



RAMAIAH
Institute of Technology

CURRICULUM

for the Academic Year 2023 - 2024

(Batch of 2023 - 2025)

DEPARTMENT OF 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 11 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 has also been conferred autonomous status for Ph.D. program since 2021. 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 67% 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 - 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 & Centre for Bio and Energy Materials Innovation. **Ramaiah Institute of Technology has obtained “Scimago Institutions Rankings” All India Rank 107 & world ranking 600 for the year 2022.**

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 is recognized by Atal Ranking of Institutions on Innovation Achievements (ARIIA), 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. The Institute is a member of DELNET, CMTI and VTU E-Library Consortium. The Institute has a modern auditorium, recording studio, 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, Ramaiah Institute of Technology has achieved 78th rank among 1314 top Engineering Institutions & 23rd Rank among 105 School of Architecture in India for the year 2023.

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

- To enable the students to be knowledgeable and creative through state-of-the-art curriculum and innovative teaching methodologies
- To provide training programs that bridges the gap between academia and industry to produce competitive software professionals
- To inculcate ethical values in the students enabling them to become socially committed professionals
- 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):

1. **Computational Knowledge:** Apply knowledge of mathematics, computing principles and domain knowledge appropriately to develop a conceptual model from defined problems and requirements.
2. **Problem Analysis:** Identify, formulate problem definition, analyze the literature of the domain and provide solutions using mathematics and computing.
3. **Design & Development of Solutions:** Design, develop and assess a software system, process, component, or program that meets specified needs with appropriate consideration for societal concerns.
4. **Conduct Investigation of Complex Computing Problem:** Use research-based knowledge to analyse, interpret the data and synthesize information to provide valid conclusions.
5. **Modern Tools Usage:** Create, select, and use modern tools and technologies necessary for computing practices.
6. **Professional Ethics:** Adopt professional ethics, principles of professional computing practices, cyber regulations, and responsibilities.
7. **Lifelong Learning:** Recognize the need and engage in independent learning for continual development as a computing professional.
8. **Project management and Finance:** Demonstrate the management principles for managing projects as an individual, as a member, and as a leader in a team in multidisciplinary environments.
9. **Communication Efficacy:** Communicate effectively about computing activities by being able to write effective reports, design documentation, make effective presentations, and give and understand clear instructions.
10. **Societal and Environmental Concern:** Assess the local and global impact of software solutions on individuals, organizations, and society.
11. **Individual and Team work:** Perform effectively as an individual and as a member or leader in diverse teams and multidisciplinary environments.
12. **Innovation and Entrepreneurship:** Recognize and pursue the opportunities 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)	Ability Enhancement Course	Total credits in a Semester
				Core (Hard core, Soft core, Lab) (PC-C)	Electives (PC-E)				
First	4		2	19					25
Second				17	9				26
Third		3		14	6	4			27
Fourth						18	2	2	22
Total	4	3	2	50	15	22	2	2	100

SCHEME FOR 2023-2025 BATCH

I SEMESTER

	Course Code	Course Name	Credits			
			L	T	P	Total
1.	MCA11	Programming with Python	3	0	1	4
2.	MCA12	Computational Mathematics	4	0	0	4
3.	MCA13	Database Systems	3	0	1	4
4.	MCA14	UNIX and Shell Programming	3	0	1	4
5.	MCA15	Data Structures	3	0	0	3
6.	MCA16	Professional Communication and Ethics	1	1	0	2
7.	MCA17 [#]	Web Programming	0	1	2	3
8.	MCA18 [#]	Data Structures Using 'C'	0	0	1	1
9.	MCABC ^{**}	Fundamentals of Computing	0	0	0	0
Total			17	2	6	25

II SEMESTER

S. No	Course Code	Course Name	Credits			
			L	T	P	Total
1.	MCA21	Object Oriented Programming Using Java	3	0	1	4
2.	MCA22	Design and Analysis of Algorithms	3	0	1	4
3.	MCA23	Software Engineering and Agile Methodologies	3	0	0	3
4.	MCA24	Computer Networks	3	0	1	4
5.	MCA25	Research Methodology and IPR	2	0	0	2
6.	MCAE1x	Elective I				3
7.	MCAE2x	Elective II				3
8.	MCAE3x	Elective III	0	1	2	3
Total						26

III SEMESTER

S. No	Course Code	Course Name	Pre-requisite Courses	Credits			
				L	T	P	Total
1.	MCA31 [#]	Mobile Application and Development	MCA21	0	1	2	3
2.	MCA32	Artificial Intelligence And Machine Learning	MCA11 MCA12	3	0	1	4
3.	MCA33	Information Security		3	0	0	3
4.	MCA34	Cloud Computing	MCA24	3	0	1	4
5.	MCAE4x	Elective IV					3
6.	MCAE5x	Elective V		0	1	2	3
7.	MCAE6x	Elective VI		3	0	0	3
8.	MCAP1 ^{##}	Project - Phase I					4
9.	MCASA [*]	Societal Activity					0
Total							27

IV SEMESTER

S. No	Course Code	Course Name	Credits			
			L	T	P/S	Total
1.	MCAP2	Project - Phase II			16	16
2.	MCAS1	Seminar			2	2
3.	MCAIN ^{##}	Industry Internship			2	2
4.	MCAAEC ^{##}	Ability Enhancement Course			2	2
Total						22

ELECTIVE I

S. No	Course Code	Course Name	Credits			
			L	T	P	Total
1.	MCAE11	Object Oriented Modeling and Design	2	0	1	3
2.	MCAE12	Digital Marketing	3	0	0	3
3.	MCAE13	User Interface and User Experience Design	2	0	1	3
4.	MCAE14	Data Analytics Using 'R'	2	0	1	3

ELECTIVE II

S. No	Course Code	Course Name	Credits			
			L	T	P	Total
1.	MCAE21	Digital Forensics	2	0	1	3
2.	MCAE22	Augmented and Virtual Reality	2	0	1	3
3.	MCAE23	Operations Research	2	1	0	3
4.	MCAE24	Social Network Analysis	2	0	1	3

ELECTIVE III

S. No	Course Code	Course Name	Pre-requisite Course(s)	Credits			
				L	T	P	Total
1.	MCAE31 [#]	Full Stack Development	MCA17	0	1	2	3
2.	MCAE32 [#]	ASP.Net with C#	-	0	1	2	3
3.	MCAE33 [#]	Power BI		0	1	2	3
4.	MCAE34 [#]	Web Programming with PHP and AJAX	MCA17	0	1	2	3

ELECTIVE IV

S. No	Course Code	Course Name	Credits			
			L	T	P	Total
1.	MCAE41	Natural Language Processing	3	0	0	3
2.	MCAE42	Cyber Security	3	0	0	3
3.	MCAE43	Secure Coding in C and C++	2	0	1	3
4.	MCAE44	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 [#]	Programming IoT	MCA11	0	1	2	3
3.	MCAE53 [#]	Software Testing	MCA11	0	1	2	3
4.	MCAE54 [#]	DevOps	-	0	1	2	3

ELECTIVE VI

S. No	Course Code	Course Name	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

Semester End Examination will be conducted for Laboratory

Only Continuous Internal Evaluation will be conducted

**** Audit Course. Only for Non-BCA students and Only Continuous Internal Evaluation will be conducted**

*** Audit Course. Only Continuous Internal Evaluation will be conducted**

L: Lecture

T: Tutorial

P: Practical

S: Seminar

I SEMESTER

PROGRAMMING WITH PYTHON	
Subject Code: MCA11	Credits: 3:0:1
Pre requisites: Nil	Contact Hours: 42L 28P
Course Coordinator: Dr. D Evangelin Geetha	

Course Content

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.

Unit II

Core Data Structures

Strings - Working with strings as single things, working with the parts of a string, length, traversal, slicing, strings are immutable, string operations, Tuples - Tuples are used for grouping data, tuple assignment, tuples as return values, Composability of Data Structures, Lists – list values, accessing elements, list length, list membership, list operations, list slices, list deletion, objects and references, lists and for loops, list parameters and methods, lists and functions, strings and lists, nested lists

Dictionaries - Dictionary operations, methods

NumPy: shape, slicing, masking, broadcasting, dtype

Unit III

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 IV

Regular Expressions: Defining Regular Expressions and String Processing

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

Unit V

Exceptions Handling: Catching exceptions, the finally clause of the try statement, Handling Exceptions, Built-in Exceptions and User defined Exceptions.

File I/O: File object attributes, Read and Write into the file, Rename and Delete a File.

Laboratory:

- Programs that supplement the theory concepts are to be implemented.

Text Books:

1. Peter Wentworth, Jeffrey Elkner, Allen B. Downey and Chris Meyers: “How to Think Like a Computer Scientist: Learning with Python 3”, 3rd Edition, Green Tea Press, 2020.
2. Timothy A. Budd: Exploring Python, Tata McGraw-Hill, 2011.

References:

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

Course Outcomes (COs):

1. Develop programs using basic concepts of Python programming. (PO-1, PO-2, PO-3, PO-5, PO-9)
2. Apply the methods to create and manipulate the core data structures strings, lists, tuples and dictionaries and arrays. (PO-1, PO-2, PO-3, PO-5, PO-9)
3. Construct modular programs using functions. (PO-1, PO-2, PO-3, PO-5, PO-9)
4. Implement object-oriented concepts and regular expressions. (PO-1, PO-2, PO-3, PO-5, PO-9)
5. Demonstrate exception handling and file processing. (PO-1, PO-2, PO-3, PO-5, PO-9)

COMPUTATIONAL MATHEMATICS	
Subject Code: MCA12	Credits: 4:0:0
Pre requisites: Nil	Contact Hours: 56L
Course Coordinator: Mr. Tamal Sarkar	

Course Content

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

Relations and Functions: Cartesian Products and Relations, Functions: Plain and One-to-One, Onto Functions, The Pigeonhole Principle, Function Composition and Inverse Functions, Properties of Relations, Computer Recognition: Zero-One Matrices and Directed Graphs.

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

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

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, 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, 14.8)

Reference Books:

1. Discrete Mathematics and its Applications, 7th Edition, McGraw Hill publications
2. Douglas B. West, Introduction to Graph Theory, Second Edition, Prentice-Hall.

Course Outcomes (COs):

1. Apply the notion of mathematical logic and proof and be able to apply them in problem solving
2. Solve Problems which involve discrete data structure such as relations and functions and its associated properties.
3. Evaluate the given problem by applying the concepts of graph theory. (PO-1, PO-2)
4. Apply probability for uncertainty and examine the data characteristics. (PO-1, PO-2, PO-4)
5. Analyze various data distributions using hypothesis testing. (PO-1, PO-2, PO-4)

DATABASE SYSTEMS	
Subject Code: MCA13	Credits: 3:0:1
Pre requisites: Nil	Contact Hours: 42L 28P
Course Coordinator: Ms. Sushitha S	

Course Content

Unit I

Introduction: Introduction, Characteristics of the Database Approach, Database Architecture: Data Models, Schemas and Instances, Three Schema Architecture and Data Independence, DBMS Component module.

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 changing statements in SQL.

Unit II

SQL: Basic Retrieval Queries in SQL: The Select from where structure, Ambiguous Attribute Names and Aliasing, Use of asterisk, Tables as Sets and Pattern Matching, INSERT, DELETE and UPDATE statements in SQL; Additional features of SQL, Complex Queries: Handling Null values, Nested and Co-Related Nested 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: Informal Design Guidelines, Functional Dependencies: Definition, Inference Rules, Equivalence and Minimal Sets of Functional Dependencies. Normal Forms Based on Primary Keys.

Unit IV

Advanced Database Concepts:

Object Oriented Databases: Object Database Concepts, Object Identity, Object Structure and Type Constructors.

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, Infinite Graph

Unit V

MongoDB: Introduction to Mongo Database Features, Database, Collection, Documents, Data Types.

CRUD Operations: Create, Read, Update, Delete, operations.

Bulk Write Aggregation: Aggregation Pipeline, Map Reduce, Single Purpose Aggregation Operations

Laboratory:

- Programs that supplement the theory concepts are to be implemented.

Text Books:

1. Ramez Elmasri and Shamkanth B Navathe: Fundamentals of Database Systems, 6th Edition, Pearson Education, 2011.
Chapters: 1.1, 1.2, 1.3, 2.1, 2.2, 2.4.1, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 5.1, 5.2, 5.3, 8.1, 8.2, 8.3, 8.4, 8.5, 8.6, 8.9, 10.1, 10.2, 10.3, 20.1, 20.2, 25.1, 25.2, 25.3
2. Kristina Chodorow: MongoDB: The Definitive Guide: Powerful and Scalable Data Storage, 3rd Edition, O'Reilly, 2020

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.

Web Links:

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

Course Outcomes (COs):

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

UNIX AND SHELL PROGRAMMING	
Subject Code: MCA14	Credits: 3:0:1
Pre requisites: Nil	Contact Hours: 42L 28P
Course Coordinator: Ms. Komala R	

Course Content

Unit I

Introduction to UNIX, File system and File attributes

The Unix/Unix Like Operating System architecture and commands: Unix Architecture, Features of UNIX, General purpose utility commands, Command structure / command line syntax, Introduction Unix file System, File Names, Path Name, type, locating commands, Home Directory, pwd, ls, rm, mkdir, rmdir, cd, cp, mv, wc, ls, cmp, comm, diff, od and The file attributes.

Unit II

Basic and Advanced Filters

pr: paginating files, head: Displaying the beginning of a file, tail: displaying the end of the file, cut: slitting a file vertically, paste: pasting files, sort: ordering a file, uniq, tr: translating characters. Filters and regular expression: grep: Searching for a pattern, Basic Regular Expression, Extended Regular Expression and egrep, types of grep. sed: stream editor, Line addressing, Context addressing, Text editing, Substitution.

Unit III

The Shell and Process Management

The Shell: Introduction, how commands are executed / shell's interpretive cycle, Meta Characters, Escaping and Quoting, Input Output Error Redirection and Pipes.

Process Management: Process status, system processes, mechanism of process creation, Internal and External commands, process states and Zombies, job control, killing processes with signals Job scheduling: Scheduling jobs with at and batch, crontab, cron: Running jobs periodically Log Management: Running script in background for tracking various log messages, tail with egrep and echo, Central logging (rsyslog)

Unit IV

Shell Programming

Introduction to version control system: git and its usage for managing code repositories. Introduction to Shell Script: Shell scripts, read, command line arguments, exit, variables, logical operators and conditional operators if conditional, case conditional, expr computations and string handling, while looping, for looping, set and shift, trap interrupting a program, debugging shell scripts with set command, validation and data entry scripts. Arrays, functions

Unit V

Advanced filter AWK

Introduction awk, Basic Structure, How to run awk Programs, Comments in awk Programs, AWK operators, Fields, Variables, Built in variable , print / printf - formatting output, Escape Sequences, Format Specifiers, Explicit File output, OFS - The Output Field Separator Variable, user Defined variables, Parameter Passing, Built in functions, getline Function, Regular Expression, if – else, while and for loop, Arrays, Subscripts, Deleting Array Elements, User Defined Functions

Laboratory:

- Programs that supplement the theory concepts are to be implemented.

Text Book:

1. Sumitabha Das, Unix Concepts and Applications, McGraw Hill, 4th Edition, 2012, ISBN:978-0-07-063546-3

Reference Books:

1. Narendra Kumar Reddy, Complete Bash Shell Scripting, Polu Packt Publishing, April 2020, ISBN: 9781800209695 <https://www.packtpub.com/in/cloud-networking/complete-bash-shell-scripting-video>
2. Mokhtar Ebrahim, Andrew Mallett, Mastering Linux shell scripting, Packt Publishing, 2nd Edition, 2018, ISBN 9781788990554
3. Imran Afzal, A Complete Course on Linux bash shell scripting with real life examples, Packt Publishing, July 2019, ISBN:9781838984083

Course Outcomes (COs):

1. Exploring Unix File system with basic utility commands and file attributes. (PO-1, PO-2, PO-3, PO-9)
2. Apply shell scripting techniques and standards using filters for pattern matching. (PO-1, PO-2, PO-3, PO-9)
3. Demonstrate process management and batch files. (PO-1, PO-2, PO-3, PO-9)
4. Develop shell scripts using basic commands and advanced filters. (PO-1, PO-2, PO-3, PO-9)
5. Implement effective and interactive scripts using functional blocks, Awk script. (PO-1, PO-2, PO-3, PO-9)

DATA STRUCTURES	
Subject Code: MCA15	Credits: 3:0:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Mr. Abhishek K L	

Course Content

Unit I

Introduction to Data Structures: Definition, Need of Data Structures, Classification of Data Structures.

Recursion: Recursive definition and processes, Designing the recursive functions, Examples on recursion: Factorial of a number, Fibonacci numbers, Towers of Hanoi problem for 'n' disks.

Stack: Introduction to Stacks, Operations on a Stack, Applications of Stacks: Conversion from Infix to Postfix, evaluation of a postfix expression.

Unit II

Queues: Introduction to Queues, Definition, Array Representation of Queues, Primitive operations of queue and its implementation; Types of Queues: How to overcome the drawbacks of Linear Queue using Circular Queue, Representation of Circular Queues, Deques and Priority Queues.

Linked list: Introduction, Representation and implementation of operations (Insertion, Deletion and Search) of Singly, Doubly and Circular Linked Lists, Implementation of stack and queue using lists.

Unit III

Trees: Importance of Trees, Basic Tree Concepts and Terminologies: node, path, degree, internal nodes, height, subtree. Binary Tree: Binary Trees, Binary Tree Representations, Representing Lists as Binary trees, Minimum nodes, Maximum nodes, Nearly complete binary tree – Tree Traversals Depth First Traversal (Preorder, Inorder and Postorder), Breadth First Traversal, Construction of Expression Tree.

Binary Search Tree: Binary Search Trees – Basic Concepts, Operations (Insertion, Deletion, Find the smallest node, Find the largest node, and Find a requested node), Applications, Threaded Binary Trees.

Unit IV

Advanced concepts in Trees: AVL Search Trees: Need for AVL Search Trees, Definition, Balancing Trees (L-L Rotation, R-R Rotation, L-R Double Rotation, R-L Double Rotation)-, AVL tree Operations: Insertion, Deletion. Heaps – Definition, Heap Maintenance operations: insertion and deletion. Rheapup, Rheapdown algorithms and heap implementation, Applications.

Unit V

Multi-way trees: Introduction, Definition, features. B-trees – Introduction, Definition and features, Construction of B-trees of order 3, order 4 and order 5, Implementation, Simplified B-Trees: 2-3 tree, 2-3-4 tree.

Graphs: Basic concepts, Terminologies: vertices, edge, cycle, loop, graph vs tree, operations: insert vertex delete vertex, insert edge, delete edge. Graph traversals: Breadth-First- Search (BFS) Traversal, Depth-First- Search (DFS) Traversal, storage structures (Adjacency Matrix and Adjacency List), graph algorithms.

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.
3. Horowitz, Sahani, Anderson, Freed, Fundamentals of Data Structures in C, Second edition, 2014

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 for real world problems. (PO-1, PO-2, PO-3, PO-4)
2. Implement the queue and list for real world applications, select appropriate data structures as applied to specified problem definition (PO-1, PO-2, PO-3, PO-4)
3. Demonstrate the usage and operation of binary search trees. (PO-1, PO-2, PO-3, PO-4)
4. Construct AVL tree, heap and apply operations on them. (PO-1, PO-2, PO-3, PO-4)
5. Exhibit the construction of Multi way Trees and traversal of graphs. (PO-1, PO-2, PO-3, PO-4).

PROFESSIONAL COMMUNICATION AND ETHICS	
Subject Code: MCA16	Credits: 1:1:0
Pre requisites: Nil	Contact Hours: 14L 28T
Course Coordinator: Dr. S Ajitha	

Course Content

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.

Reference Books:

1. R. Subramanian: Professional Ethics, Oxford University Press, 2013.
2. M.Ashraf Rizivi: Effective Technical Communication, 1st Edition, Tata McGraw Hill, 2005.
3. Mike W Martin and Ronald Schinzinger: Ethics in Engineering, 4th Edition, Tata McGraw Hill, 2005.

Course Outcomes (COs):

1. Demonstrate the skills of presentation. (PO-6, PO-9, PO-11)
2. Demonstrate the skills of email writing, research paper and group discussion etiquettes. (PO-6, PO-9, PO-11)
3. Apply the skills of writing resumes and attending interview. (PO-6, PO-9, PO-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, PO-9, PO-10, PO-11)
5. Demonstrate the ethics of IT organizations etiquettes. (PO-6, PO-9, PO-10, PO-11)

WEB PROGRAMMING	
Subject Code: MCA17	Credits: 0:1:2
Pre requisites: Nil	Contact Hours: 28T 56P
Course Coordinator: Dr. Madhu Bhan	

Course Content

Topics to be covered in Tutorial

1. Introduction to HTML5, Basic HTML Tags
2. HTML Forms, Graphics and Media
3. Designing HTML pages using CSS
4. Basics of XML and DTD
5. Introduction to JavaScript, JavaScript variables, operators
6. Conditional and loop statements in JavaScript
7. Functions and Arrays in JavaScript
8. Event Handling and Document Object model in JavaScript
9. Handling strings and working with window object
10. New Features in ES6, Introduction to JSON
11. Introduction to Bootstrap
12. 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)

DATA STRUCTURES USING ‘C’	
Subject Code: MCA18	Credits: 0:0:1
Pre requisites: Nil	Contact Hours: 28P
Course Coordinator: Mr. Abhishek K L	

Course Content

Topics Covered

1. Illustrating recursion using Example: Tower of Hanoi Problem.
2. Implementation of STACK Operations: push(), pop(),display()
3. Implementation of C program to convert infix expression to postfix expression.
4. Implementation of C program to evaluate postfix expression.
5. Implementation of Linear Queue.
6. Implementation of Circular Queue.
7. Implementation of Single Linked List Operations.
8. Implementation of Circular Single Linked List Operations.
9. Implementation of Doubly Linked List Operations.
10. Implementation of Circular Doubly Linked List Operations.
11. Implementation of STACK using Linked List.
12. Implementation of Binary Tree.

Note: Each Lab Session is of two hours’ duration/week.

Reference Books:

1. Data Structures using C and C++ by Yedidyah Langsam and Moshe J. Augenstein and Aaron M Tenenbaum, 2nd Edition, Pearson Education Asia, 2017.
2. Reema Thareja: Data Structures Using C, 2nd Edition, Oxford University Press, 2018.
3. Behrouz A Forouzan, Data Structures - A Pseudocode Approach with C, Richard F Gilberg and Cengage Learning, 6th Indian Reprint, 2009.

Course Outcomes (COs):

1. Simulate stack and queue operations and implement its applications. (PO-1, PO-2, PO-3, PO-4, PO-5)
2. Develop C programs on linked list and its variations. (PO-1, PO-2, PO-3, PO-4, PO-5)
3. Construct C programs on Binary tree and its applications. (PO-1, PO-2, PO-3, PO-4, PO-5)

FUNDAMENTALS OF COMPUTING	
Subject Code: MCABC	Credits: 0:0:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. D Evangelin Geetha	

Course Content

Unit I

Digital Logic: Binary Systems and Combinational Logic Digital Computers and Digital Systems, Binary Numbers, Number Base Conversion, Octal and Hexadecimal Numbers, subtraction using r's and r-1 complements, Binary Code, Binary Logic, Digital Logic Gates

Computer Organization: Basic Operational Concepts, Software, Performance, Multiprocessing and Multi computers, Machine Instruction: Memory Locations and Addresses, Memory Operations, Instructions and Instruction Sequencing, Addressing Modes, Interrupts

Unit II

Operating System: Operating-System Structure, Operating-System Operations, Overview of - Process Management, Memory Management, Storage Management, Protection and Security, Distributed Systems

CPU Scheduling: Basic Concepts of CPU scheduling, Scheduling Algorithms-FCFS, SJF, Round Robin, Priority Scheduling

Unit III

C Programming: Decision making, control structures and arrays: C Structure, Data Types, Input-Output Statements, Decision making with if statement, simple if statement, the if-else statement, nesting of if-else statements, the else-if ladder, the switch statement, the?: operator, the goto statement, the break statement, programming examples

The while statement, the do...while statement, the for statement, nested loops, jumps in loops, the continue statement, programming examples.

Unit IV

Arrays: One dimensional and two dimensional arrays, declaration and initialization of arrays, reading, writing and manipulation of above types of arrays

Structures: Defining a structure, declaring structure variables, accessing structure members, structure initialization, copying and comparing structure variables, Operations on individual members, array of structures, structures within structures, structures and functions, Unions, size of structures

Unit V

Pointers: Pointers in C, Declaring and accessing pointers in C, Pointer arithmetic, Functions, Call by value, Call by reference, Pointer as function arguments, recursion, Passing arrays to functions, passing strings to functions, Functions returning pointers, Pointers to functions, Programming Examples

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: C The Complete Reference, 4th Edition, Tata McGraw Hill, 2000.
3. Yashwant Kanetkar, Let us C, BPB Publications ,18th Edition, 2021, ISBN-13: 978-9391392994
4. M.Morris Mano, Digital Logic and Computer Design” Pearson, 2016, ISBN-13: 978-9332542525
5. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, Wiley India Pvt. Limited , 9th Edition, ISBN-BRV: !978-1-118-12938-8

Reference Books:

1. V Rajaraman: Computer Programming in C, Prentice Hall India, 2000.
2. Carl Hamacher, Z Varnesic and S Zaky: Computer Organization, 5th Edition, McGraw Hill, 2002.

Course Outcomes (COs):

1. Apply number system conversion and Boolean algebra and explain the organization of computer. (PO-1, PO-2, PO-3)
2. Explain the operating system management. (PO-1, PO-2, PO-3)
3. Determine the suitable control statements and implement the solution. (PO-1, PO-2, PO-3, PO-5)
4. Apply concepts of arrays and structures. (PO-1, PO-2, PO-3, PO-5)
5. Demonstrate dynamic memory allocation using pointers, new and delete. (PO-1, PO-2, PO-3, PO-5).

II SEMESTER

OBJECT ORIENTED PROGRAMMING USING JAVA	
Subject Code: MCA21	Credits: 3:0:1
Pre requisites: Nil	Contact Hours: 42L 28P
Course Coordinator: Dr. Manish Kumar	

Course Content

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

DESIGN AND ANALYSIS OF ALGORITHMS	
Subject Code: MCA22	Credits: 3:0:1
Pre requisites: MCA15	Contact Hours: 42L 28P
Course Coordinator: Dr. Madhu Bhan	

Course Content

Unit I

Introduction: Notion of Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types

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, Sequential Search, Brute-Force String Matching, Exhaustive Search.

Divide-and-Conquer: Merge Sort, Quick Sort, Binary Search

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 Search and Breadth First Search, Topological sorting, Algorithms for Generating Combinatorial Objects-Generating Permutations, Generating Subsets.

Transform-and-Conquer: Presorting, Heaps-Notion of the Heap, Heapsort.

Unit IV

Space and Time Tradeoffs: Sorting by Counting, Hashing-Open Hashing, Closed Hashing.

Dynamic Programming: Warshall's Algorithm, Floyd's Algorithms for the All-Pairs Shortest-Paths Problem.

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

Unit V

Backtracking: n-Queens Problem, Hamiltonian Circuit Problem, Subset-Sum Problem.

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

P, NP-Completeness and Approximation Algorithms: 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 1.1-1.3, 2.1-2.4, 3.1, 3.2, 3.4, 4.1-4.3, 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, PO-2, PO-4, PO-5, PO-9)
2. Apply the brute force, divide and conquer and parallel algorithm approaches for designing algorithm and determining the order of growth. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-9)
3. Implement the decrease and conquer and transform and conquer approach for designing and determining the order of growth of algorithms. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-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, PO-2, PO-3, PO-4, PO-5, PO-9)
5. Apply the branch and bound and backtracking approach for solving problem and describe the concepts of NP-hard problem. (PO-1, PO-2, PO-3, PO-4)

SOFTWARE ENGINEERING AND AGILE METHODOLOGIES	
Subject Code: MCA23	Credits: 3:1:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. S Ajitha	

Course Content

Unit I

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

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

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

Unit II

System modelling: Context models, Interaction Models, Structural Models, Behavioural 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, The Foundations of Agile, The Agile mind set, Delivery environments and Agile suitability, The lifecycle of product development, The ‘Iron Triangle’, Working with uncertainty and volatility, Empirical and defined processes.

Unit IV

Generic Agile Process: Agile operating model, Common Agile Roles, The customer, The team, The Agile lead, The stakeholders, Common Agile Techniques, Stories and backlog refinement, Agile estimation, Agile planning, Agile testing, Common Agile Practices, Short feedback loops, Face-to-face communication, Daily stand-ups, Show and tells, Retrospectives, Emergent documentation, Visual boards, Sustainable pace, Focus on quality, Major Agile technical practices

Unit V

Major Agile Frameworks: eXtreme programming (XP), Values, Principles, Practices Scrum, Roles, Activities and Artefacts, Dynamic systems development method (DSDM), Philosophy and eight principles, Roles, DSDM process, Agile project management, Kanban, models, Difference between Scrum and Kanban, Lean software development, Lean software development principles, Lean start-up, Scaled Agile framework (SAFe), Safe Process model

Text Books:

1. Ian Sommerville: Software Engineering, 9th Edition, Pearson Education Publications, 2013.
2. Peter Measey and Radtack: 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. Robert C. Martin with contributions by James W. Newkirk and Robert S Koss: Agile Software Development: Principles, Patterns and Practices, Pearsons Education.

Course Outcomes (COs):

1. Articulate the software engineering process by developing the Software Requirements Documentation. (PO-2,PO-3,PO-6,PO-7,PO-9,PO-10,PO-11)
2. Model and design solutions for a given real life problem. (PO-1, PO-2, PO-3, PO-5, PO-7,PO-9, PO-10, PO-11)
3. Describe the concepts Agile principles and Practices. (PO-2, PO-3, PO-6, PO-7, PO-9)
4. Discuss the process of Agile Software Development. (PO-2, PO-3, PO-6, PO-7, PO-9)
5. Describe the different Agile Framework for software Development. (PO-2, PO-3, PO-4, PO-6, PO-7, PO-8, PO-9, PO-10, PO-11)

COMPUTER NETWORKS	
Subject Code: MCA24	Credits: 3:0:1
Pre requisites: Nil	Contact Hours: 42L 28P
Course Coordinator: Dr. Monica R Mundada	

Course Content

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 De-multiplexing, 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: 1.1 – 1.5, 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.

Course Outcomes (COs):

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

RESEARCH METHODOLOGY AND IPR	
Subject Code: MCA25	Credits: 2:0:0
Pre requisites: Nil	Contact Hours: 28L
Course Coordinator: Dr. S Ajitha	

Course Content

Unit I

Research Methodology: Introduction, meaning of research, Objectives of research, Types of research, Research approaches, Significance of research, Research methods versus methodology, Research and scientific method, Research process, Criteria of good research, Problems encountered by researchers in India.

Defining the Research Problem: What is research problem, Selecting the problem, Necessity of defining the problem, Technique involved in defining a problem, An illustration.

Unit II

Literature review: Primary and secondary sources, Reviews, Monograph, Patents, Research databases, Web as a source, Searching the web, Critical literature review, identifying gap areas from literature and research database, Development of working hypothesis.

Research Design: Meaning of research design, need for research design, features of a good design, Importance concepts relating to research design, Different research designs, Basic principles of experimental design.

Unit III

Design of Sample Surveys- Introduction, sample design, sampling and non-sampling errors, sample survey Vs Census survey.

Methods of Data Collection - Collection of primary data, Collection of data through questionnaires, Collection of data through schedules, Guidelines for constructing Questionnaire/Schedules, some other methods of data collection, Collection of secondary data, Selection of appropriate method for data collection, Case study method.

Unit IV

Interpretation and Report Writing: Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports.

Unit V

IPR: IPR- Intellectual property rights and Patent law, Commercialization, Copyright, Royalty, Trade related aspects of intellectual property rights (TRIPS); Scholarly publishing- IMRAD concept and design of research paper, Citation and acknowledgement, Plagiarism, Reproducibility and Accountability.

Text Books:

1. Research Methodology: Methods and Techniques, C.R. Kothari, Gaurav Garg New Age International 4th Edition, 2018.
2. Research Methodology a step-by- step guide for beginners. (For the topic Reviewing the literature under module 2) Ranjit Kumar SAGE Publications Ltd 3rd Edition
3. Wadhera BL. 2010. Law Relating to Intellectual Property: Patent, Trademarks, Designs and Geographical Indication, Universal Law Publishing

Reference Book:

1. Zikmund WG, Babin BJ, Carr JC and Griffin M. 2013. Business Research Methods, Ninth Edition, Cengage India Private Limited, ISBN (13): 978- 9353503260.
2. Panneerselvam R. 2013. Research Methodology, Second Edition, Prentice Hall India Learning Private Limited, ISBN (13): 978-8120349469

Course Outcomes (COs):

1. Explain the research methodology and define the problem for research. (PO-2, PO-7)
2. Conduct literature review and apply the principles of research design. (PO-2, PO-3, PO-4, PO-7)
3. Apply the knowledge of various sampling procedures and different methods of data collection in the research. (PO-1, PO-2, PO-4)
4. Interpret and write effective research reports. (PO-4, PO-5, PO-9)
5. Apply ethics and concepts of intellectual property in the research process. (PO-6, PO-12)

ELECTIVE I

OBJECT ORIENTED MODELING AND DESIGN	
Subject Code: MCAE11	Credits: 2:0:1
Pre requisites: Nil	Contact Hours: 28L 28P
Course Coordinator: Dr. D Evangelin Geetha	

Course Content

Unit I

Introduction, Modeling Concepts, Class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history.

Modeling as a Design Technique: Modeling; abstraction; the three models.

Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models.

Unit II

Advanced Class Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes. Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages.

State Modeling: State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior.

Unit III

Interaction Modeling: Use case models; Sequence models; Activity models.

Use case relationships; Procedural sequence models; Special constructs for activity models.

System Conception: Devising a system concept; elaborating a concept; preparing a problem statement.

Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

Unit IV

Application Analysis: Application interaction model; Application class model; Application state model; adding operations.

Class Design: Overview of class design; Bridging the gap; Realizing use cases; Designing algorithms; Recurring downwards, Refactoring; Design optimization; Reification of behavior; Adjustment of inheritance; Organizing a class design; ATM example.

Unit V

Implementation Modeling: Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; realizing associations; Testing.

Legacy Systems: Reverse engineering; Building the class models; Building the interaction model; Building the state model; Reverse engineering tips; Wrapping; Maintenance.

Laboratory:

- Develop Object Oriented Analysis and design models for a real world problem
- Identify the model elements
- Draw the necessary diagrams in UML, using any UML tool
- Generate source code in Java/C++/C#

Text Books:

1. Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, Prentice Hall of India, 2005.
Chapters 1 to 5, 7 to 13, 15 to 17 and 23

Reference Books:

1. Grady Booch et al: Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.
2. Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2011.
3. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado: UML 2 Toolkit, Wiley-Dreamtech India, 2004.

Course Outcomes (COs):

1. Apply the concept of object oriented modeling and design techniques. (PO-1, PO-5, PO-9, PO-11)
2. Use the notations of class, state, use case, sequence and activity diagrams and various UML notations. (PO-1, PO-5, PO-7, PO-9, PO-11, PO-12)
3. Analyze the domain, application artifacts, and construct domain model and application model. (PO-1, PO-2, PO-3, PO-5, PO-7, PO-9, PO-11, PO-12)
4. Design classes using suitable design techniques. (PO-1, PO-2, PO-3, PO-5, PO-7, PO-9, PO-11, PO-12)
5. Explain implementation modeling and the legacy systems. (PO-1, PO-3)

DIGITAL MARKETING	
Subject Code: MCAE12	Credits: 3:0:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Ms. Komala R	

Course Content

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

USER INTERFACE AND USER EXPERIENCE DESIGN	
Subject Code: MCAE13	Credits: 2:0:1
Pre requisites: MCA17	Contact Hours: 28L 28P
Course Coordinator: Mr. Abhishek K L	

Course Content

Unit I

Usability of Interactive Systems: Introduction, Usability Goals and Measures, usability Motivations, Goals for Our Profession

Guidelines, Principles, and Theories: Introduction, Guidelines, Principles, Theories

Unit II

Managing Design Processes: Introduction, Organizational Design to Support Usability, The Four Pillars of Design, Development Methodologies, Ethnographic Observation, Scenario Development, Legal Issues

Evaluating Interface Designs: Expert Reviews, Usability Testing and Laboratories, Surveys Instruments, Acceptance Tests, Evaluation during Active Use

Unit III

Direct Manipulation and Virtual Environments: Introduction, Examples of Direct-Manipulation, 3D Interfaces, Virtual and Augmented Reality

Menu Selection, Form Fillin, and Dialog Boxes: Introduction, Task-Related Menu Organization, Single Menus, Combinations of Multiple Menus, Content Organization, Fast Movement through Menus, Data Entry with Menus: Form Fillin, Dialog Boxes and Alternatives.

Unit IV

Interaction Devices: Introduction, Keyboards and Keypads, Pointing Devices, Displays- Small and Large

Collaboration and Social Media Participation: Introduction, Goals of Collaboration and Participation, Asynchronous Distributed Interfaces: Different Place, Different Time, Synchronous Distributed Interfaces: Different Place, Same Time, Face-to-Face Interfaces: Same Place, Same Time

Unit V

Balancing Function and Fashion: Introduction, Error Messages, Display Design, Web Page Design, Window Design, Color

Information Search and Information Visualization:

Searching in Textual Documents and Database Querying, Multimedia Document Searches, Advanced Filtering and Search Interface, Challenges for Information Visualization.

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.

Text Book:

1. Shneiderman Plaisant, Cohen Jacobs: Designing the User Interface, 5th Edition, Pearson Education, 2010.

Reference Books:

1. Elvis Canziba: Hands-On UX Design for Developers: Design, prototype, and implement compelling user experiences from scratch. Packt Publishing, 2018.
2. Helen Sharp, Jennifer Preece, Yvonne Rogers- Interaction Design: Beyond Human-Computer Interaction, 5th edition, John Wiley & Sons; 2019.

Course Outcomes (COs):

1. Describe the fundamental knowledge on Usability of Interactive Systems and its Guidelines, Principles and theories. (PO-1,2,3)
2. Apply the techniques involved in designing real-time Interfaces and Managing Design Processes. (PO-1,2,3,5,9)
3. Apply a design process, Manipulation and data entries in web application navigation. (PO-1,2,3,10)
4. Describe the prominence of Interaction Devices, Collaboration and Social Media Participation. (PO-1,2,3)
5. Examine and design the Balancing Function and Fashion. (PO-1,2,3,5,10)

DATA ANALYTICS USING ‘R’	
Subject Code: MCAE14	Credits: 2:0:1
Pre requisites: Nil	Contact Hours: 28L 28P
Course Coordinator: Dr. D Evangelin Geetha	

Course Content

Unit I

Introduction to R: Introduction, Need of R, Advantages of R Over Other Programming Languages
Loading and Handling Data in R: Challenges of Analytical Data Processing, Expression, Variables and Functions, Missing Values Treatment in R,

Descriptive Statistics: Data Range, Frequencies and Mode, Mean and Median, Standard Deviation, Mode

Spotting Problems in Data with Visualisation: Visually Checking Distributions for a Single Variable, Histograms, Density Plots, Bar Charts

Unit II

Linear Regression using R: Introduction, Model Fitting, Linear Regression, lm() function in R
Assumptions of Linear Regression, Validating Linear Assumption, Using Scatter Plot, Using Residuals vs. Fitted Plot, Using Normal Q-Q Plot, Using Scale Location Plot, Using Residuals vs. Leverage Plot, Case Study

Unit III

Logistic Regression: Introduction, What is Regression?, Introduction to Generalised Linear Models, Logistic Regression, Binary Logistic Regression, Diagnosing Logistic Regression, Multinomial Logistic Regression Models, Case Study

Unit IV

Time Series in R: Introduction, What is Time Series Data?, Plotting Time series Data, Decomposing Time Series Data, Forecasts Using Exponential Smoothing, ARIMA Models, Case Study

Unit V

Clustering: Introduction, What is Clustering?, Basic Concepts in Clustering, Hierarchical Clustering, k-means Algorithm, CURE Algorithm,

Laboratory:

- Programs that supplement the theory concepts are to be implemented.

Text Books:

1. Seema Acharya, “Data analytics using R”, McGraw Hill Education (India) Private Limited, 2018

References:

1. Peter Bruce, Andrew Bruce: “Practical Statistics for Data Scientists”, O'Reilly Media, Inc., 2017.
2. Tilman M. Davies: “The Book of R: A First Course in Programming and Statistics”, No Starch Pres, 2016

Course Outcomes (COs):

1. Explain the fundamental syntax of R through readings, practice exercises, demonstrations, and writing R code. (PO-1, PO-2, PO-3, PO-5)
2. Apply critical programming language concepts such as data types, iteration, control structures, functions, and boolean operators by writing R programs and through examples. (PO-1, PO-2, PO-3, PO-5)
3. Import a variety of data formats into R using RStudio and Prepare or tidy datas for in preparation for analysis. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-7, PO-9)
4. Analyze a data set in R and present findings using the appropriate R packages. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-7, PO-9)
5. Visualize data attributes using ggplot2 and other R packages. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-7, PO-9)

ELECTIVE II

DIGITAL FORENSICS	
Subject Code: MCAE21	Credits: 2:0:1
Pre requisites:	Contact Hours: 28L 28P
Course Coordinator: Dr. Manish Kumar	

Course Content

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, PO-10)
2. Describe the file system and process handling concept of MS-DOS, Windows, and Macintosh and Linux operating system. (PO-3, PO-5, PO-10)
3. Analyze and validate evidences using forensic tools. (PO-4, PO-5, PO-6, PO-9, PO-10)
4. Extract, analyze hidden information from graphics, images and other files using forensic tools. (PO-4, PO-5, PO-9, PO-10)
5. Apply network forensic tools for network forensic, email investigation and live data forensic analysis. (PO-4, PO-5, PO-9, PO-10)

AUGMENTED AND VIRTUAL REALITY	
Subject Code: MCAE22	Credits: 2:0:1
Pre requisites: Nil	Contact Hours: 28L 28P
Course Coordinator: Dr. S Ajitha	

Course Content

Unit I

Introduction: Definition of VR, modern experiences, historical perspective. Virtual Reality Applications.

Birds-eye view: Hardware, sensors, displays, software, virtual world generator, game engines, human senses, perceptual psychology, psychophysics.

Unit II

Geometry of Virtual Worlds: Geometric models, Changing Position and orientation, Axis-Angle representation of rotation, Chaining the transformation.

Tracking: Tracking 2D orientation, Tracking 3D orientation, Tracking Position and orientation

Unit III

Getting started with Blender: An introduction to Blender. Features of Blender Layout workspace, Sculpt Workspace, Modeling Workspace, Animation Workspace. Introduction to Unity, working with objects, Working with Scripts First Person Controller, Third Person Controller

Unit IV

Introduction to Augmented Reality: Definition and scope, A brief history of augmented reality, Examples, Related fields.

Displays: Multimodal Displays, Visual Perception, Requirements and Characteristics, Spatial Display model, Visual Displays

Unit V

Evaluating VR Systems and Experiences: Perceptual Training, Recommendations for developers, Comfort and VR sickness, Experiments on Human subjects.

Software Architectures: AR Application Requirements, Software Engineering Requirements

Laboratory:

- Students shall implement programs which supplement the theory concepts

Text Books:

1. Steven M. LaValle: Virtual Reality, 2017 Available for downloading at <http://vr.cs.uiuc.edu/>.
2. Dieter Schmalstieg and Tobias Höllerer: Augmented Reality Principles and Practice, Addison-Wesley, 2016.

Reference 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. Paul Mealy: Virtual & Augmented Reality. Wiley publications 2018

Course Outcomes (COs):

1. Explain the concepts of Virtual Reality and its Applications. (PO-1, PO-2, PO-3)
2. Demonstrate a virtual environment to captivate its experiences. (PO-1, PO-2, PO-3, PO-5, PO-10)
3. Apply the tools for Virtual Reality. (PO-1, PO-2, PO-3, PO-5, PO-6, PO-10)
4. Create scenarios using Augmented and Virtual Reality. (PO-1, PO-2, PO-3, PO-5, PO-6, PO-10)
5. Analyze the fundamental issues of virtual reality. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-10)

OPERATIONS RESEARCH	
Subject Code: MCAE23	Credits: 2:1:0
Pre requisites: Nil	Contact Hours: 28L 28T
Course Coordinator: Dr. D Evangelin Geetha	

Course Content

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, PO-2, PO-4)
2. Solve LP problems using simplex methods. (PO-1, PO-2, PO-4)
3. Derive dual from a given primal problem and solve the LP problem using dual simplex method. Formulate and solve simple games to resolve competitive situations. (PO-1, PO-2, PO-4)
4. Develop transportation and assignment models and solve the models to obtain optimum solution. (PO-1, PO-2, PO-4)
5. Apply PERT and CPM techniques for project management. (PO-1, PO-2, PO-4)

SOCIAL NETWORK ANALYSIS	
Subject Code: MCAE24	Credits: 2:0:1
Pre requisites: Nil	Contact Hours: 28L 28P
Course Coordinator: Dr. D Evangelin Geetha	

Course Content

Unit I

Networks and Society: Social Network Analysis, Applications, Graph Preliminaries, Three Levels of Social Network Analysis, Graph Visualization Tools

Network Measures: Network Basics – Degree and Degree Distribution, Paths

Unit II

Network Measures: Network Basics – Clustering Coefficient, Connected Components, Node Centrality, Assortativity, Transitivity and Reciprocity, Similarity

Unit III

Link Analysis: Applications of Link Analysis, Signed Networks, Strong and Weak Ties, Link Analysis Algorithms, PageRank, SimRank

Link Prediction: Applications of Link Prediction, Temporal Changes in a Network, Problem Definition, Evaluating Link Prediction Methods

Unit IV

Community Structure in Networks: Applications of Community Detection, Types of Communities, Community Detection Methods, Disjoint Community Detection - Node-centric Community Detection, Modularity and Community Detection-Modularity, Fast Greedy Algorithm, Overlapping Community Detection - Clique Percolation, Link Partition, Evaluation of Community Detection Methods-Evaluation for Disjoint Communities.

Unit V

Anomaly Detection in Networks: Outliers and versus Network-based Anomalies, Challenges, Anomaly Detection in Static Networks, Anomaly Detection in Dynamic Networks – Preliminaries, Feature-based Approaches, Decomposition-based Approaches, Window-based Approaches

Laboratory:

- The students have to work on simulated and publicly available real datasets. The project(s) will require students to develop a complete end-to-end solution requiring preprocessing, design of the graph algorithms, training and validation, testing and evaluation with quantitative performance comparisons.

Text Books:

1. Tanmoy Chakraborty: Social Network Analysis, Wiley, 2021.
Chapters: 1.1 - 1.5, 1.7, 2.1 – 2.5, 4.1 – 4.5, 4.8, 5.1 – 5.3, 5.4.1, 5.4.2, 5.5.1, 5.5.2, 5.7, 5.8, 6.1 – 6.4, 8.1 – 8.3, 8.4.1, 8.4.2, 8.4.3, 8.4.5

References:

1. Stanley Wasserman, Katherine Faust: Social Network Analysis: Methods and Applications, Cambridge University Press, 1994.
2. Charu C Aggarwal: Social Network Data Analytics, Springer, 2011.

Course Outcomes (COs):

1. Relate the physical society with the online social network and explain how one shapes the other. (PO-1, PO-2, PO-6, PO-10)
2. Apply network measures to real-world networks. (PO-1, PO-2)
3. Analyze the edges in the network using link analysis algorithms and link prediction methods. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-9, PO-10, PO-11, PO-12)
4. Formulate the community structures in networks and evaluate the community detection methods. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-9, PO-10, PO-11, PO-12)
5. Design algorithms for efficient and cost-effective anomaly detection and discuss the advantages and limitations of existing graph representation learning approaches. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-9, PO-10, PO-11, PO-12)

ELECTIVE III

FULL STACK WEB DEVELOPMENT	
Subject Code: MCAE31	Credits: 0:1:2
Pre requisites: MCA17	Contact Hours: 28T 56P
Course Coordinator: Ms. Sushitha S	

Course Content

Concepts to be covered in Tutorial

1. Introduction to ReactJS, Express JS and Node.js.
2. React features, components, keys, lists.
3. React CSS, React Props Validation.
4. React forms, events, React Conditional Rendering.
5. Node.js First Application, REPL Terminal, Package Manager(NPM).
6. Node.js Callbacks, Even Loop, Event Emitter.
7. Node.js Buffers, Streams and File System.
8. Express JS Routing, HTTP Methods.
9. Express JS URL Building, Templating, Static Files.
10. Express JS Cookies, Sessions and Authentication.
11. Connecting MongoDB, insert documents, update/delete documents, Query Database.

Laboratory:

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

References:

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

Course Outcomes (COs):

1. Demonstrate and Develop simple programs using ReactJS. (PO-1, PO-2, PO-3, PO-5, PO-6, PO-9)
2. Demonstrate and Develop simple programs using Express JS. (PO-1, PO-2, PO-3, PO-5, PO-6 PO-,9)
3. Demonstrate and Develop simple programs using Node JS. (PO-1, PO-2, PO-3, PO-5, PO-6, PO-9)

ASP.NET WITH C#	
Subject Code: MCAE32	Credits: 0:1:2
Pre requisites: MCA17	Contact Hours: 28T 56P
Course Coordinator: Dr. Madhu Bhan	

Course Content

Concepts to be covered in Tutorial

1. Introduction to C#, Classes.
2. Concepts of ASP.NET Framework, and Applications
3. Working with Standard, List, Rich and Validation Controls.
4. Building Data Access Components with ADO.NET
5. Working with GridView, Repeater, Data list and Navigation Controls.
6. Concepts of LINQ to SQL.
7. Designing websites with Master pages.
8. 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, PO-3, PO-5, PO-6, PO-8, PO-10, PO-11, PO-12)
2. Demonstrate the use of ADO.NET for Web Applications. (PO-2, PO-3, PO-5, PO-6, PO-8, PO-10, PO-11, PO-12)
3. Exhibit skills to use technologies like master pages and LINQ to develop highly responsive web applications (PO-2, PO-3, PO-5, PO-6, PO-8, PO-10, PO-11, PO-12)

POWER BI	
Subject Code: MCAE33	Credits: 0:1:2
Pre requisites: Nil	Contact Hours: 28L 28P
Course Coordinator: Ms. R Geetanjali	

Course Content

Concepts to be covered in Tutorial

1. Introduction to Power BI and difference between Power BI and Excel
2. Understanding the Power BI Desktop Basics and preparing the project template
3. Understanding Data Preparation/Cleaning and Cleansing
4. Data Preparation in the Power Query Editor
5. The Star Schema
6. Data Transformation in the Power Query Editor
7. The Data Model: Working with Relationships and DAX (Data Analysis Expressions)
8. Creating Visuals in Report View

Laboratory:

- Get to know the different tools of the Power BI universe and learn how to use them
- Understanding Power BI Desktop and its components
- Learning how to use the Query Editor to connect Power BI to various source types, how to work on the Data Model and understand the difference between those two steps
- Learning how to filter and format data, how pivoting and unpivoting works
- Illustrating the different views of the Data Model
- Demonstrating how to create calculated columns and measures
- Understanding how to build relationships between different tables
- Demonstrating how to create a report with different interactive visualization types?
- Learning how to use Power BI Pro to create dashboards and to share and publish your results

Reference Books:

1. Power Pivot and Power BI: The Excel User's Guide to DAX Power Query, Power BI & Power Pivot by Rob Collie and Avi Singh, Holy Macro! Books, PO Box 541731 Merritt Island FL 32954 USA
2. Beginning DAX with Power BI: The SQL Pro Guide to better Business Intelligence by Philips Seamark, Apress Publications.

Course Outcomes(COs):

1. Analyze data from different data sources and create their own datasets. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-9, PO-12)
2. Illustrate the different tools of the Power BI universe and know how the different tools work together. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-8, PO-9, PO-11)
3. Build Power BI applications. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-8, PO-9, PO-11)

WEB PROGRAMMING WITH PHP AND AJAX	
Subject Code: MCAE34	Credits: 0:1:2
Pre requisites: MCA17	Contact Hours: 28T 56P
Course Coordinator: Mr. Tamal Sarkar	

Course Content

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

III SEMESTER

MOBILE APPLICATION DEVELOPMENT	
Subject Code: MCA31	Credits: 0:1:2
Pre requisites: MCA21	Contact Hours: 28T 56P
Course Coordinator: Ms. Sushitha S	

Course Content

Topics to be Covered in Tutorial

1. Introduction to android, features, Android Architecture
2. Exploring linear layout and Relative layout, Frame Layout
3. Exploring UI widgets
4. Android activity life cycle
5. Intents in Android
6. Fragments in android
7. Databases and content providers
8. Services
9. Location based services
10. Audio playback and image capture
11. Introduction to frameworks (Flutter, Cordova)

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. **Web Reference:** Any Google developer sites

Course Outcomes (COs):

1. Describe the Android SDK, Development Framework and Demonstrate Android Application Life Cycle. (PO-1, PO-2, PO-3, PO-5)
2. Apply the Android UI and animations API for enhancing the user experience and developing advanced applications. (PO-1, PO-2, PO-3, PO-5, PO-7, PO-10, PO-11)
3. Develop the Android Applications using sensors, location based services, databases and Background services. (PO-1, PO-2, PO-3, PO-5, PO-7, PO-10, PO-11, PO-12)

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	
Subject Code: MCA32	Credits: 3:0:1
Pre requisites: MCA11, MCA12	Contact Hours: 42L 28P
Course Coordinator: Dr. Madhu Bhan	

Course Content

Unit I

Artificial Intelligence: Overview of AI Techniques, Types of Knowledge, Knowledge Representation, Solving Problems by Searching, Problem Solving using State Space Search (Tic-Tac-Toe and water jug problem), Forward vs Backward Reasoning

Unit II

Introduction to 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.

Unit III

Classification: Decision Tree, Building a Decision tree, Information gain of Decision tree, Bayes Bayes Theorem, Naïve Bayes classifier, Applications of Naïve Bayes Theorem. Support Vector Machines, Linear SVM, Kernel Tricks, k-Nearest Neighbors.

Unit IV

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

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

Unit V

Feature Transformation: Feature Construction, Feature Extraction, Feature Subset Selection, Feature Selection Approaches.

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

Laboratory:

- Implementation of techniques for AI and ML using Python

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, Vincy 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.
4. Stuart Russel, and Peter Norvig, Artificial Intelligence: A Modern Approach by, 3rd Edition, Pearson Education, 2015.

Course Outcomes (COs):

1. Explain basic concepts of Artificial Intelligence. (PO-1, PO-2, PO-3, PO-4)
2. Distinguish between types of learning and prepare the data for analysis. (PO-1, PO-2, PO-3, PO-4, PO-8)
3. Classify the data using Decision Tree, Naïve Bayes Classifier, kNN and SVM techniques. (PO-1, PO-2, PO-3, PO-4)
4. Develop Regression and Clustering Models for any given problem. (PO-1, PO-2, PO-3, PO-4)
5. Explain the basic concepts of feature transformation and design simple neural network models. (PO-1, PO-2, PO-3, PO-4, PO-8)

INFORMATION SECURITY	
Subject Code: MCA33	Credits: 3:0:1
Pre requisites: Nil	Contact Hours: 42L 28P
Course Coordinator: Dr. Manish Kumar	

Course Content

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, PO-6)
2. Determine risks and its controlling mechanisms, and discuss the importance of firewalls and VPN in the context of network security. (PO-1, PO-5, PO-7, PO-10)
3. Discuss different security technologies and implementation of information security. (PO-1, PO-3, PO-5, PO-7, PO-10)
4. Apply symmetric key cryptography and encryption standards. (PO-1, PO-3, PO-5, PO-7, PO-10)
5. Explain public-key cryptography and hash functions. (PO-1, PO-3, PO-5, PO-7, PO-10)

CLOUD COMPUTING	
Subject Code: MCA34	Credits: 3:0:1
Pre requisites: MCA14, MCA24	Contact Hours: 42L 28P
Course Coordinator: Dr. Madhu Bhan	

Course Content

Unit I

Introduction: Cloud Computing, delivery models & Services, Ethical issues, Cloud vulnerabilities, Challenges, Cloud Infrastructure: Amazon, Azure & online services, open source private clouds. Storage diversity and vendor lockin, Cloud interoperability, Service and Compliance level agreement, Responsibility sharing between a user and a CSP, User experience, Software licensing., Challenges faced by Cloud Computing.

Unit II

Applications and Paradigms: Challenges, existing and new application opportunities, Architectural styles of cloud applications; different cloud architectures, Applications: Healthcare, Energy systems, transportation, manufacturing, Education, Government, mobile communication, application development.

Unit III

Cloud Resource Virtualization: Layering and virtualization, Virtual machine monitors, Virtual machines, VM Performance and security isolation, virtualization types, Hardware support for virtualization, A performance comparison of virtual machines, The darker side of virtualization, Software virtualization.

Unit IV

Cloud Resource Management and Scheduling: Policies and mechanisms for resource management, Resource bundling, combinatorial auctions for cloud Scheduling algorithms for computing clouds, fair queuing, start time fair queuing, borrowed virtual time Resource management and application scaling.

Unit V

Cloud Security: Cloud Security Risks, security as a service, privacy and privacy impacts assessments, Trust, OS security, VM security, security of virtualization, risk posed by shared images, Security risks posed by a management OS, Xoar, and Trusted VMM, Mobile Devices and cloud security, AWS security.

Laboratory

- Programs that supplement the theory concepts are to be implemented

Text Books:

1. Marinescu, Dan C. Cloud computing: theory and practice. Morgan Kaufmann, 2022. – 3rd Edition – Elsevier.

Reference Books:

1. Raj kumarBuyya, Christian Vecchiola, S.ThamaraiSelvi, "Mastering Cloud Computing", McGraw Hill Education (2013).
2. Cloud Computing: A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw Fill, 2010.

Course Outcomes (COs):

1. Describe the Delivery and Deployment models of Cloud Computing. (PO1, PO2, PO3, PO5).
2. Explain the fundamentals of cloud Architectures and cloud computing applications (PO1, PO2, PO3, PO5).
3. Demonstrate Cloud Resource Virtualization and the development of Cloud Computing. (PO1, PO2, PO3, PO5)
4. Understand Resource Management and Scheduling (PO-1, PO-2, PO-3, PO5)
5. Acquire knowledge of Cloud security. (PO-1, PO-2, PO-3, PO5)

ELECTIVE IV

NATURAL LANGUAGE PROCESSING	
Subject Code: MCAE41	Credits: 3:0:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. Madhu Bhan	

Course Content

Unit I

Language Modelling: Introduction to Natural Language Processing, Language and Knowledge, Language and Grammar, NLP Applications, Various Grammar-based Language Models, Statistical Language Model.

Unit II

Word Level Analysis: Introduction, Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and Correction, Words and Word Classes, Part-of-Speech Tagging

Unit III

Syntactic Analysis: Introduction, Context-Free Grammar, Contents, Constituency, Parsing, Probabilistic Parsing, Indian Languages.

Unit IV

Semantic Analysis: Introduction, Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation.

Unit V

Machine Translation: Problems in Machine Translation, Machine Translation Approaches, Direct Machine Translation, Rule-based Machine Translation, Corpus-based Machine Translation, Semantic or Knowledge-based MT systems.

Text Books:

1. Natural Language Processing and Information Retrieval by Tanveer Siddiqui and U.S Tiwary, Oxford University Press, 2008.
2. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Daniel Jurafsky, James H. Martin Pearson Publication, 2014.

Reference Books:

1. Natural Language Processing and Text Mining by Anne Kao and Stephen R. Potte, Springer Verlag, London, 2007.

2. Natural Language Processing with Python Steven Bird, Ewan Klein, Edward Loper O'Reilly Media 2009.

Course Outcomes (COs):

1. Tag a given text with basic language features. (PO-1, PO-2, PO-3)
2. Design an innovative application using NLP components. (PO-1, PO-2, PO-3)
3. Design a rule based system to tackle morphology/syntax of a language. (PO-1, PO-2, PO-3)
4. Design a tag set to be used for statistical processing of real time applications.(PO-1, PO-2, PO-3)
5. Compare and contrast various machine translation approaches. (PO-1, PO-2, PO-3)

CYBER SECURITY	
Subject Code: MCAE42	Credits: 3:0:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. Manish Kumar	

Course Content

Unit I

Cyber security increasing threat landscape, Cyber security terminologies- Cyberspace, attack, attack vector, attack surface, threat, risk, vulnerability, exploit, exploitation, hacker., Non-state actors, Cyber terrorism, Protection of end user machine, Critical IT and National Critical Infrastructure, Cyberwarfare, Case Studies.

Unit II

Cyber crimes targeting Computer systems and Mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, APTs, virus, Trojans, ransomware, data breach., Online scams and frauds- email scams, Phishing, Vishing, Smishing, Online job fraud, Online sextortion, Debit/ credit card fraud, Online payment fraud, Cyberbullying, website defacement, Cybersquatting, Pharming, Cyber espionage, Cryptojacking, Darknet- illegal trades, drug trafficking, human trafficking., Social Media Scams & Frauds- impersonation, identity theft, job scams, misinformation, fake news cyber crime against persons - cyber grooming, child pornography, cyber stalking., Social Engineering attacks, Cyber Police stations, Crime reporting procedure, Case studies.

Unit III

Cyber crime and legal landscape around the world, IT Act, 2000 and its amendments. Limitations of IT Act, 2000. Cyber crime and punishments, Cyber Laws and Legal and ethical aspects related to new technologies- AI/ML, IoT, Blockchain, Darknet and Social media, Cyber Laws of other countries, Case Studies.

Unit IV

Defining data, meta-data, big data, nonpersonal data. Data protection, Data privacy and data security, Personal Data Protection Bill and its compliance, Data protection principles, Big data security issues and challenges, Data protection regulations of other countries- General Data Protection Regulations (GDPR), 2016 Personal Information Protection and Electronic Documents Act (PIPEDA)., Social media- data privacy and security issues.

Unit V

Cyber security Plan- cyber security policy, cyber crises management plan., Business continuity, Risk assessment, Types of security controls and their goals, Cyber security audit and compliance, National cyber security policy and strategy.

Text Books:

1. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd, 2011.
2. Data Privacy Principles and Practice by Natraj Venkataramanan and Ashwin Shriram, CRC Press, 2016.

Reference Books:

1. Information Warfare and Security by Dorothy F. Denning, Addison Wesley.
2. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform.
3. Information Security Governance, Guidance for Information Security Managers by W. Krag Brothy, 1st Edition, Wiley Publication.
4. Auditing IT Infrastructures for Compliance by Martin Weiss, Michael G. Solomon, 2nd Edition, Jones Bartlett Learning.

Course Outcomes (COs):

1. Describe the basic terminologies related to cyber security and current cyber security threat landscape. (PO-1, PO-2, PO-6)
2. Develop understanding about the type and nature of cybercrimes and as to how report these crimes through the prescribed legal and Government channels. (PO-1, PO-6)
3. Examine the legal framework that exist in India for cybercrimes and penalties and punishments for such crimes. (PO-1, PO-6)
4. Explain the aspects related to personal data privacy and security. (PO-1, PO-6)
5. Determine the risk based assessment, requirement of security controls and need for cyber security audit and compliance. (PO-1, PO-3, PO-6)

SECURE CODING IN C AND C++	
Subject Code: MCAE43	Credits: 2:0:1
Pre requisites: Nil	Contact Hours: 28L 28P
Course Coordinator: Dr. Manish Kumar	

Course Content

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

BLOCKCHAIN TECHNOLOGY	
Subject Code: MCAE44	Credits: 2:0:1
Pre requisites: Nil	Contact Hours: 28L 28P
Course Coordinator: Dr. Manish Kumar	

Course Content

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 and Solidity.

Unit V

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

Text Books:

1. Josh Thompsons: Block Chain: The Block Chain for Beginners - Guide to Blockchain Technology and Leveraging Block Chain Programming, Create Space Independent Publishing Platform, 2017.
2. Daniel Drescher: Block Chain Basics, 1st Edition, Apress, 2017.

Reference Books:

1. Melanie Swan: Block Chain: Blueprint for a New Economy, O'Reilly, 2015.
2. Anshul Kaushik: Block Chain and Crypto Currencies, Khanna Publishing House, Delhi, 2019.
3. Imran Bashir: Mastering Block Chain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained, Packt Publishing, 2018.
4. Ritesh Modi: Solidity Programming Essentials: A Beginner's Guide to Build Smart Contracts for Ethereum and Block Chain, Packt Publishing, 2018.
5. 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, PO-2, PO-3, PO-5, PO-9, PO-12)
2. Explain the concept of crypto currencies and consensus algorithms. (PO-1, PO-2, PO-3, PO-5, PO-9, PO-12)
3. Describe different types of Blockchain and smart contract. (PO-1, PO-2, PO-3, PO-5, PO-9, PO-12)
4. Develop Blockchain based applications using Hyperledger Fabric. (PO-1, PO-2, PO-3, PO-5, PO-9, PO-12)
5. Integrate ideas from various domains and implement them using Blockchain technology. (PO-1, PO-2, PO-3, PO-5, PO-9, PO-12)

ELECTIVE V

WEB COMPONENT DEVELOPMENT WITH J2EE	
Subject Code: MCAE51	Credits: 0:1:2
Pre requisites: MCA21	Contact Hours: 28T 56P
Course Coordinator: Ms. R Geetanjali	

Course Content

Topics to be covered in Tutorial:

1. Introduction to J2EE and JDBC
2. Creating statement objects
3. Writing the Callable and Prepared statements
4. Creating Servlets, Servlet Context and Config
5. Using Request Dispatcher
6. Using Send Redirect
7. Create Cookies and how to track sessions using Session Tracking
8. Using Filter API in the code
9. Introduction to Java Server Pages(JSP) and explain Components of a JSP
10. Creating Declaratives, Directives, (Page, Include, Taglib)
11. Creating and calling Implicit Objects, JSTL
12. Introduction to JSP Standard Actions
13. Introduction to Java Beans, a Bean Example
14. Integrating the pages JSP with Java Beans
15. Introduction to Springs and Spring with Eclipse
16. Creating first Spring Application
17. Introduction to Hibernate and Configuring Hibernate with Eclipse
18. 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, 1st Edition, Tata McGraw Hill, 2002.
2. Mahesh P. Matha: JSP and Servlets, 1st Edition, 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, PO-2, PO-3, PO-5, PO-7, PO-11, PO-12)
2. Apply the concepts JSP, Beans and Java frameworks for Dynamic Web Applications. (PO-1, PO-2, PO-3, PO-5, PO-7, PO-11, PO-12)
3. Demonstrate the concepts of framework and create Simple web-based application with the interaction of multi-tier architecture. (PO-1, PO-2, PO-3, PO-5, PO-7, PO-11, PO-12)

PROGRAMMING IoT	
Subject Code: MCAE52	Credits: 0:1:2
Pre requisites: MCA11, MCA23	Contact Hours: 28T 56P
Course Coordinator: Mr. Abhishek K L	

Course Content

Concepts to be covered in Tutorial

1. Introduction to Internet of Things (IoT)
2. IoT enabling technologies and IoT levels
3. Python Programming with Raspberry Pi
4. Working with Arduino
5. Working with Sensors on Raspberry Pi and Arduino
6. Case study on Home Intrusion Detection
7. Introducing Cloud platform for IoT
8. 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, PO-2, PO-3, PO-5)
2. Configure and set up the Arduino board for a given application. (PO-1, PO-2, PO-3, PO-5)
3. Building IoT applications using Cloud and Machine Learning. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-8, PO-9, PO-10, PO-11, PO-12)

SOFTWARE TESTING	
Subject Code: MCAE53	Credits: 0:1:2
Pre requisites: MCA11 , MCA23	Contact Hours: 28T 56P
Course Coordinator: Dr. D Evangelin Geetha	

Course Content

Concepts to be covered in Tutorial

1. Articulate the basics of Software Testing Life Cycle using Manual Testing implementations.
2. Installation of Selenium IDE, Recording and running test cases using Selenium IDE, Selenium Commands
3. Installation of Selenium Webdriver in Pycharm and basics of python programming
4. Finding Elements by NAME, ID, CSS, XPATH, LINKTEXT. Understanding “By” class
5. Working with Web Elements; Useful Methods and Properties; Wait Types.
6. Construct the complete automation framework in selenium webdriver.
7. 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, PO-2, PO-3, PO-4, PO-5, PO-7, PO-9, PO-11, PO-12)
2. Demonstrate the basics of working with Selenium IDE. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-7, PO-9, PO-11, PO-12)
3. Demonstrate the basics of working with Selenium Web Driver. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-7, PO-9, PO-11, PO-12)

DEVOPS	
Subject Code: MCAE54	Credits: 0:1:2
Pre requisites: Nil	Contact Hours: 28T 56P
Course Coordinator: Mr. Abhishek K L	

Course Content

Concepts to be covered in Tutorial

1. Introduction to Agile, Agile Phases.
2. Introduction to DevOps, DevOps Life Cycle, Agile vs DevOps
3. DevOps Work Flow and Principles.
4. Roles, Responsibilities and Skills of a DevOps Engineer.
5. overview of Git, GitHub, Git Workflow.
6. Overview of Jenkins.
7. Introduction to Docker, Docker Architecture.
8. 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, PO-6, PO-7, PO-8)
2. Demonstrate the basic commands and Source Control Management using Git. (PO-3, PO-5, PO-6, PO-8)
3. Implement the CI/CD Pipelines and Continuous Monitoring using Jenkins, Maven and Docker. (PO-3, PO-5, PO-6, PO-9)

ELECTIVE VI

SOFTWARE PROJECT MANAGEMENT	
Subject Code: MCAE61	Credits: 3:0:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. Monica R Mundada	

Course Content

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 13.10.2

Reference Books:

1. Robert K. Wysocki: Effective Software Project Management, Wiley Publication, 2011.
2. Walker Royce: Software Project Management, Addison-Wesley, 1998.
3. Gopalaswamy 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, PO-2, PO-4, PO-6, PO-8, PO-9, PO-10)
2. Explain the project planning approach and apply the software effort estimation techniques. (PO-1, PO-2, PO-4, PO-8, PO-9, PO-12)
3. Determine the appropriate process model and produce activities plan. (PO-1, PO-2, PO-4, PO-8, PO-9, PO-12)
4. Manage the risks, monitor the progress of projects and manage the change control. (PO-1, PO-2, PO-4, PO-6, PO-8, PO-9)
5. Handle the resource allocation and practice the software quality standards. (PO-1, PO-2, PO-4, PO-6, PO-8, PO-9, PO-12)

MANAGEMENT AND ENTREPRENEURSHIP	
Subject Code: MCAE62	Credits: 3:0:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Dr. S Ajitha	

Course Content

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, Difference between Strategic Planning and Tactical Planning

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).

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, Distinction between an Entrepreneur and a Manager, Intrapreneur, Social Entrepreneur.

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

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.

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.

Reference Books:

1. Poornima M Charantimath: Entrepreneurship Development Small Business Development Pearson Education 2008
2. Kanishka Bedi, Management and Entrepreneurship, Oxford University Press-2017

Course Outcomes (COs):

1. Discuss the nature and functions of management and functions of manager. (PO-8, PO-9, PO-11, PO-12)
2. Exemplify the administrative skills coordination, staffing and managerial control. (PO-8, PO-11, PO-12)
3. Identify the skills required for an entrepreneur. (PO-8, PO-11, PO-12)
4. Discuss the role of micro and small enterprises. (PO-8, PO-11, PO-12)
5. Discuss the support of institutional finance to entrepreneurs and institutional support to entrepreneurs. (PO-8, PO-11, PO-12)

DESIGN THINKING	
Subject Code: MCAE63	Credits: 3:0:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Ms. Komala R	

Course Content

Unit I

DESIGN THINKING

Introduction, need for need design thinking, uniqueness of design thinking

DESIGN ACTION PLAN: Five 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?

Textbooks:

1. Daniel Ling: Complete Design Thinking Guide for Successful Professionals, Emerge Creatives Group LLP, 2015.

Reference Books:

1. Nigel Cross, Design Thinking: Understanding How Designers Think and Work, Bloomsbury Academic, 2016.
2. John R. Karsnitz, Stephen O'Brien, John P. Hutchinson: Engineering Design: An Introduction, Cengage Learning, 2nd Edition.
3. Yousef Haik, Sangarappillai Sivaloganathan, Tamer M. Shahin: Engineering Design Process, Cengage Learning, 2018.

Course Outcomes (COs):

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

ENTERPRISE RESOURCE PLANNING	
Subject Code: MCAE64	Credits: 3:0:0
Pre requisites: Nil	Contact Hours: 42L
Course Coordinator: Ms. Komala R	

Course Content

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
2. concepts and Planning, Prentice Hall, 1998.
3. 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, PO-2, PO-3, PO-4, PO-8)
2. Analyze the implementation of ERP in the context of business of the different organization. (PO-2, PO-3, PO-8, PO-9, PO-11)
3. Apply ERP for different business modules. (PO-1, PO-2, PO-3, PO-4, PO-8)
4. With the help of a case study explain ERP marketing. (PO-2, PO-3, PO-8, PO-9, PO-11)
5. Analyze the design ERP with future E-commerce and internet. (PO-1, PO-2, PO-8, PO-11)

PROJECT WORK - PHASE I	
Subject Code: MCAP1	Credits: 0:0:4
Pre requisites: Nil	Contact Hours: 28P
Course Coordinator: Dr. Manish Kumar	

Course Content

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 Project Phase-1.
- 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,
- 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 Project phase-1

Course Outcomes (COs):

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

SOCIETAL ACTIVITY	
Subject Code: MCASA	Credits: 0:0:0
Pre requisites: Nil	Contact Hours: Nil
Course Coordinator: Dr. D Evangelin Geetha	

Course Content

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 and a report.
- The result is declared either pass or fail, based on the completion of the course in the stipulated time.

Course Outcomes (COs):

1. Engage in independent learning in the chosen area/field. (PO-8)
2. Discuss the legal, environmental, societal and health issues for the work carried out. (PO-3)
3. Function effectively as an individual or work in a team for the task undertaken. (PO-5)

IV SEMESTER

PROJECT PHASE - II	
Subject Code: MCAP2	Credits: 16
Pre requisites: Nil	Contact Hours: Nil
Course Coordinator: Dr. Manish Kumar	

Course Content

Dissertation Work Guidelines

- During the phase-2, the students are required to carry out the implementation, testing and results part of their project work.
- The students are required to exhibit their working model module-wise to their guide every week.
- 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. Implement the design, verify, validate and analyze the results. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-7, PO-8, PO-9, PO-10, PO-11, PO-12)
2. Demonstrate and document the project work efficiently. (PO-4, PO-5, PO-6, PO-7, PO-8, PO-9, PO-10, PO-11, PO-12)
3. Manage as an individual or in a team in development of technical projects. (PO-5, PO-7, PO-8, PO-9, PO-10, PO-11, PO-12)

SEMINAR	
Subject Code: MCAS1	Credits: 2
Pre requisites: Nil	Contact Hours: Nil
Course Coordinator: Mr. Abhishek K L	

Course Content

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 and review the literature in a state-of-the art research area. (PO-2, PO-5, PO-6, PO-7, PO-9, PO-10, PO-12)
2. Design and develop a solution for an identified problem. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-9, PO-10, PO-12)
3. Analyze and validate the findings. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-9, PO-10, PO-11, PO-12)
4. Communicate the research work professionally and develop the team spirit. (PO-1, PO-2, PO-5, PO-7, PO-9, PO-11)

INDUSTRY INTERNSHIP	
Subject Code: MCAIN	Credits: 2
Pre requisites: Nil	Contact Hours: Nil
Course Coordinator: Dr. Madhu Bhan	

Course Content

- 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, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-10, PO-12)
2. Contribute as an individual or in a team in development of technical projects. (PO-1, PO-2, PO-3, PO-7, PO-8, PO-9, PO-11, PO-12)
3. Develop effective presentation skills in presenting project related activities. (PO-1, PO-2, PO-3, PO-4, PO-5, PO-6, PO-7, PO-8, PO-9, PO-11, PO-12)

ABILITY ENHANCEMENT COURSE	
Subject Code: MCAAEC	Credits: 2
Pre requisites: Nil	Contact Hours: Nil
Course Coordinator: Mr. Abhishek K L	

Course Content

Guidelines:

- Students have to acquire the credits by carrying out an On-line Course
- Students can register for any On-line 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 course
- A stipulated period can be provided for the approval and evaluation process

Course Outcomes (COs):

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