



RAMAIAH
Institute of Technology

CURRICULUM

For the Batch 2021 - 2023

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 17 UG programs and 15 PG programs. All these programs are approved by AICTE. All eligible UG and PG programs are accredited by National Board of Accreditation (NBA). The institute is accredited with ‘A⁺’ **grade by NAAC in March 2021** for 5 years. University Grants Commission (UGC) & Visvesvaraya Technological University (VTU) have conferred Autonomous Status to MSRIT for both UG and PG Programs since 2007. 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 for 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, Centre for Antennas and Radio Frequency systems (CARFS), Center for Cyber Physical Systems & 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 Entrepreneurship Development Cell (EDC) and Section 8 company “Ramaiah Evolute” have been set up on campus to incubate startups. **M S Ramaiah Institute of Technology secured All India Rank 8th for the year 2020 for Atal Ranking of Institutions on Innovation Achievements (ARIIA), by MoE, 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. The institute 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 (NIRF), MoE, Government of India, M S Ramaiah Institute of Technology has achieved 65th rank among 1143 top Engineering institutions of India for the year 2021 and is 1st amongst the Engineering colleges affiliated to VTU, 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 the 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)	Co- curricular Activities	Total credits in a Semester
				Core (Hard core, Soft core, Lab) (PC-C)	Electives (PC-E)				
First	4		2	18					24
Second				16	9				25
Third		3		15	6	1			25
Fourth						22	2	2	26
Total	4	3	2	49	15	23	2	2	100

SCHEME FOR 2021-2023 BATCH

I SEMESTER

S. No	Course Code	Course Name	Credits*			
			L	T	P	Total
1.	MCA11	Programming with Python	3	0	1	4
2.	MCA12	Computational Mathematics	3	1	0	4
3.	MCA13	Computer Organization	3	0	0	3
4.	MCA14	Operating System and Unix	3	0	1	4
5.	MCA15	Data Structures	3	0	1	4
6.	MCA16	Professional Communication and Ethics	1	1	0	2
7.	MCA17 [#]	Web Programming	0	1	2	3
8.	MCABC ^{##}	Bridge Course	0	0	0	0
Total			16	3	5	24

II SEMESTER

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCA21	Programming in Java		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	Machine Learning	MCA11 MCA12	3	0	1	4
5.	MCAE1-	Elective I					3
6.	MCAE2-	Elective II					3
7.	MCAE3-	Elective III					3
Total							25

III SEMESTER

S. No	Course Code	Course Name	Pre-requisite Courses	Credits*			
				L	T	P	Total
1.	MCA31	Software Engineering and Agile Methodologies		3	1	0	4
2.	MCA32	Computer Networks		3	0	1	4
3.	MCA33	Information Security		3	0	1	4
4.	MCA34	Big Data Analytics	MCA23	0	1	2	3
5.	MCAE4-	Elective IV					3
6.	MCAE5-	Elective V					3
7.	MCAE6-	Elective VI					3
8.	MCAP1	Mini Project					1
9.	MCASA	Societal Activity					0
Total							25

IV SEMESTER

S. No	Course Code	Course Name	Credits*			
			L	T	P	Total
1.	MCA41	Project Work				20
2.	MCAS1	Seminar				2
3.	MCAIN	Industry Internship				2
4.	MCACCA	Co-curricular Activities				2
Total						26

ELECTIVE I

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE11 [#]	MEAN Stack Development	MCA17	0	1	2	3
2.	MCAE12 [#]	ASP.Net with C#	MCA17	0	1	2	3
3.	MCAE13 [#]	User Interface and User Experience Design	MCA17	0	1	2	3
4.	MCAE14 [#]	Computer Graphics and Animation		0	1	2	3
5.	MCAE15	System Modeling and Simulation	MCA12	2	0	1	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	MCA14	2	0	1	3
3.	MCAE23	Operations Research		2	1	0	3
4.	MCAE24	Social Network Analysis		2	0	1	3
5.	MCAE25	Virtual and Augmented Reality		2	0	1	3

ELECTIVE III

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE31 [#]	Programming IoT	MCA11	0	1	2	3
2.	MCAE32 [#]	Introduction to Microservices		0	1	2	3
3.	MCAE33 [#]	Go Programming		0	1	2	3
4.	MCAE34 [#]	Web Programming with PHP and AJAX	MCA17	0	1	2	3
5.	MCAE35	Secure Coding in C and C++		2	0	1	3

ELECTIVE IV

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE41	Ethical Hacking and Penetration Testing		2	0	1	3
2.	MCAE42	Digital Marketing		3	0	0	3
3.	MCAE43	Bioinformatics		2	0	1	3
4.	MCAE44 [#]	Cloud Computing	MCA14	0	1	2	3
5.	MCAE45	Blockchain Technology		2	0	1	3

ELECTIVE V

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE51 [#]	Web Component Development with J2EE	MCA21	0	1	2	3
2.	MCAE52 [#]	Mobile Application Development	MCA21	0	1	2	3
3.	MCAE53	Deep Learning	MCA24	2	0	1	3
4.	MCAE54 [#]	DevOps		0	1	2	3
5.	MCAE55	Software Testing	MCA11	0	1	2	3

ELECTIVE VI

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits*			
				L	T	P	Total
1.	MCAE61	Software Project Management		3	0	0	3
2.	MCAE62	Management and Entrepreneurship		3	0	0	3
3.	MCAE63	Design Thinking		3	0	0	3
4.	MCAE64	Enterprise Resource Planning		3	0	0	3
5.	MCAE65	Management Information Systems		3	0	0	3
6.	MCAE66	Soft Skills and Personality Development		3	0	0	3

Semester End Examination will be conducted for Laboratory

Audit Course. Only for Non-BCA students

*** L: Lecture**

T: Tutorial

P: Practical

I SEMESTER

Programming with Python

Course Code: MCA11

Prerequisites: Nil

Course Coordinator:

Credits: 3:0:1

Contact Hours: 42L 28P

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, 4th Edition, 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)

Computational Mathematics

Course Code: MCA12

Credits: 3:1:0

Prerequisite: Nil

Contact Hours: 42L 28T

Course Coordinator:

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

Descriptive Statistics

Measures of Central Tendency, Measures of Dispersion, Moments, Skewness and Kurtosis

UNIT V

Distributions and Test of Significance

Theoretical Distributions Overview-Uniform, Binomial, Poisson, Normal; Theory of Test of Significance, Large Sample Tests, Small Sample Tests

Text Books:

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

2. N G Das: Statistical Methods, McGraw Hill Education (India) Private Limited, 2009. (5.1,5.2,5.11,5.12,5.14,5.15,5.17 to 5.19, 6.1 to 6.5, 6.7, 7.1,7.3,7.7,7.8, 12.1,12.2,12.4 to 12.6,12.11 to 12.13, 14,6 to 14.8)

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-1,2)
4. Examine the data characteristics. (PO-1,2,4)
5. Analyze various data distributions using hypothesis testing.

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, 5th 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 Unix

Course Code: MCA14

Credits: 3:0:1

Pre requisite: Nil

Contact Hours: 42L 28P

Course Coordinator:

UNIT I

Introduction to Operating Systems, System Structure

What operating systems do, Operating System Operations, Computing Environments, Operating System Services, System Calls, Types of System Calls, System Programs, Operating System Structure, System Boot

UNIT II

Process Concept

Process Concept, Process Scheduling, Interprocess Communication

Process Scheduling

Basic Concepts, Scheduling Criteria, Scheduling Algorithms

Synchronization

Background, The Critical Section Problem, Mutex Locks, Semaphores, Classic Problems of Synchronization: Readers-Writers Problem, 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 Strategies

Basic Hardware, Swapping, Contiguous Memory Allocation, Segmentation, Paging,

Virtual Memory Management

Background, Demand Paging, Page Replacement

UNIT V

File System

File concept, Access methods, Directory overview

Implementing File System

Allocation methods, Free Space Management

Mass Storage Structures

Overview of Mass Storage Structure, Disk Scheduling, Disk Management, Swap Space Management

Laboratory

Unix Laboratory covering the following topics:

- 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, 9th Edition, Wiley – India, 2018.
Chapters: 1.1, 1.5, 1.11, 2.1, 2.3, 2.4, 2.5, 2.10, 3.1, 3.2, 3.4, 5.1, 5.2, 5.3, 6.1, 6.2, 6.5, 6.6.1, 6.6.2, 6.6.3, 6.7.2, 6.7.3, 7, 8.1.1, 8.2, 8.3, 8.4, 8.5.1, 8.5.2, 9.1, 9.2.1, 9.4.1, 9.4.2, 9.4.3, 9.4.4, 10.1.1, 10.1.2, 10.1.3, 10.2, 10.3.2, 11.4.1, 11.4.2, 11.4.3, 11.5, 12.1, 12.4, 12.5, 12.6
2. Sumitabha Das: UNIX Concepts and Applications, 4th Edition, Tata McGraw Hill, 2017.

Reference Books:

1. D M Dhamdhare: Operating Systems – A Concept Based Approach, 3rd Edition, Tata McGraw – Hill, 2017.
2. Harvey M Deital: Operating Systems, 3rd Edition, Addison Wesley, 1990.

Course outcomes (COs):

1. Explain the elements and various functionalities of the operating system using different utilities in Unix (PO - 1,2,3,5,9)
2. Apply the techniques of process management and demonstrate process synchronization (PO - 1,2,3,5,9)
3. Demonstrate deadlock handling and process control. (PO – 1,2,3,5,9)
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 - 1,2,3,5,9)

Data Structures

Course Code: MCA15

Credits: 3:0:1

Prerequisite:

Contact Hours: 42L 28P

Course Coordinator:

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. Richard F Gilberg and Behrouz A Forouzan: Data Structures - A Pseudocode Approach with C, Cengage Learning, 6th Indian Reprint, 2009.
2. Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenenbaum: Data Structures using C and C++ by, 2nd Edition, Pearson Education Asia, 2004.

Reference Books:

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

Course Outcomes (COs):

1. Apply the concepts of recursion and stack. (PO-1,2,3,5,9)
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: 1:1:0

Prerequisite: Nil

Contact Hours: 14L 28T

Course Coordinator:

UNIT I

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

UNIT II

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

Email: Introduction, Letter Writing, Email

Research Papers: Research Papers

UNIT III

Interviews: Introduction, Objectives of Interviews, Types of Interviews

Resumes: Resume, biodata and curriculum vitae, Resume Design

UNIT IV

An Overview of Ethics: What Is Ethics? Ethics in the Business World

Intellectual Property: What Is Intellectual Property? Copyrights, Patents, Trade Secrets, Key Intellectual Property Issues

UNIT V

Ethics of IT Organizations: Key Ethical Issues for Organizations, Contingent Workers, Outsourcing, Whistle-Blowing

Text Books:

1. Meenakshi Raman and Sangeeta Sharma: Technical Communication-Principles and Practices, 3rd Edition, Oxford University Press, 2015.
2. George Reynolds: Ethics in Information Technology, 5th Edition, Cengage, 2015.

Course Outcomes (COs):

1. Demonstrate the skills of presentation. (PO-6,9,11)
2. Demonstrate the skills of email writing, research paper and group discussion etiquettes. (PO-6,9,11)

3. Demonstrate the skills of writing resumes and attending interview. (PO-6,9,11)
4. 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)
5. Demonstrate the ethics of IT organizations etiquettes. (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 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
- New Features in ES6, Introduction to JSON
- Introduction to Bootstrap
- Developing web pages using Bootstrap

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, 4th 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-1,2,3,5)
2. Develop interactive web pages using JavaScript. (PO-1,2,3,5)
3. Develop web pages using Bootstrap framework. (PO-1,2,3,5,7,9,12)

Bridge Course

Course Code: MCABC

Prerequisite: Nil

Course Coordinator:

Credits: 0:0:0

Contact Hours: 42L

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.

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.

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.

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, 6th Edition, Tata McGraw Hill, 2010.
2. Herbert Schildt: The Complete Reference C++, 4th Edition, Tata McGraw Hill, 2003.
3. E Balagurusamy: Object Oriented Programming with C++, 6th 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, 4th Edition, Tata McGraw Hill, 2000.
3. Stanley B.Lippmann, JoseeLajore: C++ Primer, 4th 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. Determine 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).

II SEMESTER

Programming in Java

Course Code: MCA21

Prerequisite: Nil

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, 9th 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, 9th Edition, PHI, 2012.
2. Y.Daniel Liang: Introduction to JAVA Programming, 6th Edition, Pearson Education, 2006
3. Cay S Horstmann, Gary Cornell: Core Java 2 volume 1 and volume 2, 7th Edition, Pearson Education, 2005.

Course Outcomes (COs):

1. Develop programs using the OOP concepts and basic constructs in Java for a given problem. (PO-1,2,3,5,12)
2. Exemplify the usage of Packages, Interfaces and Exceptions for OO Programming. (PO-1,2,3,5,12)
3. Apply Generics, Multithreading, Enumerations, and Auto boxing Concepts to develop robust programs. (PO-1,2,3,5,12)
4. Implement the concepts of Networking, and analyze the usage of collection framework and lambda expression. (PO-1,2,3,5,12)
5. Develop User Interfaces using JavaFX with Event Handling for Dynamic Applications. (PO-1,2,3,5,12)

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, 2nd Edition, Universities Press, 2007.
2. Thomas H. Cormen, Charles E. Leiserson, Ronal L. Rivest, Clifford Stein: Introduction to Algorithms, 3rd 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

Credits: 3:0:1

Prerequisite: Nil

Contact Hours: 42L 28P

Course Coordinator:

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, 6th 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, 3rd 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, 6th Edition, Mc-Graw Hill, 2011.
2. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3rd Edition, McGraw-Hill, 2003.
3. C.J. Date, A. Kannan, S. Swamynatham: An Introduction to Database Systems, 8th 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-1,2,3,4,5,7,9,11)
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-1,3)
5. Perform mongodb crude operations and aggregation. (PO- 1,2,3,5,7,9,11,12)

Machine Learning

Course Code: MCA24

Prerequisite: MCA11, MCA12

Course Coordinator:

Credits: 3:0:1

Contact Hours: 42L 28P

UNIT I

Artificial Intelligence: Overview of AI Techniques, Representing Knowledge as Rules, Problem Solving using State Space Search, Procedural vs Declarative Knowledge, Forward vs Backward Reasoning.

UNIT II

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, Correlation.

UNIT III

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

Classification: Bayes Theorem, Naïve Bayes classifier.

UNIT IV

Classification: Decision Tree, Building a Decision tree, Information gain of Decision tree, Support Vector Machines. Linear SVM.

UNIT V

Clustering: Partitioning Method – K-means, Hierarchical Method - Agglomerative clustering

Neural Networks: Working of a Perceptron Model, Multilayer Network.

Laboratory

Implementation of techniques for AI and ML.

Text Books:

1. Rich and Knight: Artificial Intelligence, Mc Graw Hill, 2nd Edition 1991.
2. Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das: Machine Learning, 2019.
3. Pang-Ning Tan, Micheal Steinbach and Vipin Kumar: Introduction to Data Mining, second Edition, Pearson Education 2006.

Reference Books:

1. Anuradha Srinivasaraghavan, Vinc y Joseph: Machine Learning, Wiley, 2019.
2. Tom Mitchell, Machine Learning: 1st Edition, McGraw- Hill, 1997.
3. Ethem Alpaydin: Introduction to Machine Learning, 2nd Edition, The MIT Press Cambridge, Massachusetts London, England, 2010.

Course Outcomes (COs):

1. Explain basic concepts of Artificial Intelligence. (PO-1,2,4)
2. Distinguish between types of learning and prepare the data for analysis. (PO-1,2,4,6,9)
3. Develop Regression and Classification Models for any given problem. (PO-1,3,4,6,9)
4. Classify the data using popular Decision Tree and SVM techniques. (PO-1,3,4,6,9)
5. Group the data into clusters and design neural networks Models. (PO-1,3,4,6,9)

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 / Web References:

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)

ASP.Net with C#

Course code: MCAE12

Prerequisites: MCA17

Course Coordinator:

Credits: 0:1:2

Contact Hours:28T 56P

Concepts to be covered in Tutorial

- Introduction to C#, Classes.
- Concepts of ASP.NET Framework, and 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 an application to connect to a Database with ADO.NET and display using GridView.
- Design and develop an application to connect to a Database with ADO.NET and display using Repeaters.
- Design and develop an application to connect to a Database with ADO.NET and display using DataList Controls.
- Design and Develop an Application using Navigation controls.
- Demonstrate and Data Access with LINQ to SQL.
- Design and Develop an application to demonstrate the concepts of Master pages
- Demonstrate Applications state using cookies
- Demonstrate Applications state using sessions.

References:

1. Herbert Schildt: Complete Reference C# 4.0, Tata McGraw Hill, 2010.
2. .NET 4.5 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley- Dream Tech Press.
3. Paul Deitel and Harvey Deitel: C# 2010 for Programmers, 4th Edition, Pearson Education.

4. Andrew Troelsen: Pro C# 5.0 and the .NET 4.5 Framework, 6th Edition, 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)

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, Microsoft Visio, Paint.NET etc.

CASE Tools: Introduction to Adobe Photoshop, Adobe Image Ready, Paint.NET, 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, 5th 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-1,2,3,4,5,7)
2. Develop the design process of Direct manipulation and Collaboration systems. (PO-1,2,3,4,5,7)
3. Develop the UI of particular domain. (PO-1,2,3,4,5,7,12)

Computer Graphics and Animation

Course code: MCAE14

Credits: 0:1:2

Prerequisites:

Contact Hours:28T 56P

Course Coordinator:

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, 5th Edition, Pearson Education, 2014.
2. Hearn and Baker: Computer Graphics with OpenGL, 3rd Edition, Pearson 2009.

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

Course Outcomes (COs):

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

System Modeling and Simulation

Course Code: MCAE15

Credits: 2:0:1

Prerequisite: MCA12

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 queuing systems, Queuing notation, Simulation of queuing 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.

Text Book:

1. Jerry Banks, John S. Carson II, Barry L. Nelson, David M. Nicol: Discrete-Event System Simulation, 4th 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, 4th 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)

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, 2nd 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: 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, 2nd 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. (PO-1,2,4,5)

Operations Research

Course Code: MCAE23

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, 8th 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, 15th 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)

Social Network Analysis

Course Code: MCAE24

Prerequisite: Nil

Course Coordinator:

Credits: 2:0:1

Contact Hours: 28L 28P

UNIT I

Introduction to Social Network Mining, Graph Models and Node Metrics:

Introduction to social network mining, Illustration of various social network mining tasks with real-world examples, Data characteristics unique to these settings and potential biases due to them, Social Networks as Graphs, Overview of Random graph models/ graph generators, degree distributions, Models of evolving networks, Node based metrics, ranking algorithms-PageRank.

UNIT II

Social-Network Graph Analysis: Social network exploration/ processing: graph kernels, graph classification, clustering of social-network graphs, centrality measures, community detection and mining, degeneracy-outlier detection and centrality, partitioning of graphs.

UNIT III

Social-Network Graph Analysis and Properties: Social network exploration/ processing and properties: Finding overlapping communities, similarity between graph nodes, counting triangles in graphs, neighborhood properties of graphs.

UNIT IV

Information Diffusion in Social Networks: Strategic network formation: game theoretic models for network creation/ user behavior in social networks, Information diffusion in graphs: Cascading behavior, spreading, epidemics, heterogeneous social network mining, influence maximization, outbreak detection, Opinion analysis on social networks: Contagion, opinion formation, coordination and cooperation.

UNIT V

Dynamic Social Networks and Applications: Dynamic social networks, Link prediction, Social learning on networks, Special issues in Information and Biological networks. Important applications of social network mining related to the above topics.

Laboratory

- Students shall implement programs which supplement the theory concepts

Text Books:

1. David Easley and Jon Kleinberg: Networks, crowds, and markets, Cambridge University Press, 2010.
2. Jure Leskovec, Anand Rajaraman and Jeffrey David Ullman: Mining of Massive Datasets, Cambridge University Press, 2014.

Course Outcomes (COs):

1. Explain the basic concepts of social networks. (PO – 1,2,3,4,5)
2. Analyze the social networks graph. (PO – 1,2,3,4,5)
3. Explore the properties of social networks. (PO – 1,2,3,4,5)
4. Implement mining algorithms for social networks. (PO – 1,2,3,4,5)
5. Examine social networks dynamics. (PO – 1,2,3,4,5)

Virtual and Augmented Reality

Course Code: MCAE25

Credits: 2:0:1

Prerequisite: Nil

Contact Hours: 28L 28P

Course Coordinator:

UNIT I

Introduction: Virtual Reality, Virtual Reality Applications.

Birds-eye view: Hardware, Software, Human Physiology and perception

Objects and Scale: Getting started with Unity- Starting a new Unity project, The Unity editor, The default world space.

Getting Started with Blender: An introduction to Blender. Introduction to Unity, Importing from Blender to Unity.

UNIT II

Getting started with Unity: Starting a new Unity project, The Unity editor, The default world space. An introduction to Blender. Introduction to Unity, Importing from Blender to Unity

UNIT III

Geometry of Virtual Worlds: Geometric models, Transforming models, 2D and 3D rotation yaw, pitch, and roll. Viewing Transformations, Chaining the Transformations.

UNIT IV

Augmented Reality: Augmented reality and its applications, Mixed reality and its applications, Creating examples using Unity and Blender. Evaluating VR systems and experience.

UNIT V

Understanding the Unity Characters: The Camera component, The Rigid body component, The Character Controller component. Unity Standard Assets- Third Person Controller, AI Third Person Controller, First Person Controller, Rigid Body FPS Controller. Making a first person, User calibrations, Managing VR motion sickness.

Evaluating VR Systems and Experiences.

Laboratory

- Students shall implement programs which supplement the theory concepts

Text Books:

1. Tony Parisi: Learning Virtual Reality, Developing Immersive Experiences and Applications for Desktop, Web and Mobile, 1st Edition, O'Reilly Media, Inc., 2015.
2. Jonathan Linowes: Unity Virtual Reality Projects, 1st Edition, Packt Publishing Ltd, 2015.
3. Steven M. LaValle: Virtual Reality, 2017 Available for downloading at <http://vr.cs.uiuc.edu/>.
4. Dieter Schmalstieg and Tobias Höllerer: Augmented Reality Principles and Practice, Addison-Wesley, 2016.

Course Outcomes (COs):

1. Describe the concepts of Virtual Reality and its Applications. (PO – 1, 2, 3)
2. Demonstrate the tools for Virtual Reality. (PO – 1, 2, 3, 5, 10)
3. Demonstrate a virtual environment to captivate its experiences.
(PO – 1, 2, 3, 5, 6, 10)
4. Implement the concepts of Augmented Reality and its Applications.
(PO – 1, 2, 3, 5, 6, 10)
5. Analyze the fundamental issues of virtual reality. (PO – 1, 2, 3, 4, 5, 10)

ELECTIVE III

Programming IoT

Course code: MCAE31

Prerequisites: MCA11

Course Coordinator:

Credits: 0:1:2

Contact Hours:28T 56P

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

Laboratory

- Familiarity with Raspberry Pi
- Exploring the different components of Raspberry pi
- Setting up of the board and booting the board
- Practice sessions on Python
- 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. Arshdeep Bahga, Vijay Madisetti: Internet of Things: A Hands on Approach, Universities Press, 2015
2. Simon Monk: Programming the Raspberry Pi: Getting Started with Python, McGrawHill, 2nd Ed, 2015
3. Simon Monk: Raspberry Pi Cookbook, May 2016, O'Reilly
4. 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-1,2,3,5)
2. Configure and set up the Arduino board for a given application. (PO-1,2,3,5)
3. Building IoT applications using Cloud and Machine Learning.
(PO-1,2,3,4,5,6,7,8,9,10,11,12)

Introduction to Microservices

Course Code: MCAE32

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, 1st 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, 1st Edition, APress, 2017.
3. Sourabh Sharma: Mastering Microservices with Java 9, 2nd 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)

Go Programming

Course Code: MCAE33

Prerequisite: Nil

Course Coordinator:

Credits: 0:1:2

Contact Hours: 28T 56P

Topics to be Covered in Tutorial:

- Go Programming language fundamentals
- Core Go Language Concepts
- Explore Functions in Go
- Object-based Programming in Go
- Defining methods
- Go Interfaces
- Go Embedded Types
- The Go approach to error handling
- Go routines and Channels
- Concurrency management with shared data
- Go Packages and the Go Tool
- Go Test tool
- Go and Relational Databases
- Create a RESTful service using Go

Laboratory

- Programs supplement the tutorial concepts will be based on the latest Go release.

Reference Books:

1. Alan Donovan and Brian Kernighan: Go Programming Language, Addison-Wesley, 2015.
2. Agus Kurniawan: Go Programming by Example, Addison-Wesley, 2015.
3. Caleb Doxsey: Introducing Go. O'Reilly Media, Inc., 2016.
4. Katherine Cox-Buday: Concurrency in Go, O'Reilly Media, Inc., 2017.

Web References:

1. <https://golang.org/>
2. <https://gobyexample.com/>

Course Outcomes (COs):

1. Implement the basic programming constructs of Go language.
(PO-1,2,3,5,7,10,11)
2. Apply the principles of concurrency programming using Go language.
(PO-1,2,3,5,7,10,11)
3. Develop the real-world and general-purpose applications using Go Language.
(PO-1,2,3,5,7,10,11,12)

Web Programming with PHP and AJAX

Course Code: MCAE34

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)

Secure Coding in C and C++

Subject Code: MCAE35

Credits: 2:0:1

Prerequisite: Nil

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++, 2nd Edition, Pearson, 2013. (Chapter 1,2,3,4,5,6,8,9)

References:

1. SEI CERT Coding Standards
2. Robert C. Seacord: CERT C Coding Standard, 2nd Edition, The: 98 Rules for Developing Safe, Reliable, and Secure Systems (SEI Series in Software Engineering), Addison-Wesley Professional, 2014.
3. John Viega, Malt Messier: Secure Programming Cookbook for C and C++, O'Reilly Media, 2003.

Course Outcomes (COs):

1. Identify the vulnerability associated with String Handling and Mitigation strategies. (PO-1,2,3,5,6)
2. Describe the threats associated with Runtime Memory Management and Pointers. (PO-1,2,3,5,6)
3. Apply the mitigation techniques for vulnerable memory management and data type's conversion. (PO-1,2,3,5,6)
4. Identify the vulnerability associated with Formatted Output and Concurrency. (PO-1,2,3,5,6)
5. Describe the vulnerability mitigation techniques for File I/O and recommended practices for security development lifecycle. (PO-1,2,3,5,6)

III SEMESTER

Software Engineering and Agile Methodologies

Course Code: MCA31

Credits: 3:1:0

Prerequisite: Nil

Contact Hours: 42L 28T

Course Coordinator:

UNIT I

Socio-technical Systems: Complex systems, System engineering, System procurement, System development, System operation,

Dependability and Security: Dependability properties, Availability and reliability, Safety, Security,

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

UNIT II

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

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

UNIT III

Agile Methodologies – Introduction: What is Agile? The history of Agile, The Agile Manifesto, Agile Principles. Why Agile? – Understanding Success, Beyond Deadlines, The Importance of Organizational Success, Enter Agility. How to Be Agile – Agile Methods, Don't Make your own Method, The Road to Mastery, Find a Mentor.

UNIT IV

Overview of Extreme Programming: XP Concepts

Agile Design: Symptoms of Poor Design, Principles, Smells and Principles, what is Agile Design? What Goes Wrong with Software? How did the Agile Developers Know What to Do? Keeping the Design as Good as It Can Be.

UNIT V

Agile Frameworks: Dynamic system development method (DSDM), Agile Project Management, Kanban, Lean Software Development, Lean Start-up, Scaled Agile Framework (SAFe).

Agile Development - Planning: Initial Exploration, Release Planning, Iteration Planning, Task Planning, Iterating.

Testing: Test Driven Development (TDD), Acceptance tests, Exploratory testing.

Text Books:

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education Publications, 2013.
2. Robert C. Martin with contributions by James W. Newkirk and Robert S. Koss: Agile Software Development: Principles, Patterns, and Practices, Pearson Education.
3. Peter Measey and Radtac: Agile Foundations: Principles, Practices and frameworks, Viva Books Private Limited.

Reference Books:

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

Course Outcomes (COs):

1. Explain the software engineering process by identifying the requirements and system modeling. (PO - 1,2,3,4,6,8,10,11,12)
2. Design, develop and implement software based on requirements. (PO - 1,2,3,4,8,10,11,12)
3. Discuss the progress and process of Agile. (PO-1,4,3)
4. Explain the Agile Design by identifying if there is a code smell. (PO - 1,2,3,4,6,8,10,11,12)
5. Describe the agile framework and agile development process. (PO - 1,3,4,8,11,12)

Computer Networks

Course Code: MCA32

Credits: 3:0:1

Prerequisite: Nil

Contact Hours: 42L 28P

Course Coordinator:

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, 5th 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, 4th Edition, Tata McGraw-Hill, 2006.
2. Alberto Leon-Garcia and Indra Widjaja: Communication Networks- Fundamental Concepts and Key architectures, 3rd Edition, Tata McGraw-Hill, 2004.
3. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
4. Larry L. Peterson and Bruce S. David: Computer Networks – A Systems Approach, 4th 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.

Laboratory

Exercises to supplement the concepts using existing tools

Text Books:

1. Michael E. Whitman, Herbert J. Mattord: Principles of Information Security, 4th 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, 4th 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, 3rd Edition, Tata McGraw Hill, 2015.
2. R. Kelly Rainer, Casey G. Cegielski: Introduction to Information Systems, 4th 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. Determine risks and its controlling mechanisms, and discuss the importance of firewalls and VPN in the context of network security. (PO-1,5,7,10)
3. Discuss different security technologies and implementation of information security. (PO-1,3,5,7,10)
4. Apply symmetric key cryptography and encryption standards.
(PO-1,3,5,7,10)
5. Explain public-key cryptography and hash functions. (PO-1, 3, 5,7,10)

Big Data Analytics

Course Code: MCA34

Credits: 0:1:2

Prerequisite: MCA23

Contact Hours: 28T 56P

Course Coordinator:

Topics to be covered in Tutorial:

- Big Data Fundamentals
- 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.
- Hive Overview and Working with Hive.
- Pig Overview and Working with Pig.
- Flume Overview and Moving the Data from Web Server into Hadoop.
- 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 and Spark

Reference Books:

1. Tom White: Hadoop The Definitive Guide, Fourth Edition, 4th Edition, O'Reilly Media, 2015.
2. Edward Capriolo, Dean Wampler, and Jason Rutherglen: Programming Hive, 1st Edition, O'Reilly Media, 2012.
3. Alan Gates: Jason Ostrander: Programming Pig, 1st Edition, O'Reilly Media, 2011.
4. Lars George: HBase The Definitive Guide, 1st Edition, O'Reilly Media, 2011.
5. Learning Spark by Matei Zaharia, Patrick Wendell, Andy Konwinski, Holden Karau, 1st Edition, O'Reilly, 2015.
6. Mastering Apache Spark by Mike Frampton, 1st Edition, Packt Publishing, 2015.

Course Outcomes (COs):

1. Demonstrate MapReduce programs and build Hadoop ecosystem to manage big data. (PO-1,2,3,4,5,7).
2. Analyze large data sets using Spark Resilient Distributed Datasets operations (PO-1,2,3,4,5,7).
3. Build and deploy Spark Application (PO-1,2,3,4,5,6,7,9,10,11,12).

ELECTIVE IV

Ethical Hacking and Penetration Testing

Subject Code: MCAE41

Credits: 2:0:1

Prerequisite: Nil

Contact Hours: 28L 28P

Course Coordinator:

UNIT I

Ethical hacking process, Hackers' behaviour and mind-set, Maintaining Anonymity, Hacking Methodology, Information Gathering, Active and Passive Sniffing, Preparation of Ethical Hacking and Penetration Test.

UNIT II

Introduction to penetration testing tools in Kali Linux. Introduction to Metasploit: Metasploit framework, Metasploit Console, Payloads, Meterpreter, Introduction to Armitage, Installing and using Kali Linux Distribution.

UNIT III

DoS attacks. Web server and application vulnerabilities, SQL injection attacks, Vulnerability Analysis and Reverse Engineering, Buffer overflow attacks. Client-side browser exploits, Exploiting Windows Access Control Model for Local Elevation Privilege.

UNIT IV

Social Engineering attacks and countermeasures. Password attacks, Privilege Escalation and Executing Applications, Network Infrastructure Vulnerabilities, IP spoofing, DNS spoofing, Wireless Hacking: Wireless footprint, Wireless scanning and enumeration, gaining access (hacking 802.11), WEP, WPA, WPA2.

UNIT V

Exploiting vulnerabilities in Mobile Application, Malware Analysis and Reverse Engineering, The Ethical Hacking Deliverable, The Document, Overall Structure, Aligning Findings, Presentation Integration: Integrating the Results, Integration Summary, Mitigation, Defence Planning, Incident Management, Security Policy.

Laboratory

Exercises to supplement the concepts using existing tools

Reference Books:

1. Georgia Weidman: Penetration Testing: A Hands-On Introduction to Hacking, No Starch Press, 2014.
2. David Kennedy, Jim O’Gorman, Devon Kearns, Mati Aharoni: Metasploit: The Penetration Tester's Guide, No Starch Press, 2011.
3. James S. Tiller: The Ethical Hack: A Framework for Business Value Penetration Testing, Auerbach Publications, CRC Press, 2004.
4. Shon Harris, Allen Harper, Chris Eagle and Jonathan Ness, Gray Hat Hacking: The Ethical Hackers' Handbook, TMH Edition, 4th Edition, 2014.
5. Baloch, R.: Ethical Hacking and Penetration Testing Guide, CRC Press, 2015.
6. Davidoff, S. and Ham, J.: Network Forensics Tracking Hackers through Cyberspace, Prentice Hall, 2012.

Course Outcomes (COs):

1. Discuss the importance of penetration testing and security assessment. (PO-3,5,6,9,10)
2. Elaborate the core concepts related to vulnerabilities and their causes. (PO-3,5,10)
3. Explain ethics behind hacking and vulnerability disclosure. (PO-5,6)
4. Identify the vulnerabilities related to computer system and networks using state of the art tools and technologies. (PO-3,5,10)
5. Plan the Mitigation and Defense against IT infrastructure. (PO-3,5,10)

Digital Marketing

Course Code: MCAE42

Prerequisites: Nil

Course Coordinator:

Credits: 3:0:0

Contact Hours: 42L

UNIT I

Introduction to Digital Marketing: Evolution of Digital Marketing from traditional to modern era, Role of Internet; Current trends, Info-graphics, implications for business & society; Emergence of digital marketing as a tool; Drivers of the new marketing environment; Digital marketing strategy; P.O.E.M. framework, Digital landscape, Digital marketing plan, Digital marketing models.

UNIT II

Internet Marketing and Digital Marketing: Mix – Internet Marketing, opportunities and challenges; Digital marketing framework; Digital Marketing mix, Impact of digital channels on IMC; Search Engine Advertising: - Pay for Search Advertisements, Ad Placement, Ad Ranks, Creating Ad Campaigns, Campaign Report Generation Display marketing: - Types of Display Ads - Buying Models - Programmable Digital Marketing - Analytical Tools - YouTube marketing.

UNIT III

Introduction to SEO, SEM, Web Analytics, Mobile Marketing, Trends in Digital Advertising– - Introduction and need for SEO, How to use internet & search engines; search engine and its working pattern, On-page and off-page optimization, SEO Tactics - Introduction to SEM Web Analytics: - Google Analytics & Google AdWords; data collection for web analytics, multichannel attribution, Universal analytics, Tracking code Trends in digital advertising.

UNIT IV

Social Media Marketing: Role of Influencer Marketing, Tools & Plan– Introduction to social media platforms, penetration and characteristics; Building a successful social media marketing strategy

Facebook Marketing: Business through Facebook Marketing, Creating Advertising Campaigns, Adverts, Facebook Marketing Tools LinkedIn Marketing, Content Strategy, Analytics and Targeting Twitter Marketing Instagram and Snapchat: - Digital Marketing Strategies through Instagram and Snapchat Mobile Marketing.

UNIT V

Addressing Social Media Channels: Introduction, Key terms and concepts, Traditional media vs Social media. Social media channels: Social networking. Content creation, Bookmarking and aggregating and Location & social media. Tracking social media campaigns. Social media marketing: Rules of engagement. Advantages and challenges. Social Media Strategy: Introduction, Key terms and concepts. Using social media to solve business challenges. Step-by-step guide to creating a social media strategy. Documents and processes. Dealing with opportunities and threats. Step-by-step guide for recovering from an online brand attack. Social media risks and challenges.

Text Books:

1. Seema Gupta: Digital Marketing, 1st Edition, Mc-Graw Hill, 2017.

Reference Books:

1. Ian Dodson: The Art of Digital Marketing, Wiley.
2. Puneet Singh Bhatia: Fundamentals of Digital Marketing, 1st Edition, Pearson, 2017.
3. Prof. Nitin C. Kamat, Mr.Chinmay Nitin Kamat: Digital Social Media Marketing, Himalaya Publishing House Pvt. Ltd.

Course Outcomes (COs):

1. Describe basic concepts of digital marketing. (PO - 1)
2. Demonstrate electronic media usage in digital marketing. (PO - 4, 5)
3. Demonstrate the importance of search engine in digital marketing. (PO - 4, 5)
4. Discuss different social media marketing platforms and its importance in digital marketing. (PO - 4, 5)
5. Determine business challenges that can be overcome by social media. (PO - 4,5)

Bioinformatics

Subject Code: MCAE43

Credits: 2:0:1

Prerequisite: Nil

Contact Hours: 28L 28P

Course Coordinator:

UNIT I

Molecular Biology: The Genetic Materials, Gene Structure and Information content, Protein Structure and Function, Protein Structure and Function, Molecular Biology tools: Cloning, Polymerase Chain Reaction, DNA Sequence.

Data Searches and Pairwise Alignment: Dot Plots, Simple Alignment, Gaps, Scoring matrices.

UNIT II

Biological Sequence Databases: Introduction, Primary and Secondary Databases, Nucleotide Sequence Databases, Nucleotide Sequence Flat files: A Dissection, Protein Sequence Databases

Mapping Databases: Introduction, Relationship between mapping and sequencing, Genomic Map Elements, Complexities and pitfalls of mapping, Types of Maps, Genomic Mapping Resources, comparative Maps.

UNIT III

Information Retrieval from Biological Databases: Integrated Information Retrieval, Gene-Centric Information Retrieval, Sequence Databases Beyond NCBI, Medical Databases

Genomic Databases: Introduction, UCSC, NCBI, Ensembl.

UNIT IV

Predictive Methods Using DNA Sequence: Introduction, Gene Prediction Methods, Gene Prediction Programs and working,

Promoter Analysis: Characterization and Prediction, Strategies and Considerations, Visualization and Integration Tools.

UNIT V

Predictive Methods using RNA sequence: Introduction, RNA Secondary Structure Thermodynamics, Dynamic Programming, Accuracy of RNA Secondary Structure Predictions, Programs available for RNA Secondary Structure Prediction of a Single Sequence, Comparison of Dynamic Programming Secondary Structure Methods, Genetic Algorithm for RNA Secondary Structure Prediction, Predicting the secondary structure common to multiple RNA sequences, Comparison of Methods, Interactively

Drawing RNA secondary structures, Predicting RNA Tertiary Structure, Future of Tertiary Structure Prediction.

Laboratory

Exercises to supplement the concepts using existing tools.

Text Books:

1. Fundamental Concepts of Bioinformatics (): Dan E. Krane, Michael L. Raymer, Pearson Education, 2009.
2. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins, Volume 43, Second Andreas D. Baxevanis; B. F. Francis Ouellette. Third edition, Wiley.

Course Outcomes (COs):

1. Explain the molecular biology components and data search and pair alignment. (PO - 1,2,3,4,6,8,10,11,12)
2. Describe the types of databases and explain the relationship between mapping and sequencing. (PO - 1,3,4,8,11,12)
3. Illustrate how to retrieve the information from biological database. (PO - 1,2,3,4,8,10,11,12)
4. Demonstrate the skills of predictive methods using DNA sequence. (PO-6,9,11)
5. Demonstrate the skills of predictive methods using RNA sequence. (PO-6,9,11)

Cloud Computing

Course code: MCAE44

Prerequisites: MCA14

Course Coordinator:

Credits: 0:1:2

Contact Hours: 28T 56P

Concepts to be covered in Tutorial

- Introduction to Cloud Computing
- Familiarity of different services provided by AWS
- Setting of Private Cloud in AWS
- Working with Amazon EC2, and S3 services
- Working with AMI
- Back up and Launch a new instance using Back-up
- Elastic IPs and AWS Identity and Access Management(IAM)
- Hosting Static Website and Hosting Applications in AWS
- Working with AWS RDS: MySQL Workbench and Dynamo DB
- Resource management in cloud: Load Balancer and Auto Scaling Group
- AWS-Eclipse Integration with Elastic Beanstalk
- Connect RDS and Java Applications
- Data Analytics, Security

Laboratory

- Familiarize the services by AWS
- Creating user login
- Creating Linux, Windows virtual machines instance using EC2
- Run simple applications on EC2 Instance
- Creating Storage using S3
- Create a Backup using Image and launch new instance using Backup image
- Creating an RDS Instance with MySQL Workbench and Dynamo DB
- Demonstrate Database application on AWS
- Upgrading and downgrading the infrastructure based on the requirement
- Demonstrate Load balancing using different instance of EC2
- Launch a web application.
- Demonstrate Identity and Access management.
- Demonstrate Elastic bean stack
- Demonstrate AWS dynamic web application.
- Demonstrate Data Analytics using Elastic Map Reduce (EMR)

References:

1. Rajkumar Buyya, ChristaianVecchiola, S. ThamaraiSelvi, Master Cloud Computing, TMH Education, 2013.
2. Arshdeep Bahga, Vijay Madiseti, Cloud Computing: A Hands-on Approach, Universities Press, 2014.
3. https://aws.amazon.com/training/intro_series/
4. <https://aws.amazon.com/getting-started/>
5. <https://aws.amazon.com/>
6. <https://aws.amazon.com/free/>
7. <https://blog.webspecia.com/cloud/iaas-paas-saas-explained-examples-comparison>
8. <http://aws.amazon.com/training/self-paced-labs/>
9. 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, EMR, Auto Scaling, Load Balancer and IAM services on AWS. (PO-1,2,3,5,7)
3. Develop AWS Dynamic Web Application and Migrate Applications on AWS.
(PO-1,2,3,5,7)

Blockchain Technology

Subject Code: MCAE45

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, 1st 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-1,2,3,5,9,12)
2. Explain the concept of crypto currencies and consensus algorithms.
(PO-1,2,3,5,9,12)
3. Describe different types of Blockchain and smart contract. (PO-1,2,3,5,9,12)
4. Develop Blockchain based applications using Hyperledger Fabric.
(PO-1,2,3,5,9,12)
5. Integrate ideas from various domains and implement them using Blockchain technology. (PO-1,2,3,5,9,12)

ELECTIVE V

Web Component Development with J2EE

Course Code: MCAE51

Credits: 0:1:2

Prerequisites: MCA21

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, 1stEdition, Tata McGraw Hill, 2002.
2. Mahesh P. Matha: JSP and Servlets, 1stEdition, PHI, 2013.
3. Sharanam Shah: Spring 3 with Hibernate 4 Project For Professionals, Shroff Publisher, 1st 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), 2nd 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: MCA21

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

Reference Books:

1. Reto Meier: Professional Android 4 Application Development. Wiley India Edition, 2012.
2. Jerome (J.F.) Di Marzio: Android A Programmer's Guide, Tata McGraw-Hill, 2010.
3. B.M. Harwani: Android Programming, Pearson, 2013.
4. Jason Ostrander: Android UI Fundamentals Develop and Design, Pearson, 2014.
5. John Horton: Android Programming for Beginners, Packt publishing, 2015.
6. Nanjesh Bennur, Deepesh R, Dr. Niranjanamurthy M: Fundamentals of Mobile Application Development First Edition, InSc Publishing house, 2019.
7. **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. Develop the Android Applications using sensors, location based services, databases and Background services. (PO - 1,2,3,5,7,10,11,12)

Deep Learning

Subject Code: MCAE53

Credits: 2:0:1

Prerequisite: MCA24

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. 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. Explain various Deep Learning Models. (PO-1,2,5)

DevOps

Course Code: MCAE54

Prerequisite: Nil

Course Coordinator:

Credits: 0:1:2

Contact Hours: 28T 56P

Concepts to be covered in Tutorial

- Introduction to Agile, Agile Phases.
- Introduction to DevOps, DevOps Life Cycle, Agile vs DevOps
- DevOps Work Flow and Principles.
- Roles, Responsibilities and Skills of a DevOps Engineer.
- overview of Git, GitHub, Git Workflow.
- Overview of Jenkins.
- Introduction to Docker, Docker Architecture.
- Container, Containerization vs Virtualization.

Exercises for Lab

- Git Installation, Environment Setup.
- Creating local repository using Git.
- Creating an Account in GitHub, Creating Remote Repository.
- Working in local repository using Basic Git commands.
- Working with remote repository using Git remote commands.
- Jenkins Master–Slave Installation on AWS
- Installing Jenkins Plugins.
- Creating Jenkins Builds, Creating Scheduled Builds
- Installing Docker, Running a Container.
- Pulling an Image from the Docker Registry.
- Running an Image, Stopping and Starting Containers.
- Pushing an Image to the Repository.
- Basic Docker Commands.

References:

1. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer Paperback – Import, 1st ed. Edition ,1 December 2019 by Mariot Tsitoara .
2. Continuous Delivery with Docker and Jenkins: Create secure applications by building complete CI/CD pipelines, 2nd Edition by Rafal Leszko.
3. <https://git-scm.com/book/en/v2>

4. <https://www.jenkins.io/doc/tutorials/>
5. <https://docs.docker.com/get-started/>

Course Outcomes (COs):

1. Exemplify the usage of DevOps and its life cycle. (PO-3, 6,7,8)
2. Demonstrate the basic commands and Source Control Management using Git (PO-3, 5, 6,8)
3. Implement the CI/CD Pipelines using Jenkins. (PO-3, 5, 6, 9)
4. Demonstrate the Containerization with Docker. (PO-3, 5, 6, 9)

Software Testing

Course code: MCAE55

Credits: 0:1:2

Prerequisites: MCA11

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-1,2,3,4,5,7,9,11,12)
2. Demonstrate the basics of working with Selenium IDE. (PO-1,2,3,4,5,7,9,11,12)
3. Demonstrate the basics of working with Selenium Web Driver. (PO-1,2,3,4,5,7,9,11,12)

ELECTIVE VI

Software Project Management

Subject Code: MCAE61

Credits: 3:0:0

Prerequisite: Nil

Contact Hours: 42L

Course Coordinator:

UNIT I

Introduction to Software Project Management and Project Evaluation: 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.

UNIT II

Project Planning and Effort Estimation: Stepwise Project Planning, Basics of Software estimation, Effort estimation techniques, COSMIC Full function points, COCOMO II A Parametric Productivity Model.

UNIT III

Project Approach Selection and Activity Planning: Software process and Process Models, Choice of Process models, Rapid Application development, Agile methods, Extreme Programming, SCRUM, Objectives of Activity planning, Project schedules, Activities, Sequencing and scheduling, Network Planning models, Forward Pass and Backward Pass techniques, Critical path (CRM) method.

UNIT IV

Risk Management and Project Monitoring: Risk identification, Assessment, Monitoring, PERT technique, 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

Resource Allocation and Software Quality: Resource Allocation, Creation of critical paths, 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, 6th 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, 13.1 to 13.5, 13.7 to 13.10.

Reference Books:

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

Course Outcomes (COs):

1. Discuss the scope of software project management and adapt the software project evaluation principles. (PO-1,2,4,8,9,10)
2. Explain the project planning approach and apply the software effort estimation techniques. (PO-1,2,4,8,9,12)
3. Determine the appropriate process model and produce activities plan (PO-1,2,4,8,9,12)
4. Manage the risks, monitor the progress of projects and manage the change control. (PO-1,2,4,6,8,9)
5. Handle the resource allocation and practice the software quality standards. (PO-1,2,4,6,8,9,12)

Management and Entrepreneurship

Subject Code: MCAE62

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: MCAE63

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?

Reference Books

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, 2nd 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: MCAE64

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. 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: MCAE65

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.

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, 16th 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 9.3, 10.1 to 10.4, 11.1,11.2, 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, 13st Edition, Pearson Education, 2015.
2. Management Information Systems, Jawadekar, 5th 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-1,2,8,9,10,11)
3. Describe the Enterprise Systems and Digital Marketing in Industry. (PO- 2,8,9,10)
4. Describe managing knowledge and Analyze the Decision Making concepts for building and managing information systems in an organization. (PO-2,8,9,10,11)
5. Apply the Project Management principles for managing the system. (PO-1,2,8,10,11)

Soft Skills and Personality Development

Course Code: MCAE66

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, 28th 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 the skills needed to stimulating Creative Thinking in Communications. (PO-8,11)

Mini Project

Course Code: MCAP1

Prerequisite: Nil

Course Coordinator:

Credits: 0:0:1

Contact Hours: 28P

Guidelines:

- The objective of this course is to work toward solving problems using latest technologies.
- Students are expected to take up mini project with a team size not exceeding 2. However, during the examination, each student has to demonstrate the project individually.
- Brief synopsis not more than two pages to be submitted by the team as per the format given. It is recommended that students to do prior art search as part of literature survey before submitting the synopsis for the Mini/Major projects.
- The team must submit a brief project report (25-30 pages) that must include the following
 - Introduction
 - Requirement Analysis
 - Software Requirement Specification
 - Analysis and Design,
 - Implementation
 - Testing
- The title, relevance of the title, novelty, synopsis and technologies used for developing an application or to carry out research work will be scrutinized by respective guides.
- Rubrics may be used to evaluate the Mini-Project

Course Outcomes (COs):

1. Design and implement solution for a given problem using software engineering approach. (PO-1,2,3,4,5,6,7,10,12)
2. Manage as an individual or in a team in development of technical projects. (PO-1,2,3,7,8,9,11,12)
3. Develop effective presentation skills in presenting project related activities. (PO-1,2,3,4,5,6,7,8,9,11,12)

Societal Activity

Course Code: MCASA

Prerequisite: Nil

Course Coordinator:

Credits: 0:0:0

Contact Hours: Nil

Guidelines:

- The student shall take up an activity with a NGO / Professional body / NSS / NCC etc.
- This course does not have any CIE or SEE; however, the students are required to submit a Completion Certificate.
- The result is declared either pass or fail, based on the completion of the course in the stipulated time.

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.

Course Outcomes (COs):

1. Gather and analyze the requirements of the given application, survey the literature on existing methodologies, techniques and tools in the related area of the problem and analyze their applicability for the solution.
(PO-1,2,3,5,7,9,10,11,12)
2. Model and design the solution ethically considering social issues.
(PO-1,2,3,5,6,7,8,9,10,11,12)
3. Implement the design, verify, validate and analyze the results.
(PO-1,2,3,4,5,7,8,9,10,11,12)
4. Demonstrate and document the project work efficiently.
(PO-4,5,6,7,8,9,10,11,12)
5. Manage as an individual or in a team in development of technical projects.
(PO-5,7,8,9,10,11,12)

Seminar

Course Code: MCAS1

Credits: 2

Seminar Guidelines:

- The topic of the seminar shall be chosen by the candidate in consultation with the guide. The topic shall be from the emerging field of computer Science / Computer Applications.
- The seminar shall be carried out by each candidate independently under the guidance of one of the faculty members of the Department.
- The students shall gather literature related to their specific topic from IEEE explore or Science direct or ACM digital library, etc. and prepare a research paper.
- The research paper shall be published in Scopus indexed Conference / Journal before the end of the semester.
- At the end of the semester each candidate shall submit the published paper with plagiarism copy duly approved by the guide.
- The seminar 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.

Course Outcomes (COs):

1. Gather information on emerging technologies and tools on a specific topic.
(PO-2,5,6,7,9,10,12)
2. Prepare a concise article using ICT efficiently. (PO-1,2,3,4,5,6,7,9,10,12)
3. Communicate professionally and develop the team spirit.
(PO-1,2,3,4,5,6,7,8,9,11,12)

Industry Internship

Course Code: MCAIN

Credits: 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

Course Outcomes (COs):

1. Design and implement solution for a given problem using software engineering approach. (PO-1,2,3,4,5,6,7,10,12)
2. Contribute as an individual or in a team in development of technical projects. (PO-1,2,3,7,8,9,11,12)
3. Develop effective presentation skills in presenting project related activities. (PO-1,2,3,4,5,6,7,8,9,11,12)

Co-Curricular Activities

Course Code: MCACCA

Credits: 2

Guidelines:

- Students have to acquire 2 credits by carrying out an On-line Certification Course
 - Students can register for any On-line Certification Course in the field of Computer Science/Management for a minimum duration of 8 weeks
 - They have to submit the Course Completion Certificate along with their scores

Approval and Evaluation Process:

- Approval and evaluation can be done by the committee along with the concerned proctor
- The students have to get prior approval from the committee to take up the activity
- A stipulated period can be provided for the approval and evaluation process

Course Outcomes (COs):

1. Identify the course/technology to learn. (PO-1,3,5,7)
2. Demonstrate the concepts/technology learnt. (PO-1,2,3,5,7)
3. Apply the concepts in solving real world problems. (PO-1,2,3,4,5,7,10)