,9)
3. Illustrate transport layer protocols using wire shark. (PO - 1,2,3,5,9)
4. Elucidate network layer protocols using packet tracer. (PO - 1,2,3,5,9)
5. Explain link layer functionalities. (PO - 1,2,3,5)

# Information Security

**Subject Code: MCA33**

**Credits: 3:0:1**

**Prerequisite: Nil**

**Contact Hours: 42L 28P**

**Course Coordinator:**

## UNIT I

**Introduction to Information Security:** What Is Security? Components of an Information System, Balancing Information Security and Access, Approaches to Information Security Implementation, The Security Systems Development Life Cycle, **The Need for Security:** Threats, Attacks, **Legal, Ethical, and Professional Issues in Information Security:** Ethics and Information Security, Codes of Ethics and Professional Organizations.

## UNIT II

**Risk Management:** Risk Identification, Risk Assessment, Risk Control Strategies, selecting a Risk Control Strategy, Quantitative Versus Qualitative Risk Control Practices, **Security Technology: Firewalls and VPNs,** Access Control, Firewalls, Protecting Remote Connections.

## UNIT III

**Security Technology: Intrusion Detection and Prevention Systems, and Other Security Tools,** Intrusion Detection and Prevention Systems, Honeypots, Honeynets, and Padded Cell Systems, Scanning and Analysis Tools, Biometric Access Controls **Implementing Information Security,** Information Security Project Management, Technical Aspects of Implementation, Nontechnical Aspects of Implementation.

## UNIT IV

**Symmetric Ciphers:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography, **Block Ciphers and the Data Encryption Standard:** Block Cipher Principles, The Data Encryption Standard, The Strength of Des, **Advanced Encryption Standard,** Evaluation Criteria For AES, The AES Cipher.

## UNIT V

**Public-Key Encryption and Hash Functions, Public-Key Cryptography and RSA,** Principles of Public-Key Cryptosystems The RSA Algorithm, **Key Management; Other Public-Key Cryptosystems,** Key Management, Diffie-Hellman Key Exchange, **Message Authentication and Hash Functions,** Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Security of Hash Functions and Macs.



**Text Books:**

1. Michael E. Whitman, Herbert J. Mattord: Principles of Information Security, 4<sup>th</sup> Edition, Cengage Learning, 2012.  
(Selected Portion from Chapters 1,2,3,4,5,6,7,9,10).
2. William Stallings: Cryptography and Network Security-Principles and Practices, 4<sup>th</sup> Edition, Prentice Hall.  
Chapters: 2.1 to 2.5, 3.1 to 3.3, 3.5, 5.1 to 5.2, 9.1 to 9.2, 10.1 to 10.2, 11.1 to 11.5.

**Reference Books:**

1. Behrouz A Forouzan: Cryptography and Network Security, 3<sup>rd</sup> Edition, Tata McGraw Hill, 2015.
2. R. Kelly Rainer, Casey G. Cegielski: Introduction to Information Systems, 4<sup>th</sup> Edition, Wiley India, 2015.
3. Mark Merkow, James Breithaupt: Information Security: Principles and Practices, Pearson Education, 2014.

**Course Outcomes (COs):**

1. Describe the basic concepts of information security, its need, legal, ethical and professional issues associated with it. (PO-1, 6)
2. Identify risks and its controlling mechanisms, importance of firewalls and VPN in the context of network security. (PO-1, 5)
3. Discuss different security technologies and implementation of information security. (PO-1, 3, 5)
4. Apply symmetric key cryptography and encryption standards. (PO-1, 3, 5)
5. Explain public-key cryptography and hash functions. (PO-1, 3, 5)

# Machine Learning

**Subject Code: MCA34**

**Credits: 3:0:1**

**Prerequisite: MCA12**

**Contact Hours: 42L 28P**

**Course Coordinator:**

## UNIT I

**Introduction:** Machine Learning, Types of Machine Learning, Applications of Machine Learning. Preparing to Model, Basic types of data in Machine Learning, Exploring structures of Data, Data quality and remediation, Data Pre-processing

## UNIT II

**Regression Model:** Correlation and Regression, Simple Linear Regression, Multiple Linear Regression, Overview of Logistic Regression, Model Validation using t-test

## UNIT III

**Classification:** Bayes Theorem, Naïve Bayes classifier, Building a Decision tree, Information gain of Decision tree, Algorithm for Decision Tree.

## UNIT IV

**Support Vector Machine:** Introduction to Support Vector Machines (SVM), Linear SVM, Optimal Hyperplane, Non-Linear SVM, Radial Basis Function

## UNIT V

**Clustering:** Partitioning Clustering Method, Hierarchical Clustering Method

**Neural Networks:** Perceptron, Overview of Activation Functions, Multilayer Network.

## Laboratory

Implementation of techniques for Machine Learning

## Reference Books:

1. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das: Machine Learning, 2019.
2. Anuradha Srinivasaraghavan, Vincy Joseph: Machine Learning, Wiley, 2019.
3. Tom Mitchell: Machine Learning, 1<sup>st</sup> Edition, McGraw- Hill, 1997.
4. Ethem Alpaydin: Introduction to Machine Learning, 2<sup>nd</sup> Edition, The MIT Press Cambridge, Massachusetts London, England, 2010.
5. Pang-Ning Tan, Michael Steinbach, and Vipin Kumar: Introduction to Data Mining, 2<sup>nd</sup> Edition, Pearson Education, 2006.

6. Jiawei Han, Micheline Kamber, Jian Pei: Data Mining - Concepts and Techniques, 3<sup>rd</sup> Edition, Elsevier Publications, 2011.

**Course Outcomes (COs):**

1. Distinguish between Supervised, unsupervised and semi-supervised learning and prepare the data for analysis. (PO-1,2,4)
2. Develop Regression Models for a given problem. (PO-1,3,4,6)
3. Classify the future data trends using popular classification techniques. (PO-1,3,4,6)
4. Analyze the usage of SVM in solving problems. (PO-1,3,4,6)
5. Group the data into clusters and design Neural Network Models. (PO-1,3,4,6)

# **ELECTIVE IV**

# Programming IoT

**Course code: MCAE41**

**Credits: 0:1:2**

**Prerequisites: MCA21**

**Contact Hours:28T 56P**

**Course Coordinator:**

## Concepts to be covered in Tutorial

- Introduction to Internet of Things (IoT)
- IoT enabling technologies and IoT levels
- Python Programming with Raspberry Pi
- Working with Arduino
- Working with Sensors on Raspberry Pi and Arduino
- Case study on Home Intrusion Detection
- Introducing Cloud platform for IoT
- Introduction to IoT with Machine Learning

## Exercises for Lab

- Familiarity with Raspberry Pi
- Exploring the different components of Raspberry pi
- Setting up of the board and booting the board
- Practice sessions on Python with Django
- Working with different sensors on Raspberry Pi
- Simple application development using Raspberry Pi and Python
- Familiarity with Arduino
- Exploring the different components of Arduino
- Setting up of the board and booting the board
- Working with different sensors on Arduino
- Working with Cloud platform.
- Working with simple IoT applications using Machine Learning
- Project work.

## References:

1. ArshdeepBahga, Vijay Madiseti: Internet of Things - A Hands on Approach, Universities Press, 2015.
2. Simon Monk: Programming the RaspberryPi - Getting Started with Python, McGrawHill, 2<sup>nd</sup> Edition, 2015.
3. Simon Monk: Raspberry Pi Cookbook, O'Reilly, 2016.

4. [www.raspberrypi.org](http://www.raspberrypi.org)
5. <http://forefront.io/a/beginners-guide-to-arduino/>
6. <https://www.arduino.cc/en/Tutorial/HomePage>

**Course outcomes (COs):**

1. Configure and set up the Raspberry Pi board for a given application. (PO-3,6)
2. Configure and set up the Arduino board for a given application. (PO-3,6)
3. Building IoT applications using Cloud and Machine Learning. (PO-3,6,9)

## **ASP.Net with C#**

**Course code: MCAE42**

**Credits: 0:1:2**

**Prerequisites: MCA11, MCA17**

**Contact Hours: 28T 56P**

**Course Coordinator:**

### **Concepts to be covered in Tutorial**

- ASP.NET Framework and its Applications
- Working with Standard, List, Rich and Validation Controls.
- Building Data Access Components with ADO.NET
- Working with GridView, Repeater, Data list and Navigation Controls.
- Concepts of LINQ to SQL.
- Designing websites with Master pages.
- Maintaining applications states in ASP .NET

### **Exercises for Laboratory:**

- Creating ASP.NET Applications
- Demonstrate the use of Standard and list controls
- Demonstrate the use of Rich and validation controls
- Design and develop applications to connect to a Database with ADO.NET and display using GridView.
- Design and develop applications to connect to a Database with ADO.NET and display using Repeaters.
- Design and develop applications to connect to a Database with ADO.NET and display using DataList Controls.
- Design and Develop applications using Navigation controls.
- Demonstrate and Data Access with LINQ to SQL.
- Design and Develop applications to demonstrate the concepts of Master pages
- Demonstrate Applications state using cookies
- Demonstrate Applications state using sessions.

### **References:**

1. Adam Freeman: Pro ASP.Net MVC 5, 5<sup>th</sup> Edition, Apress, 2013.
2. Mathew MacDonald: ASP.NET: The Complete Reference, Tata McGraw Hill Edition, 2017.
3. Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010.
4. C# 5.0 and the .NET 4.5 Framework, 6<sup>th</sup> Edition, Wiley-Apress.

5. Bart De Smet: C# 4.0 Unleashed, Pearson Education - SAMS Series.

**Course Outcomes (COs):**

1. Develop Interactive Web Applications using various Controls.  
(PO-2, 3, 5, 6, 8, 10,11,12)
2. Demonstrate the use of ADO.NET for Web Applications.  
(PO-2, 3, 5, 6, 8, 10,11,12)
3. Acquire Skills to use technologies like master pages and LINQ to develop highly responsive web applications. (PO-2, 3, 5, 6, 8, 10,11,12)



# Introduction to Big Data Analytics using SPARK

**Course Code: MCAE43**

**Credits: 0:1:2**

**Prerequisite: Nil**

**Contact Hours: 28T 56P**

**Course Coordinator:**

## **Topics to be covered in Tutorial:**

- Introduction to Scala, History of Scala, Features Basic Syntax, Scala Comments, Variables, Data types, Operators.
- Conditional Expressions: If-else, While, do-while, for, Pattern matching, break statement.
- Scala Function: Function declaration, function definition, Function calling, Functions-Call by name, Functions with named arguments, Functions with variable arguments, Default parameter values, Nested functions, Recursion, Higher order functions, Scala Closures.
- Scala Classes and Objects: Object, Class, Singleton Object, Companion Object, access modifiers, constructors, method overloading, inheritance, method overriding, this keyword, inheritance, method overriding, field overriding, final, Scala Abstract class, Scala Trait, Apply and Unapply.
- Array and Strings: Single dimensional, Passing array into the function, Multidimensional Array, Strings, String methods, String Interpolation
- Scala Collections: Sequence, List, Set, Map, Tuples, Options, Iterators
- File Input-Output: Reading and Writing of files
- Introduction to Apache Spark: Features of Apache Spark, Apache Spark Architecture, Spark Applications, Apache Spark Components, Different Data Sources and Formats in Spark.
- Resilient Distributed Dataset (RDD): Introduction of RDD, Features of RDD in Spark, RDD operations.
- Spark RDD operations: RDD Transformation, RDD Action.
- Building and Deploying Spark Application

## **Laboratory**

- Programs supplement the tutorial concepts will be based on the latest version of Apache Hadoop, Scala and Spark

**Reference Books:**

1. Learning Spark by Matei Zaharia, Patrick Wendell, Andy Konwinski, Holden Karau, 1<sup>st</sup> Edition, O'Reilly, 2015.
2. Mastering Apache Spark by Mike Frampton, 1<sup>st</sup> Edition, Packt Publishing, 2015.
3. Alvin Alexander: Scala Cookbook, 1<sup>st</sup> Edition, O'Reilly, 2013.
4. Dean Wampler and Alex Payne: Programming Scala, 1<sup>st</sup> Edition, O'Reilly, 2009.

**Course Outcomes (COs):**

1. To implement the concepts of Scala. (PO-1,2,3,5,6)
2. To process large data sets using Spark Resilient Distributed Datasets operations. (PO-1,2,3,5,6)
3. To Build and Deploy Spark Application. (PO-1,2,3,5,6,10)

# Cloud Computing

**Course code: MCAE44**

**Credits: 0:1:2**

**Prerequisites:**

**Contact Hours:28T 56P**

**Course Coordinator:**

## **Concepts to be covered in Tutorial**

- Introduction to Cloud Computing
- Familiarity of different services provided by AWS
- Setting up of Private Cloud
- Working with Amazon EC2, and Storage S3 services
- Working with AMI.
- Resource management in cloud: Load Balancer and Auto Scaling Group
- Elastic IPs and AWS Identity and Access Management (IAM).
- Hosting Static Website and Migrating Applications to AWS
- Working with Databases in AWS.
- AWS-Eclipse Integration with Elastic Beanstalk.
- Connect RDS and Web Applications

## **Exercises for Laboratory:**

- Creating user id: Educator Account, Console Account
- Familiarize the services by AWS
- Creating EC2: Linux, Windows, Ubuntu virtual instance
- Run simple PHP, R program, C Program on Linux, Ubuntu, Windows virtual instance respectively.
- Creating Storage space and Hosting static applications with S3
- Create an AMI and using the same to launch instance.
- Demonstrate Load balancing using different instance of EC2
- Demonstrate Auto scaling Group.
- Creating RDS server and NoSql virtual server with Dynamo DB
- Demonstrate PHP and Java Database application on AWS
- Launch a web application.
- Demonstration of Identity and Access management.
- Demonstrate Elastic bean stack
- Demonstrate AWS dynamic web application.

## References:

1. Rajkumar Buyya, ChristaianVecchiola, S. ThamaraiSelvi, Master Cloud Computing, TMH Education, 2013.
2. ArshdeepBahga, Vijay Madiseti, Cloud Computing: A Hands-on Approach, Universities Press, 2014.
3. [https://aws.amazon.com/training/intro\\_series/](https://aws.amazon.com/training/intro_series/)
4. <https://www.udemy.com/>
5. <https://www.coursera.org/>
6. <https://aws.amazon.com/getting-started/>
7. <https://aws.amazon.com/>
8. <https://docs.aws.amazon.com/>
9. <https://aws.amazon.com/free/>
10. <https://blog.webspecia.com/cloud/iaas-paas-saas-explained-examples-comparison>
11. <http://aws.amazon.com/training/self-paced-labs/>
12. Instructor led AWS Training - <http://aws.amazon.com/training/>

## Course Outcomes (COs):

1. Build Private Cloud and launch instances using AWS Services.  
(PO - 1,2,3,5,7)
2. Demonstrate Database. Auto scaling, Load balancer and IAM on AWS.  
(PO - 1,2,3,5,7)
3. Develop AWS Dynamic Web Application and Migration Applications on AWS.  
(PO - 1,2,3,5,7)

# SOFTWARE TESTING

**Course code: MCAE45**

**Credits: 0:1:2**

**Prerequisites: MCA24**

**Contact Hours:28T 56P**

**Course Coordinator:**

## **Concepts to be covered in Tutorial**

- Articulate the basics of Software Testing Life Cycle using Manual Testing implementations.
- Installation of Selenium IDE, Recording and running test cases using Selenium IDE, Selenium Commands
- Installation of Selenium Webdriver in Pycharm and basics of python programming
- Finding Elements by NAME, ID, CSS, XPATH, LINKTEXT. Understanding “By” class
- Working with Web Elements; Useful Methods and Properties; Wait Types.
- Construct the complete automation framework in selenium webdriver.
- Running Complete Test suites.

## **Laboratory**

Students should demonstrate the working of manual testing, selenium IDE and should be able to test the given web page using selenium web driver and generate the necessary documents/ tables

**Project:** A team of 1 or 2 students must take up a Web Application and generate the necessary documents/tables using Manual Testing, Selenium IDE, Selenium Web Drivers and should run the complete test suite.

## **Text Books:**

1. Selenium with Python: A Beginners’ Guide, Pallavi R Sharma, BPB Publications.
2. David Burns: Selenium 2 Testing Tools: Beginner’s Guide, Packt Publishing, 2012.

## **Course Outcomes (COs):**

1. Explain the basics of the testing process and demonstrate the process of manual testing. (PO-1,2,3,4,5)
2. Demonstrate the basics of working with Selenium IDE. (PO-1,2,3,4,5)
3. Demonstrate the basics of working with Selenium Web Driver. (PO-1,2,3,4,5)

# **ELECTIVE V**

# Web Component Development with J2EE

**Course Code: MCAE51**

**Credits: 0:1:2**

**Prerequisites:**

**Contact Hours: 28T 56P**

**Course Coordinator:**

**Topics to be covered in Tutorial:**

- Introduction to J2EE
- JDBC
  - Statement objects
  - Callable statement
  - Prepared statement
- Servlets
  - Servlet Context
  - Servlet Config
  - Request Dispatcher
  - Send Redirect
  - Cookies
  - Session Tracking
  - Filter API
- Java Server Pages(JSP)
  - Components of a JSP
  - Declaratives, Directives, (Page, Include, Taglib)
  - Implicit Objects, JSTL
  - JSP Standard Actions
- Introduction to Java Beans
  - A Bean Example, JSP with Java Beans
- Introduction to Springs
  - Spring with Eclipse
  - Crating first Spring Application
- Introduction to Hibernate
  - Configuring Hibernate with Eclipse
  - Creating first model using Hibernate

## Laboratory

- Programs that supplement the tutorial concepts are to be implemented.
- Mini Project

**Reference Books:**

1. Jim Keogh: The complete Reference J2EE, 1<sup>st</sup>Edition, Tata McGraw Hill, 2002.
2. Mahesh P. Matha: JSP and Servlets, 1<sup>st</sup>Edition, PHI, 2013.
3. Sharanam Shah: Spring 3 with Hibernate 4 Project For Professionals, Shroff Publisher, 1<sup>st</sup> Edition, 2012.
4. Ranga Karanam: Mastering Spring 5.0, Paperback, 2017.
5. Kogent Learning solutions: Web Technologies Black Book, Dreamtech Press, 2012.
6. Bond, Law, Longshaw, Haywood, Roxburgh: Teach Yourself J2EE (J2EE 1.4), 2<sup>nd</sup> Edition, Pearson Education, 2005.

**Course Outcomes (COs):**

1. Develop server side components using Java servlet with the interaction of different tiers. (PO-1,2,3,5,7,11,12)
2. Apply the concepts JSP, Beans and Java frameworks for Dynamic Web Applications. (PO-1,2,3,5,7,11,12)
3. Demonstrate the concepts of framework and create Simple web-based application with the interaction of multi-tier architecture. (PO-1,2,3,5,7,11,12)



# Mobile Application Development

**Course Code: MCAE52**

**Credits: 0:1:2**

**Prerequisite: Nil**

**Contact Hours: 28T 56P**

**Course Coordinator:**

## Topics to be Covered in Tutorial:

- Introduction to android, features, Android Architecture
- Exploring linear layout and Relative layout
- Exploring widgets
- Android activity life cycle
- Intents in Android, Shared preferences
- Fragments in android
- Animations
- Databases and content providers
- Services
- Sensors and location based services
- Audio playback and image capture
- Introduction to frameworks (Cordova, Phonegap)

## Laboratory

- Programs supplement the tutorial concepts will be based on the latest version of Android.
- Mini Project

## Text Books:

1. Reto Meier: Professional Android 4 Application Development. Wiley India Edition, 2012.

## Reference Books:

1. Jerome J.F, Di Marzio: Android A Programmer's Guide, Tata McGraw-Hill, 2010.
2. B.M. Harwani: Android Programming, Pearson, 2013.
3. Jason Ostrander: Android UI Fundamentals Develop and Design, Pearson, 2014.
4. John Horton: Android Programming for Beginners, Packt publishing, 2015.

5. Nanjesh Bennur, Deepesh R, Dr. Niranjanamurthy M: Fundamentals of Mobile Application Development, 1<sup>st</sup> Edition, InSc Publishing house, 2019.
6. **Web Reference:** Any Google developer sites

**Course Outcomes (COs):**

1. Describe the Android SDK, Development Framework and Demonstrate Android Application Life Cycle. (PO-1,2,3,5)
2. Apply the Android UI and animations API for enhancing the user experience and developing advanced applications. (PO-1,2,3,5,7,10,11)
3. Handle sensors and location based services for real world Apps development. (PO-1,2,3,5,7,10,11)
4. Develop the Android Applications Using Databases and Background Services. (PO-1,2,3,5,7,10,11,12)

# **Blockchain Technology**

**Subject Code: MCAE53**

**Credits: 2:0:1**

**Prerequisite: Nil**

**Contact Hours: 28L 28P**

**Course Coordinator:**

## **UNIT I**

Introduction: Overview of Block chain, Public Ledgers, Bitcoin, Smart Contracts, Block in a Block chain, Transactions, Distributed Consensus, Public vs Private Block chain, Understanding Crypto currency to Block chain, Permissioned Model of Block chain, Overview of Security aspects of Block Chain Basic Crypto Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree.

## **UNIT II**

Bitcoin and Blockchain: Payments and double spending, Block Mining, Block propagation and block relay. Working with Consensus in Bitcoin: Distributed consensus in open environments, Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, Hashcash PoW, Bitcoin PoW, Attacks on PoW and the monopoly problem, Proof of Stake.

## **UNIT III**

Permissioned Blockchain: Permissioned model and use cases, Design issues for Permissioned blockchains, Execute contracts, State machine replication, Overview of Consensus models for permissioned blockchain- Distributed consensus in closed environment, Byzantine general problem.

## **UNIT IV**

Byzantine fault tolerant system, BFT over Asynchronous systems. Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric.

## **UNIT V**

Enterprise application of Block chain: Know Your Customer (KYC), Food Security, Identity on Blockchain, Case studies.

### **Reference Books:**

1. Melanie Swan: Block Chain: Blueprint for a New Economy, O'Reilly, 2015.

2. Josh Thompsons: Block Chain: The Block Chain for Beginners - Guide to Blockchain Technology and Leveraging Block Chain Programming, CreateSpace Independent Publishing Platform, 2017.
3. Daniel Drescher: Block Chain Basics, 1<sup>st</sup> Edition, Apress, 2017.
4. Anshul Kaushik: Block Chain and Crypto Currencies, Khanna Publishing House, Delhi, 2019.
5. Imran Bashir: Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained, Packt Publishing, 2018.
6. Ritesh Modi: Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain, Packt Publishing, 2018.
7. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna: Hands-On Block Chain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer, Packt Publishing, 2018.

**Course Outcomes (COs):**

1. Explain the fundamental concepts of Blockchain technology. (PO-1,2,3,5,9)
2. Explain the concept of crypto currencies and consensus algorithms. (PO-1,2,3,5,9)
3. Describe different types of Blockchain and smart contract. (PO-1,2,3,5,9)
4. Develop Blockchain based applications using Hyperledger Fabric. (PO-1,2,3,5,9)
5. Integrate ideas from various domains and implement them using Blockchain technology. (PO-1,2,3,5,9)

## Introduction to Microservices

**Course Code: MCAE54**

**Credits: 0:1:2**

**Prerequisite: Nil**

**Contact Hours: 28T 56P**

**Course Coordinator:**

### Topics to be covered in Tutorial:

- Overview of Microservices
- Microservice Architecture
- Preparing the Environment
- Introduction to Spring Boot for Microservices
- Getting started with Hello World Microservice
- Calling Another Service: Extend Hello World Microservice
- Building microservices with Spring Boot
- Managing transactions using sagas
- Implementing queries using API composition and CQRS
- Testing microservices
- Deploying microservices using Docker/Kubernetes

### Laboratory

- Programs supplement the tutorial concepts will be based on the latest version of Java and Spring Boot

### Reference Books:

1. Chris Richardson: Microservices Patterns with Examples in Java, 1<sup>st</sup> Edition, Manning Publications Co., 2019.
2. Moises Macero: Learn Microservices with Spring Boot: A Practical Approach to RESTful Services using RabbitMQ, Eureka, Ribbon, Zuul and Cucumber, 1<sup>st</sup> Edition, APress, 2017.
3. Sourabh Sharma: Mastering Microservices with Java 9, 2<sup>nd</sup> Edition, Packt Publishing Ltd., 2017.

### Course Outcomes (COs):

1. Architect an application as a set of microservices. (PO-1,2,3,5,6)
2. Implement queries that span microservices. (PO-1,2,3,5,6)
3. Build microservices and deploy them along with an API Gateway using Docker/Kubernetes. (PO-1,2,3,5,6,10)

# Virtual Reality and Augmented Reality

**Course code: MCAE55**

**Credits: 2:0:1**

**Prerequisites:**

**Contact Hours:28L 28P**

**Course Coordinator:**

## UNIT I

**Introduction:** The Three I's of Virtual Reality, A Short History of Early Virtual Reality, Early Commercial VR Technology, VR Becomes an Industry, The Five Classic Components of a VR System.

**Input Devices: Trackers, Navigation, and Gesture Interfaces:** Three-Dimensional Position Trackers-Tracker Performance Parameters, Mechanical Trackers, Magnetic Trackers, Ultrasonic Trackers, Optical Trackers, Hybrid Inertial Trackers, Navigation and Manipulation Interfaces- Tracker-Based Navigation/Manipulation Interfaces, Trackballs, Three-Dimensional Probes, Gesture Interfaces-The Pinch Glove, The 5DT Data Glove, The Didjiglove, The CyberGlove.

## UNIT II

**Output Devices: Graphics, Three-Dimensional Sound, and Haptic Displays** Graphic Displays-The Human Visual System, Personal Graphics Displays, Large-Volume Displays. Sound Displays- The Human Auditory System, The Convolvotron, Speaker-Based Three-Dimensional Sound. Haptic Feedback - The Human Haptic System, Tactile Feedback Interfaces, Force Feedback Interfaces.

### **Computing Architectures For VR**

The Rendering Pipeline - The Graphics Rendering Pipeline, The Haptics Rendering Pipeline. PC Graphics Architecture - PC Graphics Accelerators, Graphics Benchmarks. Workstation-Based Architectures-The Sun Blade 1000 Architecture, The SGI Infinite Reality Architecture. Distributed VR Architectures- Multipipeline Synchronization, Colocated Rendering Pipelines, Distributed Virtual Environments.

## UNIT III

### **Human Factors in VR**

Methodology and Terminology -Data Collection and Analysis, Usability Engineering Methodology. VR Health and Safety Issues- Direct Effects of VR Simulations on Users, Cybersickness, Adaptation and Aftereffects, Guidelines for Proper VR Usage. VR and Society- Impact on Professional Life, Impact on Private Life, Impact on Public Life.

### **Traditional VR Applications**

Medical Applications of VR - Virtual Anatomy, Triage and Diagnostic, Surgery, Rehabilitation. Education, Arts, and Entertainment - VR in Education VR and the Arts,

Entertainment Applications of VR. Military VR Applications - Army Use of VR, VR Applications in the Navy, Air Force Use of VR

#### UNIT IV

##### **Introduction to Augmented Reality**

Definition and Scope, A Brief History of Augmented Reality, Examples- Industry and Construction, Maintenance and Training, Medical, Personal Information Display, Navigation Television, Advertising and Commerce, Games. Related Fields - Mixed Reality Continuum, Virtual Reality, Ubiquitous Computing.

##### **Displays**

Multimodal Displays- Audio Displays, Haptic, Tactile, and Tangible Displays, Olfactory and Gustatory Displays. Visual Perception. Requirements and Characteristics- Method of Augmentation, Ocularity and Stereoscopy, Focus, Occlusion, Resolution and Refresh Rate, Field of View, Viewpoint Offset, Brightness and Contrast, Distortions and Aberrations, Latency, Ergonomics, Social Acceptance. Spatial Display Model. Visual Displays- Near-Eye Displays, Handheld Displays, Stationary Displays, Projected Displays.

#### UNIT V

##### **Computer Vision for Augmented Reality**

Marker Tracking- Camera Representation, Marker Detection, Pose Estimation from Homography, Pose Refinement. Multiple-Camera Infrared Tracking - Blob Detection, Establishing Point Correspondences, Triangulation from Two Cameras, Triangulation from More Than Two Cameras, Matching Targets Consisting of Spherical Markers, Absolute Orientation.

##### **Interaction**

Output Modalities-Augmentation Placement, Agile Displays, Magic Lenses. Input Modalities- Tracking and Manipulation of Rigid Objects, Body Tracking, Gestures, Touch, Physically Based Interfaces. Tangible Interfaces - Tangibles on Surfaces, Tangibles with Generic Shape, Tangibles with Distinct Shapes, Transparent Tangibles. **Navigation:** Foundations of Human Navigation, Exploration and Discovery, Route Visualization. Viewpoint Guidance- Guidance Toward a Target Object, Guidance Toward a Target Viewpoint.

##### **Laboratory**

Students shall implement the components which supplement the theory concepts

**Text Books:**

1. Grigore C. Burdea, Philippe Coiffet- Virtual Reality Technology, 2nd Edition Wiley 2014.  
Chapters:1, 2, 3,4, 7, 8
2. Dieter Schmalstieg, Tobias Höllerer - Augmented Reality: Principles and Practice- Indian Edition Pearson 2017.  
Chapters:1, 2, 4, 8, 11

**Course Outcomes (COs):**

1. Describe the Virtual Reality and its Navigation, and Gesture Interfaces.  
(PO-1,2,3,9)
2. Illustrate VR Output Devices AND Computing Architectures for VR.  
(PO-2,3,4,5)
3. Demonstrate Human Factors in VR and Traditional VR Applications.  
(PO-2,3,4,5,9)
4. Demonstrate Augmented Reality and illustrate the Augmented Reality Displays.  
(PO-2,3,4,5,9)
5. Describe the Computer Vision and Interaction of Augmented Reality.  
(PO-2,3,4,5,9)



## **ELECTIVE VI**

## **Storage Area Networks**

**Course Code: MCAE61**

**Prerequisite: MCA23**

**Course Coordinator:**

**Credits: 3:0:0**

**Contact Hours: 42L**

### **UNIT I**

#### **Concepts of Storage Networking**

The Data Storage and Data Access Problem, The Battle for Size and Access

Decoupling the Storage Component: Putting Storage on the Network, Decoupling the Storage Component: Creating a Network for Storage

### **UNIT II**

#### **Storage Fundamentals**

Storage Architectures, Device Overviews, Connectivity Options, Data Organizational Methods

### **UNIT III**

#### **Network Attached Storage**

Putting Storage on the Network, NAS Hardware Devices, NAS Software Components, NAS Connectivity Options

### **UNIT IV**

#### **Storage Area Networks**

Architecture Overview, Hardware Devices, Software Components, Configuration Options for SANs.

### **UNIT V**

#### **Application**

Defining the I/O Workload, Applying the SAN Solution, Applying the NAS Solution Considerations When Integrating SAN and NAS

#### **Management**

Planning Business Continuity, Managing Availability, Maintaining Serviceability, Capacity Planning and Security Considerations

#### **Case Studies**

NAS Case Study, SAN Case Study, SAN/NAS Management Case Study

#### **Text Books:**

1. Robert Spalding: The Complete Reference - Storage Networks, McGraw Hill Education (India), 2003.

**Reference Books:**

1. Information Storage and Management: 2<sup>nd</sup> Edition, EMC Education Services, Wiley, 2012.
2. Storage Area Networks Essentials: A complete guide to understanding and Implementing SANs, Richard Barker, Paul Massiglia, Wiley, 2008.

**Course Outcomes (COs):**

1. Describe the fundamentals of storage and storage networking concepts. (PO-1,2,3)
2. Discuss the architecture of SAN. (PO-1,2,3)
3. Analyze Network Attached and Storage Area Networks Requirements. (PO-1,2,3)
4. Describe the components of SAN. (PO-1,2,3)
5. Manage applications on SAN. (PO-1,2,3)

## Soft Skills and Personality Development

**Course Code: MCAE62**

**Credits: 2:1:0**

**Prerequisite: Nil**

**Contact Hours: 28L 28T**

**Course Coordinator:**

### UNIT I

**Introduction to Personality Development:** The concept of personality - Dimensions of personality – Theories of Freud & Erickson-Significance of personality development. The concept of success and failure: What is success? - Hurdles in achieving success - Overcoming hurdles - Factors responsible for success – What is failure - Causes of failure. SWOT analysis.

### UNIT II

**Attitude & Motivation:** Attitude - Concept - Significance - Factors affecting attitudes - Positive attitude – Advantages Ways to develop positive attitude -Concept of motivation - Significance – Internal and external motives - Importance of self-motivation- Factors leading to de-motivation

**Self-esteem:** Term self-esteem - Symptoms - Advantages - Do's and Don'ts to develop positive self-esteem Character building -Team-work – Time management

### UNIT III

**Employability Quotient:** Resume building- The art of participating in Group Discussion – Facing the Personal (HR & Technical) Interview -Frequently Asked Questions - Psychometric Analysis - Mock Interview Sessions.

**Introduction to the Soft Skill Development.** Soft skills vs. hard skills. Broad range of soft skills, focus on communication and interacting skills.

### UNIT IV

**Role of self-awareness.** Strengths and weaknesses of our personality, behaviour, thinking, and style of interacting with others: what works and what doesn't.

**Communication / Interaction Skills and Interpersonal Effectiveness:** Asking questions. Handling responses to questions and responding. Giving feedback. Receiving feedback

**Influencing Skills:** Understanding power and influence. Influence strategies and tactics. Sources of power. Influencing different types. Resisting influencing.

## UNIT V

**Building Collaboration.** Principles of collaboration. Collaboration and influences.

**Stimulating Creative Thinking in Communications.** Stimulating creativity. Brainstorming interventions. Facilitating problem solving. Building consensus. Techniques for narrowing options. Technics for exploring disagreement. Handling disruptive behaviour. Testing for consensus.

### **Textbook:**

1. Hurlock, E.B: Personality Development, 28<sup>th</sup> Reprint, Tata McGraw Hill, 2006.
2. Bacon, T: Interpersonal and interactive Skills, Lore Institute, 1996.

### **Course Outcomes (COs):**

1. Identify the various dimensions of personality and the factors that affect both success and failures (PO-5,8)
2. Discuss the importance and the methodology to have a positive attitude and proper self – esteem. Identify how to be self-motivated and to motivate others. (PO-5,7,8)
3. Describe the factors affecting employability Quotient and identify the basics of soft skills. (PO-5,7,8,11)
4. Illustrate the communication / interaction skills and interpersonal effectiveness. Illustrate the skills of influencing others and skills of working in a team. (PO-5,7,11)
5. Apply and understand the skills needed to stimulating Creative Thinking in Communications. (PO-8,11)

# Agile Software Development and DevOps

**Course Code: MCAE63**

**Credits: 2:0:1**

**Prerequisite: MCA24**

**Contact Hours: 28L 28P**

**Course Coordinator:**

## UNIT I

Overview of Agile Software Development: Lean Software Development, Project Management, Agile Manifesto, Scrum, Test Driven Development, Extreme Programming, Rational Unified Process- Best Practices, The Phases, The Process, Agile Model Driven Development.

## UNIT II

**Introduction to DevOps:** What is DevOps, Why is DevOps is Needed ,How is DevOps different from traditional IT , Agile vs DevOps, DevOps Lifecycle, stages and tools, Work Flow and Principles. Roles, Responsibilities and Skills of a DevOps Engineer.

## UNIT III

**Source Control Management with Git:** Introduction to version Control system, difference between SVN and Git, overview of Git, GitHub, Git Life Cycle, Git Installation, Environment Setup, Common Git Commands: Local Commands: init, status, add, commit, and clone, Remote Commands: remote, push, and pull, Branching, merging, Rebasing, merging and rebasing conflicts, git workflows.

## UNIT IV

**Continuous Integration with Jenkins:** Introduction to Jenkins, Jenkins Master–Slave Installation on AWS, Installing Jenkins Plugins, Creating Jenkins Builds, Creating Scheduled Builds, Understanding CI/CD Pipelines, Creating an end to end automated CI/CD Pipeline.

## UNIT V

**Containerization with Docker:** Introduction to Docker, Docker Architecture, container, Containerization vs Virtualization, Containerization vs Virtualization, Installing Docker, Running a Container, Pulling an Image from the Docker Registry, Running an Image, Stopping and Starting Containers, Tagging an Image, Pushing an Image to the Repository, Docker Commands.

## References:

1. Gene Kim, Jez Humble, Patrick Debois, John Willis, John Allspaw - The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations, Publisher: IT Revolution Press, 2016.

2. Len Bass, Ingo Weber, Liming Zhu - DevOps: A Software Architect's Perspective Publisher(s): Addison-Wesley Professional 2015
3. Jennifer Davis, Ryn Daniels - Effective DevOps, Publisher(s): O'Reilly Media, Inc. 2016.
4. Thomas Stober, Uwe Hansmann- Agile Software Development: Best Practices for Large Software Development Projects, Publisher: Springer; 2009
5. E-Resources

**Course Outcomes (COs):**

1. Understand the progress and process of Agile Software development. (PO-1,4,3)
2. Exemplify the usage of DevOps and its life cycle. (PO-3, 6)
3. Demonstrate the basic commands and Source Control Management using Git (PO-3, 5, 6)
4. Understand and Implement the CI/CD Pipelines using Jenkins. (PO-3, 5, 6, 9)
5. Demonstrate the Containerization with Docker. (PO-3, 5, 6, 9)

# **System Modeling and Simulation**

**Course Code: MCAE64**

**Credits: 2:0:1**

**Prerequisite: NIL**

**Contact Hours: 28L 28P**

**Course Coordinator:**

## **UNIT I**

### **Introduction to Simulation**

When simulation is the appropriate tool and when it is not appropriate, Advantages and disadvantages of Simulation, Areas of application, Systems and system environment, Components of a system, Discrete and continuous systems, Model of a system, Types of Models, Discrete-Event System Simulation, Steps in a Simulation Study

## **UNIT II**

### **Queueing Models**

Characteristics of queueing systems, Queueing notation, Simulation of queueing systems

### **Statistical Models in Simulation**

Review of terminology and concepts, Useful statistical models, Discrete distributions, Continuous distributions, Poisson process, Empirical distributions

## **UNIT III**

### **Random-Number Generation**

Properties of random numbers, Generation of pseudo-random numbers, Techniques for generating random numbers, Tests for Random Numbers

### **Random-Variate Generation**

Inverse transform technique

## **UNIT IV**

### **Input Modeling**

Data Collection, Identifying the distribution with data, Parameter estimation, Goodness of Fit Tests, fitting a non-stationary Poisson process, Selecting input models without data

### **Output Analysis for a Single Model**

Types of simulations with respect to output analysis, Stochastic nature of output data, Measures of performance and their estimation.



## UNIT V

### Verification and Validation of Simulation Models, Optimization

Model building, verification and validation, Verification of simulation models, Calibration and validation of models

#### Laboratory

- Programs that supplement the Theory concepts are to be implemented.
- Mini Project

#### Text Book:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 4<sup>th</sup> Edition, Pearson Education / PHI, 2007.  
Chapters 1, 2, 3, 5, 6.1, 6.2, 7, 8, 9, 10,

#### Reference Books:

1. Lawrence M. Leemis, Stephen K. Park: Discrete – Event Simulation: A First Course, Pearson / Prentice-Hall, 2006.
2. Averill M. Law: Simulation Modeling and Analysis, 4<sup>th</sup> Edition, Tata McGraw-Hill, 2007.

#### Course outcomes (COs):

1. Describe the role of important elements of simulation and modeling paradigm. (PO-1, 2, 3, 4,5,9,10)
2. Conceptualize real world situations using queuing and statistical models. (PO-1, 2, 3, 4,5,9,10)
3. Generate and test random numbers and random variates using different techniques. (PO-1, 2, 3, 4,5,9,10)
4. Analysis of Simulation models using input analyzer, and output analyzer (PO-1, 2, 3, 4,5,9,10)
5. Describe Verification and Validation of simulation model. (PO-1, 2, 3, 4,5,9,10)

# Deep Learning

**Course Code: MCAE65**

**Credits: 2:0:1**

**Prerequisite:**

**Contact Hours: 28L 28P**

**Course Coordinator:**

## UNIT I

### Introduction to Deep Learning

Foundations on Deep Learning, Linear Models and Stochastic optimization methods.

## UNIT II

### Neural Networks

Training of Neural Networks. Feed forward Neural networks, Gradient descent and the back propagation algorithm, Unit saturation

## UNIT III

### Convolution Neural Network Models

Architectures, convolution / pooling layers

## UNIT IV

### Recurrent Neural Networks

Long Short-Term Memory Networks (LSTM), Gated Recurrent Unit (GRU)

## UNIT V

### Additional Deep Learning Models

Auto encoders, Recursive Neural Tensor Nets, Deep Learning Use Cases

### Text Books:

1. Bengio, Yoshua, Ian J. Goodfellow, and Aaron Courville. "Deep learning." An MIT Press book. (2015)..
2. Josh Patterson, Adam Gibson, Deep Learning: A Practitioner's Approach, O'Reilly, 2017.

### Course Outcomes (COs):

1. Describe Deep Learning and its Architecture. (PO-1,2,5)
2. Learn and Build Neural Networks. (PO-1,2,3,4,5,9)
3. Build and Use Convolutional Networks to classify images. (PO-1,2,3,4,5,9)
4. Build Recurrent Networks and use them to generate new text. (PO-1,2,3,4,5,9)
5. Understand various Deep Learning Models. (PO-1,2,5)

## **IV SEMESTER**

## PROJECT WORK

Course Code: MCA41

Credits: 20

### DISSERTATION WORK GUIDELINES

- The topic and title of the dissertation shall be chosen by the candidate in consultation with the guide and co-guide. However, modification of the title is permitted at the time of submission of dissertation report. The subject and topic of dissertation shall be from the major field of studies of the candidate.
- The dissertation work shall be carried out by each candidate independently under the guidance of one of the faculty members of the Department.
- If dissertation has to be carried out in any industry/factory/organization, outside the campus, the permission to that effect and the name of co-guide at any of these organizations shall be intimated to the Head of the Department.
- At the end of the semester each candidate shall submit a report of the dissertation work duly approved by the guide. The dissertation work shall be countersigned by the co-guide (if any) and Head of the Department.
- The candidate shall submit Two copies of the dissertation work to the Head of the Department. Duration of the dissertation work shall be 5 months. A separate calendar of events for submission of dissertation and viva-voce shall be fixed and will be notified by the Chairman of Board of Exam (BoE). The candidates who fail to submit the dissertation work within the stipulated time have to submit the same at the time of next ensuing examination.
- The dissertation shall be evaluated by two examiners-one internal and one external, appointed by the Chairman of BoE. The evaluation of the dissertation shall be made independently by each examiner. During the evaluation of the dissertation if anyone of the examiner/both/feels that the candidate is not getting the minimum marks for passing, he/they shall notify to the Chairman of BoE stating specific reasons for rejection and suggestions for resubmission. The viva-voce examination of such candidates shall not be conducted. The resubmitted dissertation may preferably send to the same examiners for the re-examination.

- The candidate may also choose another topic of dissertation under a new guide, if necessary. In such case dissertation may be submitted within 6 years from the date of admission to the course. A different set of examiners shall be constituted for evaluation of dissertation under such circumstances by the Chairman of BoE.
- A copy of the dissertation shall be sent to both the examiners by the Chairman of BoE.
- Both the examiners shall evaluate the dissertation normally within a period of not more than 3 weeks from the date of receipt of the dissertation. The external examiner shall be contacted by the head of the department to arrive at a convenient date for the conduct of viva-voce of the batch students allotted to the external examiner.
- The relative weightage for the evaluation of dissertation and the performance of the viva-voce shall be as per the scheme.
- Both the examiners shall evaluate the dissertation independently and marks shall be awarded jointly at the time of viva-voce examination.
- The viva-voce examination will be conducted jointly by the internal and external examiners and marks shall be awarded jointly. The marks shall be sent to the Controller of Examinations immediately after examination.
- Student has to publish a research paper in indexed journal / conference.

**Note:** All the above guidelines are subjected to the approval by the Chairman of Board of Studies, from time to time.

## **Industry Internship**

**Course Code: MCAIN**

**Credits: 0:0:2**

- Internship of 4-weeks followed by a report
  - Students have to undergo the Internship in any Institute of National repute or any reputed/well-known industry
  - They are expected to submit a report and give a presentation