COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

COIMBATORE - 641 014, TAMILNADU, INDIA

DIAMOND JUBILEE

(1956 - 2016)

DEPARTMENT OF COMPUTER APPLICATIONS

MASTER OF COMPUTER APPLICATIONS

Curriculum and Syllabi

Under Choice Based Credit System

(For the students admitted during 2020 - 2021 and onwards)

INDEX

COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

VISION AND MISSION OF THE INSTITUTE

VISION

The Institute strives to inculcate a sound knowledge in engineering along with realized social responsibilities to enable its students to combat the current and impending challenges faced by our country and to extend their expertise to the global arena.

MISSION

The mission of CIT is to impart high quality education and training to its students to make them World-Class Engineers with a foresight to the changes and problems, and pioneers to offer innovative solutions to benefit the nation and the world at large.

COIMBATORE INSTITUTE OF TECHNOLOGY

(Government Aided Autonomous Institution Affiliated to Anna University, Chennai)

DEPARTMENT OF COMPUTER APPLICATIONS

VISION AND MISSION

VISION

The Department of Computer Applications strives to groom students with diverse backgrounds into competitive software professionals and pioneering leaders in offering innovative solutions to dynamic global challenges in tune with the needs of the society.

MISSION

The Mission of Department of Computer Applications is to :

M1 Provide an environment for students to gain expertise in theoretical foundations of computer applications with emphasis on strong practical training that will enable them to develop real world applications catering to the global needs.

M2 Offer students a quality learning process in a research oriented environment with industrial collaboration that motivates them to innovate and explore.

M3 Develop intellectual curiosity and a commitment to lifelong learning in students, with societal and environmental concerns.

COIMBATORE INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF COMPUTER APPLICATIONS

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEOs for MCA programme are designed based on the Department Mission.

MCA Graduates will be able to :

PEO 1 : Develop software solutions to problems across a broad range of application domains through analysis and design.

PEO 2 : Contribute to research of their chosen field and function and communicate effectively, to perform both individually and in a multi-disciplinary team.

PEO 3 : Continue the process of life-long learning through professional activities; adapt themselves with ease to new technologies, while exhibiting high ethical and professional standards.

COIMBATORE INSTITUTE OF TECHNOLOGY

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DEPARTMENT OF COMPUTER APPLICATIONS

PROGRAMME OUTCOMES (POs)

The following are Programme Outcomes for the MCA Programme :

PO1 : Graduates will be able to apply knowledge of computing fundamentals, computing specialization and domain knowledge for the abstraction and conceptualization of computing models from defined problems and requirements.

PO2 : Graduates will have the ability to understand and analyze a given real-world problem and propose feasible computing solutions.

PO3 : Graduates will be able to analyze customer requirements, create high level design, implement and document robust and reliable software systems.

PO4 : Graduates will be able to transform complex business scenarios and contemporary issues into problems, investigate, understand and propose integrated solutions using emerging technologies.

PO5 : Graduates will be able to use the techniques, skills and modern hardware and software tools necessary for innovative software solutions.

PO6 : Graduates will possess leadership and managerial skills with best professional ethical practices and social concern.

PO7 : Graduates will recognize the need for self-motivation to engage in lifelong learning.

PO8 : Graduates will be able to master fundamental project management skills, concepts and techniques, set attainable objectives and ensure positive results, meeting scope, time and budget constraints.

PO9 : Graduates will be able to communicate technical information effectively, both orally and in writing

PO10 : Graduates will be able to recognize the social, professional, cultural, and ethical issues involved in the use of computer technology and give them due consideration in developing software systems.

PO11 : Graduates will be able to work collaboratively as a member or leader in multidisciplinary teams.

PO12 : Graduates will be able to assess the need for innovation and initiate the process through entrepreneurship or otherwise.

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DEPARTMENT OF COMPUTER APPLICATIONS

MCA 2 YEARS PROGRAMME 2020

Curriculum from the Academic Year 2020 and onwards

Under Choice Based Credit System

Name of the degree : MCA

Specialization : Computer Applications

Semester I

Course Code	Course Name	L	T	P	C	CY
20MCA11	Mathematical Foundations of Computer Applications	3	0	0	3	FC
20MCA12	Data Structures and Algorithms	3	0	0	3	FC
20MCA13	Database Management Systems	3	0	0	3	FC
20MCA14	Operating System Principles	3	0	0	3	FC
20MCA15	Software Engineering	3	0	0	3	FC
20MCA16	Data Structures Laboratory	0	0	4	2	FC
20MCA17	Database Management Systems Laboratory	0	0	4	2	FC
20MCA18	Python Programming Laboratory	0	0	4	2	PC
20MCA19	Communication Skills	0	0	2	1	EEC
	Total Credits				22	

Semester II

Course Code	Course Name	L	T	P	C	CY
20MCA21	Artificial Intelligence	3	0	0	3	FC
20MCA22	Advanced Java Programming	3	0	0	3	PC
20MCA23	Virtualization and Cloud Computing	3	0	0	3	FC
20MCA24	SOA and Web Services	3	0	0	3	FC
	Elective I	3	0	0	3	PE
20MCA25	Artificial Intelligence Laboratory	0	0	4	2	FC
20MCA26	Advanced Programming Laboratory	0	0	4	2	PC
20MCA27	Professional English	0	0	2	1	EEC
20MCA28	Mini Project	0	0	2	1	EEC
20HAC01	Hackathon	0	0	0	1	EEC
	One Credit Course	1	0	0	1	OC
	Total Credits				23	

Semester III

Course Code	Course Name	L	T	P	C	CY
20MCA31	Cryptography and Network Security	3	0	0	3	FC
20MCA32	Machine Learning	3	0	0	3	FC
	Elective II	3	0	0	3	PE
	Elective III	3	0	0	3	PE
	Elective IV (Management Elective)	3	0	0	3	PE
20MCA33	Cryptography and Network Security Laboratory	0	0	4	2	FC
20MCA34	Machine Learning Laboratory	0	0	4	2	FC
	Elective Lab	0	0	4	2	PE
20MCAIT01	Inplant Training	0	0	0	1	EEC
	Total Credits				22	

Semester IV

Course Code	Course Name	L	T	P	C	CY
20MCA41	Project work and viva voce	-	-	-	13	EEC
	Total Credits				13	
	Total Credits				**80**	

#One Credit Course

Course Code	Course Name	L	T	P	C	CY
20MCAOC01	Recent Trends in Web Technology	1	0	0	1	OC
20MCAOC02	Devops Essentials	1	0	0	1	OC

Professional Electives - IT Electives

Course Code	Course Name	L	T	P	C	CY
20MCAE101	Graphics and Multimedia	3	0	0	3	PE
20MCAE102	Advanced Database Management Systems	3	0	0	3	PE
20MCAE103	Distributed Systems	3	0	0	3	PE
20MCAE104	Grid and Cluster Computing	3	0	0	3	PE
20MCAE105	Internet of Things	3	0	0	3	PE
20MCAE106	Software Metrics and Measurement	3	0	0	3	PE
20MCAE107	Agile Methods for Software Development	3	0	0	3	PE
20MCAE108	Software Architecture and Design Patterns	3	0	0	3	PE
20MCAE109	Basics of Robotics	3	0	0	3	PE
20MCAE110	GPU and Parallel Programming	3	0	0	3	PE
20MCAE111	Digital Image Processing	3	0	0	3	PE
20MCAE112	Blockchain Technologies	3	0	0	3	PE
20MCAE113	Single page web applications	3	0	0	3	PE

Course Code	Course Name	L	T	P	C	CY
20MCAE114	Digital Marketing	3	0	0	3	PE
20MCAE115	Software Project Management	3	0	0	3	PE
20MCAE116	Computer Vision	3	0	0	3	PE
20MCAE117	Software Testing and Quality Assurance	3	0	0	3	PE
20MCAE118	Open Source Ecosystem	3	0	0	3	PE
20MCAE119	Enterprise Management and Computing	3	0	0	3	PE

Professional Electives - Data Science Electives

Course Code	Course Name	L	T	P	C	CY
20MCAE201	Data Analytics	3	0	0	3	PE
20MCAE202	Intelligent Information Retrieval	3	0	0	3	PE
20MCAE203	Big Data Technologies	3	0	0	3	PE
2OMCAE204	Data Mining and Warehousing	3	0	0	3	PE
20MCAE205	Natural Language Processing	3	0	0	3	PE
20MCAE206	Social Network Analysis	3	0	0	3	PE

Professional Electives - Networking Electives

Course Code	Course Name	L	T	P	C	CY
20MCAE301	Computer Networks	3	0	0	3	PE
20MCAE302	Internetworking Protocols and Management	3	0	0	3	PE
20MCAE303	Mobile Computing	3	0	0	3	PE
20MCAE304	Wireless networks	3	0	0	3	PE
20MCAE305	Ad Hoc Networks	3	0	0	3	PE

Professional Electives - Management Electives

Course Code	Course Name	L	T	P	C	CY
20MCAE401	Organizational Behaviour	3	0	0	3	PE
20MCAE402	Principles of Management	3	0	0	3	PE
20MCAE403	Accounting and Financial Management	3	0	0	3	PE
20MCAE404	E-Commerce	3	0	0	3	PE
20MCAE405	Decision Making	3	0	0	3	PE
20MCAE406	Entrepreneurship Development	3	0	0	3	PE
20MCAE407	Principles of Environmental Science	3	0	0	3	PE

Professional Electives Laboratories

Course Code	Course Name	L	T	P	C	CY
20MCAEL01	Mobile Application Development Laboratory	0	0	4	2	PE
20MCAEL02	Graphics and Multimedia Laboratory	0	0	4	2	PE
20MCAEL03	Internet of Things Laboratory	0	0	4	2	PE
20MCAEL04	Data Analytics Laboratory	0	0	4	2	PE
20MCAEL05	Data Mining Laboratory	0	0	4	2	PE
20MCAEL06	GPU and Parallel Programming Laboratory	0	0	4	2	PE
20MCAEL07	Image Processing Laboratory	0	0	4	2	PE
20MCAEL08	Web Frameworks Laboratory	0	0	4	2	PE
20MCAEL09	Natural Language Processing Laboratory	0	0	4	2	PE
20MCAEL10	Social Network Analysis Laboratory	0	0	4	2	PE
20MCAEL11	Networks Programming Laboratory	0	0	4	2	PE
20MCAEL12	Digital Marketing Laboratory	0	0	4	2	PE

BRIDGE COURSE**

SEMESTER I

Course Code	Course Name	L	T	P	C	CY
20MCAB11	Basics of Data Structures	1	0	0	0	FC
20MCAB12	Programming in C	1	0	0	0	FC
20MCAB13	Computer Hardware and Organization	1	0	0	0	FC

SEMESTER II

Course Code	Course Name	L	T	P	C	CY
20MCAB21	Basics of Internet	1	0	0	0	FC
20MCAB22	Software Project Management	1	0	0	0	FC
20MCAB23	Object Oriented Programming in C++	1	0	0	0	FC

** Applicable to the candidates who has been admitted with Non Computer Science Undergraduate Degree

FC - Foundation Course, PC - Professional Core, OC- One Credit Course, PE - Professional Elective, EEC - Employability Enhancement Course.

20MCA11 - MATHEMATICAL FOUNDATIONS OF COMPUTER APPLICATIONS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Apply the concept of system of linear equation to real time problems*

CO2 : *Understand basic statistical concepts and measures.*

CO3 : *Apply the concept of probability distribution and random variables to different problems and apply the principles of correlation and regression.*

CO4 : *Analyse and solve problems using sampling theory.*

CO5 : *Acquire sound knowledge of analysis in the time series and decision making through analysis of variance in the field of data analysis.*

LINEAR ALGEBRA

System of linear equations - Solution Sets of Linear Systems - Linear Independence - Linear transformation - Matrix of linear transformations **(8)**

MEASURES OF CENTRAL TENDENCY AND DISPERSION

Measures of Central Tendency : mean, median, mode, Geometric mean, Harmonic mean - Measures of Dispersion: Range, mean deviation, standard deviation and coefficient of variation - Skewness and Kurtosis. **(8)**

PROBABILITY

Probability Axioms - Conditional Probability - Laws of total probability - Baye's theorem. One Dimensional Random variables - Discrete case and Continuous case - Distributions: Binomial, Poisson and Normal Distributions. Mathematical expectation - Two dimensional random variables - Joint distributions - mean and variance - Correlation and Regression. **(10)**

SAMPLING THEORY

Population and sample - sampling and its need - parameter of statistics - Test of significance - standard error- level of significance - test of hypothesis - test of significance for small samples: student t-test , F-test and Chi-square test: Goodness of fit and Independence of attributes - test of significance for large samples: mean ,proportion and variance. **(9)**

TIME SERIES AND ANALYSIS OF VARIANCE

Component of time series - measurement of trend - moving average method - least square method for linear and exponential curves. Basic principles of experimental design - analysis of variance for one way classification - completely randomized design - Latin square design. **(10)**

TOTAL : 45

REFERENCES

1. *David C Lay, "Linear Algebra and Its Applications", 5th Edition, Pearson Education, 2015.*
2. *Gupta, S.C. and Prof. Kapoor, V.K., "Fundamental of Applied Statistics", Edition 4, reprint, S.Chand & Co., 2015.*
3. *Gilbert Strang, "Linear Algebra and Its Applications", Brooke/Cole Ltd., New Delhi, Fourth Revised Edition, 2012.*
4. *Veerarajan.T, "Fundamentals of Mathematical Statistics", 1st Edition, Yes Dee Publishing Pvt Ltd, 2017.*
5. *Michael Baron, "Probability and Statistics for Computer Scientists", 2nd Edition, CRC Press, 2014.*
6. *Richard I Levin and David S. Rubin, "Statistics for Management", 8th Edition, Pearson (2017).*

20MCA12 - DATA STRUCTURES AND ALGORITHMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Choose and design data structures such as array, linked list, stack, queue, trees and graphs to effectively model information in a problem.*

CO2 *: Choose and apply operations like insertion, deletion, traversal and searching mechanism on various data structures relevant to a problem.*

CO3 *: Judge efficiency trade-offs between data structures.*

CO4 *: Apply standard algorithms for searching and sorting based on given problem.*

CO5 *: Apply algorithm analysis techniques to evaluate performance of an algorithm.*

BASIC CONCEPTS

System Life Cycle - Algorithm Specification - Data Abstraction - Primitive Data Structures - Iterative and Recursive algorithms - Performance Analysis - best case - worst case - average case complexities - Notations. **(5)**

ARRAYS

Array as an Abstract Data Type (ADT) - Polynomial ADT - Sparse Matrix ADT - Representation of Multidimensional Arrays - String ADT. **(8)**

STACKS AND QUEUES

Stack ADT - Queue ADT - Mazing Problem - Evaluation of Expressions - Multiple Stacks and Queues. **(6)**

LINKED LISTS

Pointers - Singly Linked Lists - Dynamically Linked Stacks and Queues - Polynomials - Additional List Operations - Equivalence Relations - Sparse Matrices - Doubly Linked Lists. **(8)**

TREES

Introduction - Binary Trees - Binary Tree Traversals - Additional Binary Tree Operations - Threaded Binary Trees - Heaps - Binary Search Trees. **(6)**

GRAPHS

Introduction - Elementary Graph Operations - Graph Traversal - Minimum Cost Spanning Trees Shortest Paths. **(6)**

SEARCHING AND SORTING

Searching and List Verification - Insertion Sort - Quick Sort. **(6)**

TOTAL : 45

REFERENCES

1. *Ellis Horowitz, Sartaj Sahni, Anderson Freed, "Fundamentals of Data Structures in C", Universities Press, 2nd Edition, 2008.*
2. *Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures - A Pseudocode Approach with C", Cengage Learning, 2nd Edition, 2007.*
3. *Yashavant P. Kanetkar, "Data Structures through C", BPB Publications, 2nd Edition, 2003.*
4. *Seymour Lipschutz, "Data Structures with C", Schaum's Outline Series, McGraw Hill Publications, 2nd Edition, 2014.*

20MCA13 - DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

***CO1** : Identify the components of RDMS software and its significance.*

***CO2** : Analyze the data requirements and create conceptual design of the database using Entity Relationship model.*

***CO3** : Identify functional dependencies and apply normalization techniques to optimize the data design.*

***CO4** : Write SQL queries based on the functional requirements of any real world database applications.*

***CO5** : Implement different concurrency control techniques in transactions and recovery mechanisms used in database.*

DATABASES AND DATABASE USERS

Introduction - Characteristics of the database approach - Actors - Advantages- Database system, Concepts and Architecture: Data models, schemas and instances - Three schema architecture - Data Independence - DBMS Languages and Interfaces - DBMS component modules - Centralized DBMS architecture - Basic Client/Server Architecture. **(6)**

DATA MODELING

Using high-level conceptual data models - Entity types, Entity sets, Attributes and Keys, Relationship types, Relationship sets, roles and structural constraints, Weak entity types - ER Naming conventions-Examples of ER design - Relationship types of degree higher than two- EER Model: Subclasses, Super classes and Inheritance-Specialization and Generalization. **(7)**

RELATIONAL DATA MODEL

Relational Model Concepts - Relational Model Constraints - Relational Database Schemas - Update Operations, Transaction and Dealing with Constraint Violations. Relational Algebra and Calculus - Unary Operations - Set Operations - Binary Operations - Additional Relation Operations. ER and EER to Relational Mapping. **(6)**

BASIC SQL

SQL Data Definition - Specifying Basic Constraints in SQL- Basic Retrieval Queries in SQL- Insert, Delete, Update Statements in SQL- Complex Queries: Views - Schema Change Statements in SQL- PL/SQL Programming. **(7)**

NORMALIZATION

Informal Design Guidelines for Relational Schema- Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms- Boyce Codd Normal Form-Multi-Valued Dependency and Fourth Normal Form-Join Dependencies and Fifth Normal Form. **(7)**

TRANSACTION PROCESSING CONCEPTS

Introduction-Transaction and System Concepts - Desirable Properties of Transactions- Characterizing Schedules Based on Recoverability and Conflict Serializability. **(6)**

CONCURRENCY AND RECOVERY

Concurrency Control Techniques: Two Phase Locking-Concurrency Based on Time Stamp Ordering. Recovery: Database Recovery Concepts - Recovery Techniques Based on Deferred Update and Immediate Update-Shadow Paging. **(6)**

TOTAL : 45

REFERENCES

1. *Ramez Elmasri, Shamkant B. Navathe Durvasula, V.L.N. Somayajulu, Shyam K. Gupta, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2015.*
2. *Abraham Silberschatz. A, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", John Wiley, 10th Edition, 2018*
3. *Christopher Allen, Simon Chatwin, Catherine A. Creary, "Introduction to Relational Databases and SQL Programming", Tata McGraw-Hill, 2010.*

20MCA14 - OPERATING SYSTEM PRINCIPLES

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

***CO1** : Demonstrate the structure of operating system, batch programming, system calls and virtual machines*

***CO2** : Demonstration of Kernel Management specific to concurrent process for Inter Process Communication systems*

***CO3** : Estimate system performance through scheduling algorithms - FIFO, round robin, priority, shortest job first*

***CO4** : Recognize memory allocation and de-allocation for both static and dynamic storage*

***CO5** : Design and develop a simple File System using Disk and File System Management*

INTRODUCTION

Abstract view of an Operating system - extended view of resource manager - Over view: Simple batch system multi programmed batch systems - time sharing systems - parallel systems - distributed systems - real time systems - system structure: IO structure- memory- CPU-Kernals and micro kernels - dual-mode operation - operating - system services - system calls - Structure of Operating system- Various components of Operating system **(8)**

PROCESS MANAGEMENT

Process Concepts - Process creation - Process Termination - Process states - Process Description - Process control - Relationship between process and threads - Thread State - Thread Scheduling- Thread Synchronization-Multithreading model - Concurrent Process -process synchronization: critical section problem - mutual exclusion - Dekker's algorithm -synchronization hardware - semaphore - classical problem of synchronization - critical regions - monitors - atomic transaction - race condition. Dead lock characterization - handling dead locks - prevention - avoidance - detection and recovery - combined approach **(10)**

PROCESSOR MANAGEMENT

Basic Concepts - scheduling criteria - preemptive versus non-preemptive scheduling - scheduling algorithms: FIFO - Shortest job first, priority, round robin, multi level queue - multi level feedback queue - multiprocessor scheduling **(9)**

MEMORY MANAGEMENT

Basic Concepts - logical versus physical address - swapping - Fixed partition and Dynamic partition - Simple paging - multi level paging - Inverted paging - simple segmentation- combined paging and segmentation - virtual memory - demand paging - thrashing- Working set model -demand segmentation. **(9)**

I/O AND FILE MANAGEMENT

I/O: hardware - application I/O interface - Logical structure of I/O functions -I/O Buffering - Disk I/O - disk scheduling . File management: file concepts - access methods - directory structure - file system structure - allocation methods - free space management. **(9)**

TOTAL : 45

REFERENCES

1. *Abraham Silberschatz. A, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", John Wiley, 10th Edition, 2018.*
2. *William Stallings, "Operating Systems: Internals and Design Principles", Prentice-Hall, 2008.*
3. *H.M.Dietel, "An Introduction to Operating Systems", Addison Wesley, 2nd Edition, 2007.*
4. *Andrew S. Tanenbaum, "Modern Operating Systems", Prentice Hall of India Pvt. Ltd, 2008.*

20MCA15 - SOFTWARE ENGINEERING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Choose applicable software life-cycle model to develop software for given customer need and justify choice with reference to complexity, cost and time.*

CO2 : *Determine software requirements based on customer need and develop industry standard Software Requirement Specification (SRS) document*

CO3 : *Construct models using functional and object oriented design principles, concepts and tools based on SRS document.*

CO4 : *Prepare suitable structural and behavioural analysis models based on SRS document.*

CO5 : *Formulate test cases and test data using white box and black box techniques to deliver defect free software.*

INTRODUCTION TO SOFTWARE ENGINEERING

Software Engineering - Process Models - Agile Development. **(9)**

MODELING

Understanding Requirements - Requirements Modeling - Scenario Based Methods, Class Based Methods, Behavior, Patterns, and Web/ Mobile Apps. **(9)**

DESIGN ENGINEERING

Design Concepts - Architectural Design - Component Level Design - User Interface Design - Pattern Based Design - WebApp Design - MobileApp Design **(9)**

QUALITY MANAGEMENT

Software Testing Strategies - Testing for Conventional Software - Testing for Object Oriented Software - Testing for Web Applications - Testing for MobileApps **(9)**

MANAGING SOFTWARE PROJECTS

Project Management Concepts - Process and Project Metrics - Maintenance and Reengineering - Emerging Trends in Software Engineering. **(9)**

TOTAL : 45

REFERENCES

1. *Roger S. Pressman, "Software Engineering - A Practitioner's approach", McGraw Hill International, 8th Edition, 2019.*
2. *Rajib Mall, "Fundamentals of Software Engineering", PHI. 5th Edition, 2018.*
3. *Pankaj Jalote, "An Integrated Approach to Software Engineering", Narosa Publishing House, 3rd Edition, Reprint 2019.*

20MCA16 - DATA STRUCTURES LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

20MCA12

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Choose appropriate Data structures for implementing given scenario.*

CO2 *: Demonstrate the applications of Linked Lists, Stack, Circular Queue and Priority Queue.*

CO3 *: Design recursive algorithms and implement in real time application.*

CO4 *: Demonstrate various operations on Heap and Binary Search Tree.*

CO5 *: Compare various sorting and searching techniques in term of time complexity and space complexity.*

CONCEPTS TO BE COVERED

1. Applications of 2D, 3D arrays
2. Compute time and space complexity for simple programs
3. Implement linear linked list, doubly linked list
4. Basic operations of stack- Array, linked list implementation
5. Building applications using stack
6. Basic operations of queue- Array, linked list implementation
7. Implementing priority queue, circular queue
8. Recursion - Towers of Hanoi, Fibonacci series
9. Building Binary Search Tree, operations on BST operations on AVL trees
10. Graph operations
11. Implement Sorting & Searching technique

20MCA17 - DATABASE MANAGEMENT SYTEMS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Design the conceptual data model as Entity Relationship diagram and create the database using DDL statements for a given application*

CO2 : *Formulate simple DML SQL queries to retrieve the required data for real world applications*

CO3 : *Generate DML queries using Sub Queries, Joins, Group By, Order By and Aggregate functions to filter and aggregate the data of the real world applications*

CO4 : *Construct reusable PL/SQL blocks with Functions, Procedures, Packages, Triggers, Exception Handling, and Cursors as required by OLTP applications*

CO5 : *Develop a database project by constructing ER model, Creating Tables and write SQL and PL/SQL blocks using RDBMS software.*

CONCEPTS TO BE COVERED

PART I : SQL

1. Implementation of DDL and DML Statements
2. DCL and TCL Commands
3. Single Line and Group Line functions
4. Queries using multiple tables, Join
5. Set Operations in SQL
6. Aggregating data using Group functions, Use of Group by/Having clause
7. Sub queries in SQL
8. Constraints
9. Views, Sequence, Index, Synonym

PART II : PL/SQL

1. Simple programs
2. Exception Handling
3. Trigger and Cursor
4. Functions, Procedure and Packages

PART III - Client/Server Application

1. Embedded SQL within a programming language like VB.NET/Java, etc.

20MCA18 - PYTHON PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Write, test, and debug simple Python programs using conditional and looping statements.*

CO2 *: Develop modular programs using functions.*

CO3 *: Represent compound data using strings, lists, tuples, and dictionaries.*

CO4 *: Perform numerical operations on large datasets.*

CO5 *: Apply suitable library function to analyze and classify the data.*

CONCEPTS TO BE COVERED

1. Simple programs using variables and operators.
2. Program development using conditional, control and repetition statements.
3. Data manipulation using lists, tuples and dictionaries.
4. Handling text data using string handling operations and functions.
5. Modular programming using functions and lambdas.
6. The use of local, global and built-in names within functions.
7. File operations - read, write, copy, word count.
8. Performing numerical operations using NumPy package.
9. Analyzing large datasets using Pandas package.

20MCA19 - COMMUNICATION SKILLS

L	T	P	C
0	0	2	1

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Develop Communication and Soft skills through self assesment to excel at work place.*

CO2 : *Apply intonation rules, Phonetic patterns and formulate appropriate speech patterns .*

CO3 : *Apply the rules of grammar viz., Parts of speech, Idioms, Phrasal Verbs, Concord, Cause and Effect, purpose and function and write a technical passage correctly.*

CO4 : *Summarize a technical text and write a process description.*

CO5 : *Plan, Structure and present a 15 minutes presentation on a technical topic.*

COMMUNICATION SKILLS

Introduction - Code and Content - Stimulus and Response: Source - The Encoding Process - The Channel - The Decoding Process - The Receiver - Speaking Skills - Effective Speaking Guidelines - Communicating Soft Skills: A Self-assessment - Closing Tips on Improving Speaking Skills.

INTRODUCTION TO SPEECH SOUNDS

Pronunciation Etiquette - Phonetics: Phonetic Chart - Exercise - Syllabus - Stress - Accent - Rhythm - Intonation

FOCUS ON LANGUAGE

Synonyms and Antonyms - Idioms - Phrasal Verbs - Nouns-Compound Nouns & Noun Phrases - Gerunds & Infinitives - Subject Verb Agreement- Tenses - Adjectives and Adverbs - Active Passive voice - Cause and Effect Sentences - Purpose and Function.

READING & WRITING

Reading Comprehension - Techniques for Good Comprehension - Skimming & Scanning -Sequencing of Sentences - Paragraph Construction - Paragraph Patterns - Kinds of Paragraph - Writing a First Draft, Revising & Finalizing - Steps to Effective Précis Writing - Process Description - Dialogue Writing

LISTENING & SPEAKING

Importance of Listening & Empathy in Communication - Reasons for Poor Listening - Traits of a Good listener - Listening Modes - Short Dialogues - Short Conversation Achieving Confidence, Clarity & Fluency - Paralinguistic Features - Barriers to Speaking - Types of Speaking - Persuasive Speaking - Public Speaking-Conversations - Telephonic Conversations & Etiquette - Effective Presentation Strategies - Planning - Outlining & Structuring - Nuances of Delivery.

REFERENCES

1. *Meenakshi Raman, Sangeeta Sharma, "Technical Communication - English Skills for Engineers", Oxford University Press, New Delhi, 2015.*
2. *Kiranmani Dutt P., "A Course in Communication Skills", Cambridge University Press, 2011.*
3. *Samson T, "Innovate with English", Cambridge University Press, 2012.*
4. *Michael Mc Carthy and Felicity O'Dell, "English Vocabulary in Use", Cambridge University Press, 2012.*

20MCA21 - ARTIFICIAL INTELLIGENCE

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MCA11

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Apply various heuristic search strategies in optimal decision making.*

CO2 *: Understand uncertainty in real world situations.*

CO3 *: Employ first order logic for building knowledge base and demonstrate reasoning.*

CO4 *: Express different planning strategies to deal with problems.*

CO5 *: Describe and apply various knowledge representation techniques.*

INTRODUCTION

Foundation of AI - Agents and Environments- Concept of Rationality - Nature of Environments - Structure of Agents. **(6)**

PROBLEM SOLVING

Problem-Solving Agents and examples - Uninformed and Informed Search Strategies - Heuristic Functions - Local Search Algorithms and Optimization Problems - Local search in Continuous spaces - Searching with Nondeterministic actions and Partial Observations. **(12)**

ADVERSARIAL SEARCH AND CONSTRAINT SATISFACTION PROBLEMS

Games - Optimal Decisions in Games - Alpha-Beta Pruning. Constraint Satisfaction Problems (CSP) - Backtracking Search for CSPs - Local Search for Constraint Satisfaction Problems - Structure of Problems. **(8)**

KNOWLEDGE AND REASONING

Knowledge based Agents - The Wumpus World - Logic - Propositional Logic- Syntax and Semantics of First-Order Logic - Using First-Order Logic - Knowledge Engineering in First-Order Logic - Unification and Lifting - Forward Chaining - Backward Chaining - Resolution - Knowledge Representation. **(12)**

PLANNING

Definition of classical planning - Algorithms for Planning as State-Space Search - Planning Graphs - Hierarchical Task Network Planning - Planning and Acting in Nondeterministic Domains - Multi agent Planning. **(7)**

TOTAL: 45

REFERENCES

1. *Stuart J Russell and Peter Norvig, "Artificial Intelligence- A Modern Approach", Pearson Education Series, Fourth Edition, 2020.*
2. *Dan W.Patterson, "Introduction to AI and ES", Pearson Education, First Edition, 2007*
3. *M. Tim Jones, "Artificial Intelligence: A Systems Approach (Computer Science)", Jones and Bartlett Publishers, Inc., First Edition, 2008.*
4. *Elaine Rich, Kevin Knight, Shiva Shankar B Nair, "Artificial Intelligence", Tata McGraw Hill, 3rd Edition, 2013.*
5. *David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.*

20MCA22 - ADVANCED JAVA PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Design an object oriented software solution by discovering appropriate classes and objects and identifying attributes, behavior and hierarchy among the classes*

CO2 *: Write java programs by employing the object oriented constructs of inheritance and polymorphism for a given software requirement*

CO3 *: Organize the application programs into packages and prepare a deployable application for the given software solution*

CO4 *: Generate robust java applications for a given user requirement by employing applicable object oriented concepts and handling all possible exceptions*

CO5 *: Design and develop full stack web applications using React JS and Node JS*

BASIC LANGUAGE ELEMENTS

Features of Java Language - JVM and Bytecode - Data Types - Variables - Keywords - Constants - Comments - Operators and Expressions - Control Statements. **(5)**

OBJECT ORIENTED PROGRAMMING

Classes - Object & Object reference - Constructors and Initialization - Access Control - Accessor and Mutator Methods - Overloading Methods and Constructors - Static Members - Use of Modifiers with Classes and Methods.

ARRAYS AND STRINGS

Defining an Array - Initializing and Accessing Array - Multi-dimensional Array- String Handling - Mutable & Immutable Strings - Creating Strings using StringBuffer. **(7)**

EXTENDING CLASSES AND INHERITANCE

Use and Benefits of Inheritance in OOP - Types of Inheritance in Java - Inheriting Data members and Methods - Role of Constructors in Inheritance - Overriding Super Class Methods - Use of "super" keyword - Dynamic Method Dispatch - Using Abstract Classes - Using Final with Inheritance - The Object Class - Interfaces - Implementing Interfaces - Nested Interfaces - Variables in Interfaces. **(8)**

PACKAGES

Organizing Classes and Interfaces in Packages - Access Protection - Defining Package - Importing Packages.

EXCEPTION HANDLING

Exception Hierarchy - Types of Exception - Control Flow In Exceptions - Use of try, catch, finally, throw, throws in Exception Handling -In-built and User Defined Exceptions - Checked and Un-Checked Exceptions. **(5)**

THREADS

Java Thread Model - Need for Concurrent Programming - Thread Life Cycle - Thread Priorities - Creating a Thread - Extending a Thread - Creating Multiple Threads - Using Thread Methods - Thread Exceptions - Inter-thread communication - Synchronizing Threads. **(5)**

WEBCLIENT UI

Introduction to HTML and CSS - Web Development using Bootstrap CSS - Client side scripting using Javascript - Developing reusable UI components using React JS. **(8)**

JDBC AND SERVERSIDE SCRIPTING

Introduction to JDBC - JDBC Drivers & Architecture - CURD operations Using JDBC - Connecting to conventional Databases - Server side scripting using Node JS. **(7)**

TOTAL : 45

REFERENCES

1. *Herbert Schildt, "Java The Complete Reference", Tata MCGraw Hill Publishing Company Limited, 9th Edition, 2019.*
2. *E. Balagurusamy, "Programming with Java:A Primer", Tata MCGrawHill Publishing Company Limited, 5th Edition, 2017.*
3. *Cay S. Horstmann, Gray Cornell, "Core Java Volume I - Fundamentals", Pearson Education, 9th Edition, 2013.*
4. *Herbert Schildt, "Java: A Beginners Guide", Tata MCGraw Hill Publishing Company Limited, 6th Edition, 2014.*

20MCA23 - VIRTUALIZATION AND CLOUD COMPUTING

L	T	P	C
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PRE-REQUISITES

20MCA14

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure*

CO2 : *Describe various service delivery models of cloud computing architecture*

CO3 : *Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services and Google AppEngine.*

CO4 : *Describe the virtualization technology behind the working of cloud computing.*

CO5 : *Identify security and privacy issues in cloud computing and devise appropriate security solutions for protecting cloud resources.*

OVERVIEW OF VIRTUALIZATION

Basics of Virtualization - Virtualization and Cloud Computing - Need of Virtualization - Virtualization Types - Application Virtualization - Desktop Virtualization - Network Virtualization - Storage Virtualization - System-level or Operating System Virtualization - Server Virtualization: Understanding Server Virtualization, Types of Server Virtualization - Virtualization Advantages. **(7)**

RESOURCE VIRTUALIZATION

Virtual Machine Basics - Types of Virtual Machines, Resource Virtualization: Processor - Memory - Input/Output - Hypervisor Concepts and Types - Creation and Migration of Virtual Machines using open source Hypervisors. Case Study: VMWare - Xen - KVM. **(9)**

UNDERSTANDING CLOUD COMPUTING

Cloud Computing - Definition and Characteristics - History of Cloud Computing - Cloud Architecture - Benefits and Challenges of Cloud Computing - Cloud Deployment models: Private cloud - Public cloud - Hybrid cloud **(6)**

CLOUD SERVICE MODELS

Software-as-a-Service - Understanding SaaS - Architecture of SaaS - Platform-as-a-Service - Understanding PaaS - Architecture of PaaS - Infrastructure-as-a-Service - Understanding IaaS - Architecture of IaaS - Developing and Deploying applications using Google App Engine - Creating instances in Amazon EC2 - Deploying and Accessing Applications in Amazon EC2. **(8)**

CLOUD SECURITY AND TRUST MANAGEMENT

Privacy and Security in Cloud - Security Service Boundary - Securing Data - Encryption - Data Integrity and Auditing - Identity Management and Access Control - Trusted Computing - Cloud Storage Services: Create and manage Amazon S3 instances - Upload files to S3 after applying proper security mechanisms to ensure data confidentiality and integrity. **(9)**

DISASTER RECOVERY AND SCALING

Disaster Recovery Planning - Disasters in Cloud - Disaster Management - Scaling a Cloud Infrastructure: Capacity Planning - Cloud Scale. **(6)**

TOTAL : 45

REFERENCES

1. *George Reese, "Cloud Application Architectures", 1st Edition, O'Reilly, 2019.*
2. *James E. Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes", 1st Edition, Elsevier/ Morgan Kaufmann, 2017.*
3. *Barrie Sosinsky, "Cloud Computing Bible", Wiley India Pvt. Ltd., 2012*
4. *William von Hagen, "Professional Xen Virtualization", Wrox Publications, January, 2008.*
5. *Danielle Ruest, Nelson Ruest, "Virtualization: A Beginner's Guide", Tata McGraw Hill, 2009.*
6. *Tim Mather, Subra Kumaraswamy, Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", 1st Edition, O'Reilly Media, 2009.*

20MCA24 - SOA AND WEB SERVICES

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand and use the concepts of Service-Oriented Architecture for building platform independent distributed applications.*

CO2 : *Design and develop simple to complex web services by analyzing the requirements of web applications.*

CO3 : *Apply the concepts of RESTful web services and create dynamic web applications*

CO4 : *Determine the security requirements of web services and incorporate them in building web applications.*

CO5 : *Examine the requirements of distributed applications, identify and justify the need for using web services.*

SERVICE ORIENTED ARCHITECTURE

Architecture for Enterprise applications-Software platforms for Enterprise applications-Evolution of SOA - Key components of SOA - Considerations for Enterprise-wide SOA- Strawman architecture - Enterprise SOA layers- Solution architecture for Enterprise Applications - SOA Programming Models **(8)**

DISTRIBUTED INFORMATION SYSTEMS

Understanding middleware - RPC-TP Monitors - Object Brokers- Message Oriented Middleware-Technologies for connecting remote clients **(8)**

INTRODUCTION TO WEB SERVICES

Web Services and their Approach to Distributed Computing-Web Service Technologies - Web Services Architecture Case studies on overheads in gRPC and Business Process Management **(9)**

WEB SERVICES TECHNOLOGIES

JSON-gRPC open source RPC framework-WSDL-UDDI-RESTful Web Service: Architecture- RESTful, Web Service Design Technologies Relationship Run time Vs Design, SoaML Unified Modelling language, Service components and Profile **(12)**

WEB SERVICE SECURITY AND PERFORMANCE

Securing Web Service-Custom Token Authentiction-HTTP Basic Authentiction-OAuth- Performance **(8)**

TOTAL : 45

REFERENCES

1. *K. Milos SIA, "Web Services and Service Oriented Architecture", SIA Publishers, 2nd Edition 2020.*
2. *Thomas Erl, "SOA Principles of Service Design", Prentice Hall, 3rd Edition, 2017*
3. *Shankar Kambhampaty, "Service-Oriented Architecture for Enterprise and Cloud Applications", Wiley India, 2nd Edition, 2010.*
4. *Jose Sandoval, "RESTful Java Web Services", Packt Publishing, 2009.*
5. *Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju, "Web Services", Pearson, 2018.*

20MCA25 - ARTIFICIAL INTELLIGENCE LAB

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0	0	4	2

PRE-REQUISITES

20MCA11, 20MCA18

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Design and implement heuristic search procedures.*

CO2 *: Develop constraint satisfaction problem solution.*

CO3 *: Design and implement solutions for classical Artificial Intelligence problems.*

CO4 *: Design and implement knowledge based system.*

CO5 *: Become familiar with use of Artificial Intelligence tools.*

CONCEPTS TO BE COVERED

1. Implementing state space search algorithms for solving puzzle problems.
   a. A* Search
   b. Hill-climbing Search.
2. Implementation of MiniMax Search Procedure with alpha beta pruning for finding the solutions of games.
3. Implementation of Constraint Satisfaction Problem for solving Crypt-arithmetic.
4. Develop a knowledge base system consisting of facts and rules about some specialized knowledge domain of your choice.
5. Implementation of Unification algorithm by considering Resolution concept.
6. Solve the classical Water Jug problem.
7. Solve the classical Monkey Banana problem.
8. Solve the classical Blocks World problem.
9. Development of programs for simulation of computer games like : Tic-Tac-Toe, N-queens Problems, travelling salesman problem, Chess, etc.

20MCA26- ADVANCED PROGRAMMING LABORATORY

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PRE-REQUISITES

20MCA22

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Understanding Object oriented concepts and developing software modules.*

CO2 *: To develop effective GUI on Client side using Java Client and Server Side Technologies*

CO3 *: Write codes to handle the requests of client using JSP,*

CO4 *: Handle the backend processing from both client and server side.*

CO5 *: Choose a suitable development stack for the industry requirements.*

1. Exercises on basic OOPS Concepts and Java applets
2. Web Page using Bootstrap CSS
3. Client side Scripting using javascript
4. Handling Html elements with jquery
5. Design User Interface Component using React
6. Server side scripting using JSP
7. Storing and exchanging data using JSON

20MCA27 - PROFESSIONAL ENGLISH

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Generate ideas, Acquire right communication and interpersonal skills.*

CO2 *: Set career goals and formulate strategies by Prioritizing, Organizing and Scheduling for the required task.*

CO3 *: Project appropriate grooming and right etiquette in the corporate context.*

CO4 *: Prepare a job application letter with a Resume or C.V.*

CO5 *: Exhibit appropriate grooming and right etiquettes for Interviews and Group Discussion tasks.*

SOFT SKILLS

Introduction to Soft Skills - Lessons from the Three Case Studies - Change in Today's Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft Skills: Time Management - Attitude - Responsibility - Ethics, Integrity, Values and Trust - Self-confidence and Courage - Consistency and Predictability - Teamwork and Interpersonal Skills - Communication and Networking - Empathy and Listening Skills - Problem Solving, Troubleshooting and Speed Reading - Leadership

GOAL SETTING AND TIME MANAGEMENT

Goal Setting - Immediate, Short Term and Long Term Goals - Smart Goals - Strategies to Achieve Goals - Confidence Building, Self-esteem, Motivation - Time Management -Identifying Time Wasters - Time Management Skills.

ETIQUETTE

Etiquettes - Email, Professional, Dining & Telephone -Social Etiquette - Corporate Etiquette - Personal Grooming - Using minimal Body Language - Leadership and Entrepreneurship : Corporate Training - Professionalism - Self awareness - Creativity skills - Cognitive Development - Assertiveness - Positive Thinking and Attitude.

WRITING

- Job Applications: Writing Resume or Curriculum Vitae: Introduction - Difference between a Resume and a CV - The Strategy of Resume Writing - A Favourable First Impression - The Main Body of the Resume - A Fresher's Resume - A Few Helpful Tips - E-mails.

SPEAKING

Job Interviews: Introduction - Types of Interviews - Groundwork before the Interview -Importance of body Language in Interview - Need for proper Articulation - Concluding an Interview - Telephonic or Video Interview - A Mock Interview - Group Discussion: Introduction - Ability to Work as a Team - Communication Skills - Active Listening - Non-verbal Communication - Leadership and Assertiveness - Reasoning - Ability to Influence - Innovation. Creativity, and Lateral Thinking - Flexibility - Key Steps to Succeed in a Group Discussion - The Responsibility of the First Speaker - Concluding the Discussion - Dos and Don'ts during a Group Discussion

REFERENCES

1. *Meenakshi Raman, Sangeeta Sharma, "Technical Communication - Principles and Practice", 2nd edition, Oxford University Press, New Delhi, 2015.*

2. *Simon Sweeney, "English for Business Communication", Cambridge University Press, 2013.*
3. *Mukhopadhyay Lina, "Poly Skills: A Course in Communication Skills and Life Skills" Cambridge University Press, 2012.*
4. *Krishna Mohan & Merra Banerji, "Developing Communication Skills", 2nd Edition. Macmillan Publishers India Ltd. 2012.*
5. *Mitra K.Barun, "Personality Development and Soft Skills", Oxford University Press, 2011.*

20MCA28 - MINI PROJECT

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Analyze different domains, identify problems that require software solutions and justify.*

CO2 *: Choose appropriate problem solving techniques for the identified problem.*

CO3 *: Practice software engineering principles and programming skills in developing software solutions.*

CO4 *: Test the developed software to ensure compliance of requirements.*

CO5 *: Write the project report demonstrating the contribution and complete technical details.*

Students have to undertake a project approved by their concerned supervisor. Starting from Analysis to implementation, they have to follow software engineering concepts effectively. At the end of the semester, Students have to submit a report. Evaluation of the project will be carried out by a panel of examiners duly constituted twice besides the final presentation.

AREAS FOR PROJECT

1. Application using Android platform
2. Application in Internet of Things
3. Data Analytics / Data Mining applications using latest implementation software.
4. Network based applications
5. Application on Cloud computing
6. Application in Security/Block chain Management
7. Accounting / Commercial / Information Management / Scientific / web applications using latest software.
8. Not limited to the above. Any latest Concepts / Social problems can be considered.

20HAC01 - HACKATHON

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- One Credit course on Hackathon is Compulsory for the students of 2nd Semester MCA
- Evaluation will be done under continuous assessment Scheme
- The maximum mark is 100 and will be converted to appropriate grades. Pass is mandatory for the award of degree.
- There will be two reviews and the performance of the students participating in the Hackathon
- will be jointly evaluated by two examiners (One Internal + One External) during 2nd semester
- 75% attendance is mandatory for the students to appear in the final review.
- Candidates have to submit a detailed report on the Hackathon that he or she has attended and this report should be submitted during the final review.
- Candidates with shortage in attendance or failing to attend the final review have to redo the hackathon during the even semester of the next academic year.
- Credits earned shall be over and above of the credit requirement for the award of degree. Idea Submission and Evaluation Process
- Students are unveiled of problems on various hackathon portals for being aware of hackathons few of them listed as below

Sl.No	Name of Hackathon	Company
1.	Codevita / HackQuest	TCS
2.	Tata Cruicible Campus Hackathon	TATA
3.	Code Gladiators 2020	TECHGIG
4.	Smart India Hackathon 2020	MHRD

- Theme and problem statement of hackathon is chosen and duration and dates of hackathon are specified
- Students are allowed to participate as 6 member teams.
- The evaluation is of two stages first one for submission of a proposal and the second one for building a prototype.
- The hackathons are to be presented by the teams in two reviews first to the internal member and final to the external member
- Mark split up for internal and external members are decided with a total of 100 marks of which the pass percentage is 50%.

20MCA31 - CRYPTOGRAPHY AND NETWORK SECURITY

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand the basic principles of security and develop simple cryptosystems using classical ciphers*

CO2 : *Analyze the adequate basic security required by any computing system and apply cryptography algorithms to protect the confidentiality of information resources across networks*

CO3 : *Analyze security policies and best practices and apply suitable security technique to achieve integrity, and non-repudiation of information*

CO4 : *Demonstrate different threats and vulnerabilities of network security and apply suitable security controls to protect internal and external networks*

CO5 : *Understand threats against various system components and choose a best technique to control the threat*

CRYPTOGRAPHY : CONCEPTS AND TECHNIQUES

Need for Security - Security Approaches - Principles of Security - Plain Text and Cipher Text - Substitution Ciphers -Transposition Ciphers - Stream and Block Ciphers - Encryption and Decryption - Symmetric and Asymmetric Key Cryptography - Steganography. **(7)**

ENCRYPTION TECHNIQUES

Data Encryption Standard - Advanced Encryption Standard - Confidentiality using Symmetric Encryption - Public-Key Cryptography and RSA - Key Management - Diffie-Hellman Key Exchange - Elliptic Curve Cryptography - Symmetric Key Distribution - Kerberos - X.509 Authentication Service. **(10)**

HASH FUNCTIONS AND SIGNATURES

Message Authentication and Hash Functions - Description of MD Hash Family - Secure Hash Algorithms - SHA-512 - Digital Signatures and Authentication Protocols - Digital Signature Standard - Process - Services - Attacks on Digital Signature - Digital Signature Schemes. **(10)**

NETWORK SECURITY

Threats in Networks: Vulnerability - Categories of Attack - Software Based Packet Sniffing - Impersonation - Message Confidentiality Threats - Message Integrity Threats - Website Vulnerabilities - DoS - DDoS. Network Security Controls: Security Threat Analysis - Architecture - Encryption - Content Integrity - Strong Authentication - Access Controls - Wireless Security - Alarms and Alerts - Honeypots - Firewalls - Intruders - Intrusion Detection Systems - Types - Goals - Strengths and Limitations - Snort. **(9)**

SYSTEM SECURITY

Program Security: Secure Programs - Nonmalicious Program Errors - Targeted Malicious Code - Controls against Program Threats. Database Security: Security Requirements - Reliability and Integrity - Two-Phase Update - Redundancy / Internal Consistency - Recovery - Concurrency / Consistency - Monitors - Case studies on Cryptography and Security - Single Sign On (SSO). **(9)**

TOTAL : 45

REFERENCES

1. *William Stallings, "Cryptography and Network Security - Principles and Practices", 7th Edition, Pearson Education, 2017.*
2. *Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", 4th Edition, Pearson Education, 2007.*
3. *Atul Kahate, "Cryptography and Network Security", Tata McGraw Hill, 3rd Edition, 2017.*
4. *Behrouz A. Forouzan, Debdeep Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Tata McGraw Hill, 2017.*
5. *Joseph Migga Kizza, "A Guide to Computer Network Security", Springer International Edition, 2010.*

20MCA32 - MACHINE LEARNING

L	T	P	C
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PRE-REQUISITES

20MCA11

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Recognize fundamental issues and challenges of machine learning : data, model selection, model complexity, supervised and unsupervised learning.*

CO2 : *Understand and apply Decision trees and Artificial Neural Networks.*

CO3 : *Distinguish the strength and weakness of Bayesian learning.*

CO4 : *Analyze and apply Instance based learning and rule based learning.*

CO5 : *Assess capability of Reinforcement learning and study its application.*

INTRODUCTION, CONCEPT LEARNING AND DECISION TREES

Designing a Learning System - Perspectives and Issues in Machine Learning - Concept Learning Task- Concept Learning as Search- Find-S- Version Space- Inductive bias. Decision tree representation, Decision tree Learning Algorithm- Hypothesis Basis- Inductive bias-Issues in Decision Tree learning. **(10)**

ARTIFICIAL NEURAL NETWORKS

Introduction- Neural Network Representations- Perceptrons - Multilayer Networks Back Propagation Algorithm- Remarks on the Back propagation Algorithm- Face Recognition Example- Advanced Topics in Artificial Neural Networks. **(10)**

EVALUATING HYPOTHESIS

Motivation, Estimating Hypothesis Accuracy, Basis of Sampling Theory, A General Approach for Deriving Confidence Intervals - Difference in Error of Two Hypothesis- Comparing Learning Algorithms **(5)**

BAYESIAN LEARNING

Bayes Theorem - Bayes theorem and Concept Learning- Maximum Likelihood and Least Square Error Hypothesis- Maximum Likelihood Hypothesis for Predicting Probabilities- Minimum Description Length Principle- Bayes Optimal Classifier- Gibs Algorithm- Naive Bayes Classifier-Bayesian Belief Networks- The EM Algorithm.

INSTANCE BASED LEARNING : k - Nearest Neighbour Learning, Locally weighted Regression- Radial Basis Functions- Case based Reasoning. **(10)**

LEARNING SET OF RULES : Sequential Covering Algorithms- Learning First Order Rules- Learning Sets of First order Rules FOIL- Induction as Inverted Deduction- Inverting Resolution.

REINFORCEMENT LEARNING : The learning task - Non deterministic Rewards and Actions - Temporal Difference Learning - Generalizing from Examples - Relationship to Dynamic Programming. **(10)**

TOTAL : 45

REFERENCES

1. *Tom M Mitchell, "Machine Learning", McGraw Hill, 1st Edition, 2018.*
2. *Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, 4th Edition, 2020.*

20MCA33 - CRYPTOGRAPHY AND NETWORK SECURITY LAB

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand the classical crypto systems used for the confidential information exchange and use different ciphers in secure data transfer*

CO2 : *Demonstrate understanding of security best practices and techniques to preserve confidentiality of information at rest, and in Transit and apply suitable cryptographic algorithm to preserve the confidentiality of information*

CO3 : *Apply hash and message digest algorithms to preserve the integrity of information*

CO4 : *Apply standard digital signature scheme to verify the authenticity of information and use Steganography to hide secret messages*

CO5 : *Demonstrate the working of network security tools including Packet capturing and Intrusion Detection*

CONCEPTS TO BE COVERED

1. Implementing Substitution and Transposition ciphers
2. Applying symmetric encryption algorithms to protect the confidentiality of users data
3. Applying asymmetric encryption algorithms to protect the confidentiality of users data
4. Comparing the performance of symmetric and asymmetric encryption algorithms in terms of computation time and storage space
5. Applying hash and message digest algorithms to ensure the integrity of users data

6 Using standard digital signature scheme to verify the authenticity of user's document

7. Applying Steganography to hide secret message in a document (image / text)
8. Given a scenario, choose appropriate security mechanisms to ensure confidentiality, integrity and non-repudiation of user's data and apply them to protect the data
9. Learning to install and work with an open source Packet capturing tool
10. Learning to install and work with an open source Intrusion Detection tool

20MCA34 - MACHINE LEARNING LABORATORY

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PRE-REQUISITES

20MCA11, 20MCA18

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Introduce students the basic concepts and techniques of machine learning.*

CO2 *: Develop skills using recent machine learning software for solving practical problems.*

CO3 *: Gain experience of doing independent study and research in machine learning.*

CO4 *: Apply various classification and clustering techniques for problems.*

CO5 *: Design and development of game and traffic control system using reinforcement learning.*

CONCEPTS TO BE COVERED

1. Implement the FIND-S algorithm.
2. Demonstrate Decision Tree - ID3 Algorithm
3. Supervised Learning : Classification
   i) Implement Naïve Bayes Classifier on a Data set. Test for Accuracy and Precision.
   ii) Implement K-Nearest Neighbor Classifier on a Data set. Test for Accuracy and Precision.
4. Implement Artificial Neural Network Algorithms to simulate logical gates.
5. Implementing the Backpropagation algorithm and test the same using appropriate data sets.
6. Implement Bayesian network to demonstrate the diagnosis of a medical data.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file.
8. Implement clustering algorithm for identifying cancerous data.
9. Apply reinforcement learning and develop a game of your own.
10. Develop a traffic signal control system using reinforcement learning technique.

20MCAIT01 - INPLANT TRAINING

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Exposure to the industrial environment, recognize the requirement of the industry and cope up with the Industrial scenario.*

CO2 : *Recognize career paths taking into account their individual abilities and prepare a report about the work experience in industry*

CO3 : *Communicate effectively about the training through technical presentation.*

CO4 : *Develop their employability and start-up skills and to enhance the ability to engage in, life-long learning*

CO5 : *Develop individual confidence to handle various engineering assignments and ability to think strategically and expose themselves to acquire life skills to meet societal challenges*

20MCA41 - PROJECT WORK AND VIVA VOCE

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Supervisor assigned.

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Comprehensively demonstrate understanding of the software development processes and practices.*

CO2 : *Work to a professional standard in a specified role.*

CO3 : *Contribute effectively/co-operatively within a team.*

CO4 : *Exhibit industry-standards of professionalism in their work through knowledge or use of latest techniques and tools.*

CO5 : *Reflect on the work done and own role and present their work through a report and formal viva.*

20MCAOC01 - RECENT TRENDS IN WEB TECHNOLOGY

L	T	P	C
1	0	0	1

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

Web development using HTML, CSS and JavaScript

AJAX - Bootstrap CSS - Develop Website using Html5 and Bootstrap - Introduction to React - Client side JS.

Introduction to NodeJs - Server side JS.

Based on the industry requirements additional topics may be included as and when needed.

TOTAL : 15

REFERENCES

1. *https://developer.mozilla.org/en-US/docs/Learn/HTML/Introduction_to_HTML*
2. *http://web.mit.edu/6.813/www/sp16/labs/lab1-html-css/*
3. *https://github.com/kbalog/web-programming*
4. *https://speakerdeck.com/kbalog/web-programming-ajax*
5. *https://speakerdeck.com/kbalog/web-programming-bootstrap*
6. *https://developer.mozilla.org/en-US/docs/Learn/Tools_and_testing/Client- Side_JavaScript_frameworks/React_getting_started*
7. *https://developer.mozilla.org/en-US/docs/Learn/Server-side/First_steps/Introduction*
8. *https://developer.mozilla.org/en-US/docs/Learn/Server-side/Express_Nodejs*

20MCAOC02 - DEVOPS ESSENTIALS

L	T	P	C
1	0	0	1

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

After competing this course, the student will be able to

CO1 : *Understanding the concept of continuous development, continuous integration and continuous deployment / delivery.*

CO2 : *Understanding the automation, culture, and metrics that are essential to develop a successful DevOps project.*

CO3 : *Learn the working knowledge on the cutting edge tools in the industry like Git, Jenkins, Nexus, Sonar, Docker, Kubernetes and Grafana.*

CO4 : *Understand the benefits of DevOps over other software development processes.*

CO5 : *Learn real world applications of DevOps.*

Introduction to Devops : Devops Overview, Devops lifecycle, stages.

Git & Maven : Basics of Git, Commands, Maven architecture, plugins.

Jenkins: Introduction, plugins, Configuration, Build system.

Sonar & Nexus : Code quality and automatic deployment.

(Lecture - 6 hours, Practical - 3 hours)

Docker : Introduction to Docker, Containerization, images, Docker files, Kubernetes basics and architecture.

Portainer & Grafana : Basic overview and usage of tools.

(Lecture - 4 hours, Practical - 2 hours)

TOTAL : 15

REFERENCES

1. *Tim O'Brien, Ason Van Zyl, Brian Fox, John Casey, "Maven: The Complete Reference", Sonatype, 2010.*
2. *James Turnbull, "The Docker Book: Containerization is the new virtualization", James Turnbull, 2nd edition, 2014.*
3. *Brayden Smith, "A Step by Step Guide to Learn and Master Kubernetes", Brayden Smith, 2019.*

20MCAE101 - GRAPHICS AND MULTIMEDIA

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Employ point- line and circle scan conversion algorithms for drawing graphical object.*

CO2 : *Employ fill area scan conversion algorithms for drawing of graphical objects.*

CO3 : *Construct a world coordinate scene from its constituent elements (defined in their local coordinate systems) by applying geometric transformations on the constituent elements.*

CO4 : *Determine the clipping operations required to change from the current display to a new display- when interactive operations through keyboard or mouse are performed.*

CO5 : *Analyse the performance of image- video- audio- text and graphics data compression techniques.*

INTRODUCTION

Graphics hardware - raster and random scan - display devices - input devices -hard copy devices. Implementation algorithms for graphic primitives - line- poly line- circle- ellipse- curves - attributes **(8)**

TRANSFORMATIONS AND VIEWING

wo dimensional geometric transformations - translation - scaling - rotation - reflection - shearing - composite transformations. Two dimensional viewing - window port- viewport - clipping - point - line - Cohen-Sutherland- Liang-Barsky- Nicholl-Lee-Nicholl. Three-Dimensional Geometric Transformations -Translation - Scaling - Rotation - reflection - shearing - affine transforms **(10)**

COMPUTER ANIMATIONS

Raster methods - double buffering - raster operations - morphing - simulating accelerations - motion Specifications - character animations - motion capture - OpenGL animation procedures. **(8)**

INTRODUCTIONS TO MULTIMEDIA

Multimedia Applications - Multimedia Systems Architecture - evolving technologies - defining objects - Compression and Decompression - Binary image compression - Color - gray scale- Still-video images - JPEG compression - video Image Compression. **(10)**

FILE FORMATS AND MULTIMEDIA I/O

Flich - text format - TIFF - RIFF - MIDI file formats- JPEG DIB- MPEG- AVI file formats. TWAIN - architecture - setting up new WAVE type. Pen Input- Video image display systems- Print output- Image Scanners- Digital Video and Audio- Video images and animation- Full-Motion video. **(9)**

TOTAL: 45

REFERENCES

1. *Donald D. Hearn, M. Pauline Baker, Warren, "Computer Graphics with Open GL", 4th Edition, Prentice Hall, 2010.*
2. *Prabhat K. Andleigh, KiranThakrar "Multimedia Systems Design", 2nd Edition, Prentice Hall of India Pvt. Ltd., 2007.*
3. *James D. Foley, Andries Van Dam, Steven K. Feiner, F. Hughes John, "Computer Graphics", 3rd Edition, Prentice Hall of India Pvt. Ltd., 2012.*

4. *Ralf Steinmetz and KlaraNahrstedt, "Multimedia: Computing- Communications and Applications", 2nd Edition, Pearson Educations, 2009.*
5. *Tarun kumar ghosh, "Graphics and Multimedia" First Edition, Penram, 2017.*
6. *Pakhira, Malay K, "Computer Graphics, Multimedia and Animation", Second Edition, PHI, 2017.*

20MCAE102 - ADVANCED DATABASE MANAGEMENT SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MCA13

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Analyze the background processes involved in queries and determine their impact on database operations and design.*

CO2 : *Analyze different methods and techniques for parallel and distributed query processing and apply appropriate algorithms for optimizing query execution.*

CO3 : *Demonstrate the usage of different architecture and design strategies for distributed and parallel databases.*

CO4 : *Apply the concepts of SQL for enterprise applications.*

CO5 : *Design data models for advanced applications using object oriented and other databases.*

QUERY PROCESSING

Overview - Measures of query Cost - Selection Operations - Sorting - Join Operations - Other Operations -Evaluation of Expressions.

QUERY OPTIMIZATION

Overview-Heuristics in query Optimization **(7)**

PARALLEL DATABASES

Introduction - I/O Parallelism - Interquery Parallelism - Intraquery Parallelism - Intraoperation Parallelism - Interoperation Parallelism.

DISTRIBUTED DATABASES

Homogenous and Heterogenous Databases - Distributed Data Storage - Distributed Transactions - Commit Protocols - Concurrency Control in Distributed Databases - Availability - Distributed Query Processing - Heterogenous Distributed Database - Cloud Based Databases. **(12)**

XML

Structure of XML Data - XML Document Schema - Querying and Transformation - Application Program Interfaces to XML - Storage of XML Data - XML Applications. **(9)**

OBJECT AND OBJECT RELATIONAL DATABASES

Introduction to Complex Objects - Object model of ODMG-ODL - OQL - Object Relational and Extended - Relational Systems - SQL and its Relational Features - Nested Relational Model. **(8)**

NoSQL DATABASES

Introduction to NoSQL - SQL vs NoSQL - Types - MongoDB - CRUD Operations - Advantages and Disadvantages. **(9)**

TOTAL : 45

REFERENCES

1. *Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", 7th Edition, Mc Graw Hill International Edition, 2019.*
2. *Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", 7th Edition, Pearson Education, 2006.*
3. *Raghu Ramakrishnan, Johannes Gehrke, "Databases Management Systems", 3rd Edition, Graw Hill, 2003.*

20MCAE103 - DISTRIBUTED SYSTEMS

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MCA13, 20MCA14

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Analyze the advantages and disadvantages of various models for a distributed system*

CO2 : *Compare Remote Procedure Call and Remote Method Invocation from the perspective of developing distributed applications*

CO3 : *Describe the role of distributed Operating System and distributed File System in developing distributed systems*

CO4 : *Design the process of discovering and locating distributed objects using Naming and Directory services*

CO5 : *Demonstrate the concurrency control mechanism for distributed transactions*

INTRODUCTION

Characterization of Distributed Systems : Example of Distributed Systems - Resource Sharing and Web - Challenges - System Models : Architectural Models and Fundamental Models - Distributed Objects and Components.

Remote Invocation : Communication between Distributed Objects - Request - Reply protocols - Remote Procedure Call - Remote Method Invocation. **(9)**

OPERATING SYSTEM SUPPORT

Introduction - Operating System Layer - Protection - Process and Threads - Communication and Invocation - OS Architecture.

DISTRIBUTED FILE SYSTEMS

Introduction - File Service Architecture - Sun Network File System. **(8)**

NAME SERVICES

Name Services and DNS - Directory and Discovery Services - Global Name Service - X.500 Directory Service.

CLOCK SYNCHRONIZATION

Clocks - Events and Process States - Synchronization - Logical time and Logical clocks - Global States. **(10)**

DISTRIBUTED TRANSACTION MANAGEMENT

Transaction and Concurrency Control: Transactions - Nested Transactions - Locks - Optimistic Concurrency Control - Time Stamp Ordering - Comparison of Methods for Concurrency Control. Distributed Transactions: Flat and Nested - Atomic Commit Protocols - Concurrency Control - Distributed Deadlock - Transaction Recovery. Replication: System model and Group Communication Fault Tolerant Services - Highly Available Services - Transactions with Replicated Data. **(12)**

DISTRIBUTED SHARED MEMORY

Design and Implementation Issues - Sequential and Release Consistency - Other Consistency Models. **(6)**

TOTAL : 45

REFERENCES

1. *George Colouris, Jean Dollimore and Tim KindBery, "Distributed Systems,Concepts and Design", 5th Edition, Pearson Education, 2018.*
2. *Andrew S Tanenbaum, Maarten Van Steen, "Distributed Systems, Principles and Paradigms", 2nd Edition, Pearson Education, 2017.*
3. *Sloman M Kramer J, "Distributed System and Computer Networks", Prentice Hall of India, 2009.*

20MCAE104 - GRID AND CLUSTER COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand the basics of distributed systems and programming models.*

CO2 : *Examine grid computing architecture and its components.*

CO3 : *Apply concepts of grid computing and build distributed applications.*

CO4 : *Access and Identify the need for cluster computing.*

CO5 : *Design cluster computing based solutions for real world problems by incorporating load balancing.*

GRID COMPUTING

The data centre- Cluster and Grid computing-Meta computing-Different types of Grids-Web services and the grid. **(7)**

TECHNOLOGIES AND ARCHITECTURE FOR GRID

Clustering and grid computing- Issues in data grids-Functional requirements in grid computing-Standards-Trends in large data grids. **(8)**

GRID STANDARDS AND TOOLKIT

Standards organization- Toolkit- Frameworks and middleware-Globus toolkit -Standards:OGSA and WSRF-Sample grid projects. **(8)**

CLUSTER COMPUTING

Basic Concepts: Approaches to parallel computing- Architecture and functionality of cluster -Categories of cluster. Cluster middleware-Early cluster architecture and High through put Computing Clusters-Setting up and administering a cluster. **(10)**

PROCESS AND MEMORY IN CLUSTER COMPUTING

Cluster architectures for high availability-Process scheduling: Job Management System-Resource management system - Jobs and Resource - Scheduling parallel jobs - Load sharing and load balancing-Distributed shared memory:Issues-Write synchronization for data consistency. **(12)**

TOTAL : 45

REFERENCES

1. *Prabhu C.S.R., "Grid and Cluster Computing" PHI Learning, 2018 Reprint*
2. *Daniel Minoli, "A Networking Approach to Grid Computing" John Wiley and Sons, INC Publications, 2010.*
3. *Hamid R. Arabnia, Fernando G. Tinetti, "Grid, Cloud and Cluster Computing and Applications", Csrea Publishers, 2017.*

20MCAE105 - INTERNET OF THINGS

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand general concepts of Internet of Things (IoT)*

CO2 : *Recognize various devices and challenges*

CO3 : *Apply design concept to IoT solutions*

CO4 : *Analyze various M2M and IoT architectures*

CO5 : *Develop IoT solutions using sensors, actuators and Devices*

INTRODUCTION TO IOT

Sensing, Actuation, Networking basics, Communication Protocols, Sensor Networks, Machine-to-Machine Communications, IoT Definition, Scope, Characteristics - Applications - Physical and logical design of IoT, Communication models & APIs - IoT Enabling Technologies. **(8)**

M2M vs IoT AN ARCHITECTURAL OVERVIEW

IoT and M2M - System Architecture - Main design principles and needed capabilities - An IoT architecture outline, standards considerations. **(5)**

IoT REFERENCE ARCHITECTURE

Getting Familiar with IoT Architecture, Various architectural views of IoT such as Functional, Information, Operational and Deployment. Constraints affecting design in IoT world- Introduction, Technical design Constraints. **(5)**

IoT LOGICAL DESIGN USING PYTHON

Introduction to Python - IoT Physical devices and Endpoints - Building blocks of an IoT device - Raspberry pi - Raspberry Pi interfaces - Programming Raspberry Pi with Python - Other IoT devices. **(12)**

DEVELOPING IOT SOLUTIONS

Introduction to Arduino - Implementation of IoT with Arduino and Raspberry pi , Cloud Computing, Fog Computing, Connected Vehicles, Data Aggregation for the IoT in Smart Cities, Privacy and Security Issues in IoT. **(10)**

DOMAIN SPECIFIC APPLICATIONS OF IOT - CASE STUDIES

Home Automation - Cities - Environment - Agriculture - Productivity Applications **(5)**

TOTAL : 45

REFERENCES

1. *Arshdeep Bahga, Vijay Madisetti “Internet of Things: A Hands on Approach”, Universities Press, 2014.*
2. *Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle,"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014.*
3. *Dr. Guillaume Girardin, Antoine Bonnabel, Dr. Eric Mounier, "Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024", Yole Dévelopment Copyrights, 2014*
4. *Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015.*

20MCAE106 - SOFTWARE METRICS AND MEASUREMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Analyze the problem to ascertain the type of software measurement.*

CO2 : *Apply selected statistical methods and enlist the findings of analysis.*

CO3 : *Design and tailor the selected metric to match the information reliabilities need.*

CO4 : *Determine a plan to decide what data to collect and who should collect it.*

CO5 : *Interpret and communicate the metric results.*

FUNDAMENTALS OF SOFTWARE MEASUREMENT

Measurement in software engineering - scope of software metrics - measurement and models - measurement scales and scale types - classifying software measures - determining what to measure software measurement validation. Software metrics data collection - Analyzing software measurement data: Introduction- Analyzing the results of experiments- Simple analysis Techniques- Overview of statistical tests. **(10)**

SOFTWARE METRICS

Product quality metrics- In- Process quality metrics - Complexity metrics and models - Size metrics - Effort- cost and time measurement - Object Oriented metrics - software maintenance metrics **(10)**

SOFTWARE RELIABILITY MEASUREMENT

Basics of reliability theory- software reliability problem- parametric reliability growth models- the recalibration of software reliability growth predictions **(9)**

METRICS TO MANAGE PROJECTS

Tracking software progress - software project metrics - utilization and efficient project management **(7)**

MEASUREMENT AND MANAGEMENT

Planning a measurement program - Metrics plan - developing goals- questions and metrics - mapping measures to activities - measurement tools - measurers- analysts and audience - Measurement in practice. **(9)**

TOTAL : 45

REFERENCES

1. *Stephen H Kan, "Metrics and Models in Software Quality Engineering", Pearson Education, Second Indian Reprint, New Delhi, 2014.*
2. *N orman Fenton and Shari Lawrence Pfleeger, "Software Metrics - A Rigorous & Practical Approach", Third Edition, Thomson Asia Pvt Ltd, Singapore- 2014.*
3. *Highsmith J, "Agile Software Development Ecosystems", Addison Wesley, 2005.*
4. *Kent Beck, "Junit Pocket Guide", O'Reilly Media, First Edition, 2004.*
5. *Craig Larman, "Agile & Iterative Development - A Manager's Guide", Pearson Education, 2009.*

20MCAE107 - AGILE METHODS FOR SOFTWARE DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

20MCA15

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Ascertain the need of software development methodologies with agility and self adaptability features to develop the software which meets the user needs.*

CO2 : *Compare the practices followed in different agile methodologies and choose the suitable methodology for a given project*

CO3 : *Synthesize the various agile methodology practices to produce a methodology for a project*

CO4 : *Develop the system by employing test first programming concept using Junit framework*

CO5 : *Develop a simple application using Scrum or XP methodology*

INTRODUCTION TO AGILE DEVELOPMENT

Agile and Self Adapting : The Cooperative Game Principle - Agile Overview-Evolution of Agile - Agile Software Development Ecosystem -Iterative and Evolutionary approach. Evolution of Agile Methodologies - Agile outside Software Development **(9)**

AGILE SOFTWARE DEVELOPMENT ECOSYSTEMS (ASDE)

The Scrum Process - Scrum's Contributions - Dynamic Systems Development Method (DSDM) Principles - The DSDM Process- DSDM's Contributions-Crystal Methodology Design Principles - The Crystal Framework - Crystal Methods - Crystal's Contributions. **(9)**

FEATURE DRIVEN DEVELOPMENT

The Feature Driven Development(FDD) Process Model - Beyond the FDD process Description - Conceptual Similarities and Differences - FDD's Contributions - Extreme Programming(XP) Basics - XP values and Principles - XP's Contributions - Adaptive Software Development Life Cycle - Leadership-Collaboration Management - ASD's Contributions **(9)**

DEVELOPING AN ASDE

Articulating Ecosystem - Designing Agile Methodology - The Agile Metamorphosis **(8)**

JUNIT FRAMEWORK

I/O : Automatic Tests - Goal -Fixtures-Testing Exceptions - JUnit's Implementation - JUnit API - Test First Programming - Stub - Other Uses for Tests - Extending JUnit - JUnit and Ant - Running JUnit Standalone - JUnit and IDEs-Test Infection. **(10)**

TOTAL : 45

REFERENCES

1. *Rubin Kenneth S, " Essential Scrum: A Practical Guide to the Most Popular Agile Process", Addison-Wesley, First Edition, July 2012.*

2. *Todaro, Dave, "The Epic Guide to Agile: More Business Value on a Predictable Schedule with Scrum", R9 Publishing LLC, Kindle Edition, 2019.*
3. *Sagar Salunke, "JUnit with examples", O'Reilly Media, First Edition, Createspace Independent Pub; 1st Edition, 23 May 2016.*
4. *Craig Larman, "Agile & Iterative Development, A Manager's Guide", Pearson Education, 2009.*

20MCAE108 - SOFTWARE ARCHITECTURE AND DESIGN PATTERNS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Ascertain the need for Software Architecture and its features to develop software that meets user needs.*

CO2 *: Choose the suitable architectural style for a given project*

CO3 *: Synthesize the various architectural styles to produce a quality project*

CO4 *: Develop system by employing Design Patterns.*

CO5 *: Develop a simple application using Software Architecture and Design Pattern.*

INTRODUCTION TO SOFTWARE ARCHITECTURE

Introduction Software Architecture Definition Prospects - State of Art Architecture Business Cycle-Importance of Software Architecture - Architectural Structures. **(9)**

SOFTWARE ARCHITECURAL STYLES

Architectural Styles: Pipes and Filters- Layered Systems- Repositories -Process Control- Other familiar Architecture- Heterogeneous Architecture - Organizing Architectural Styles **(9)**

SOFTWARE ARCHITECTURE QUALITY

The Architectures and Quality Attributes Achieving Qualities - Achieving Quality goals with Architectural Styles -Unit Operations - Applying Unit Operations to User Interface - Case Studies- World Wide Web **(9)**

INTRODUCTION TO DESIGN PATTERN

Introduction - Definition - Making a pattern - Pattern categories - Relationship between patterns - Patterns and software architecture **(9)**

DESIGN PATTERNS

Creational patterns - Structural patterns - Behavioral patterns - Frameworks for patterns - Patterns catalogs and writing patterns. Case studies in UML. **(9)**

TOTAL : 45

REFERENCES

1. *Len Bass, Paul Clements & Rick Kazman, "Software Architecture in Practice", Addision Wesley, 3rd Edition, 2013.*
2. *Mary Shaw & David Garlan, "Software Architecture Perspectives on an emerging discipline", Prentice Hall of India, 3rd Indian Reprint, 2006.*
3. *Eric Gamma, Richard Helm, Ralph Johnson, John Vissides, "Grady Booch, Design Patterns", Addision Wesley, 2007.*
4. *Craig Larman, "Applying UML and Patterns", Prentice Hall, 2009.*

20MCAE109- BASICS OF ROBOTICS

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand the architecture of robots by learning paradigms and intelligence.*

CO2 : *Apply the Forward and Inverse Kinematics of manipulators and understand the dynamics in locomotion control and trajectory generation.*

CO3 : *Program an application for industrial robots.*

CO4 : *Synthesize the Machine Intelligence in robots by studying the functions of industrial manipulators using AI approach.*

CO5 : *Understand the automation in robotics by using drive system for gripper movement.*

INTRODUCTION TO ROBOTIC PARADIGMS

Robots-Intelligent Robots-Paradigm-Robotic Paradigms-Primitives Sense-Plan-Act-Overview of Three Paradigms-Hierarchical-Reactive and Hybrid Deliberative/Reactive-Architectures **(7)**

BASICS OF MECHANICS AND CONTROL

Description of position and orientation Mechanics-Kinematics-Forward and Inverse kinematics of manipulators-Dynamics. Introduction to Jacobian of the Manipulator-Trajectory generation- Programming Robots-Off-line Programming and simulation **(9)**

ROBOT PROGRAMMING LANGUAGES AND SYSTEMS

Levels of Robot Programming- A Sample Application in industrial robot - Requirements of a Robot Programming Language-Internal world model versus external reality-Context Sensitivity- Error Recovery **(9)**

TELEOPERATION TO AUTONOMY

Overview-Machine Intelligent-Use of Robots-Implications-Brief History-Industrial Manipulators-Space Robotics and the AI approach-Teleoperation-Telepresence-Semi-autonomous control- Seven Areas of Robotic AI **(10)**

BASICS OF ROBOTICS TECHNOLOGY AND AUTOMATION

Introduction - End-Effectors-Drive System for Grippers-Mechanical- Magnetic- Vaccum and Adhesive-Design of Multiple DOF-Sensory Devices-Types of Sensors-Robot Vision Systems-Low Level- Sensing- Digitizing-Preprocessing techniques-Noise reduction-enhancement. **(10)**

TOTAL : 45

REFERENCES

1. *Bruno Siciliano, Oussam Khati "Handbook of robotics", 2nd Edition, Springer, 2020.*
2. *Robin R.Murphy, "Introduction to AI Robotics", A Bradford Book, 2nd Edition, 2019.*
3. *Kevin M.Lynch, Frank C.Park, "Modern Robotics-Mechanics, Planning and Control"Cambridge University Press, 1st Edition, 2017.*
4. *John J. Craig, "Introduction to Robotics, Mechanics and Control", Pearson Education Inc-3rd Edition, 2013.*
5. *S.R. Deb, S.Deb, "Robotics Technology and Flexible Automation", Tata McGraw Hill Education, 2nd Edition, 2012.*

6. *S.K. Saha, "Introduction to Robotics", Tata McGraw Hill Education, 4th Edition, 2011.*
7. *Robert J.Schilling, "Fundamentals of Robotics, Analysis & Control", PHI Learning, 2010.*
8. *Mikell P Groover, Mitchel Weiss, Roger N Nagel, Nicholas G Odrey, Ashish Dutta, "Industrial Robotics Technology, Programming and Applications", 2nd Edition, 2012.*

20MCAE110 - GPU AND PARALLEL PROGRAMMING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Understand the basic concepts of super-computing and parallel programming architecture*

CO2 *: Identify the difference between serial and parallel programming needs to solve real-time problems.*

CO3 *: Demonstrate the ability to use GPUs for parallel programming to solve compute intensive tasks.*

CO4 *: Identify CUDA architecture and its components.*

CO5 *: Apply parallel programming methods and solve problems using CUDA platform*

HISTORY OF SUPER COMPUTING

Von Neumann Architecture - Cray - Connection Machine - Cell Processor - Multinode Computing - The Early Days of GPGPU Coding - The Death of the Single - Core Solution - NVIDIA and CUDA - GPU Hardware Alternatives to CUDA: OpenCL - Direct Compute - CPU alternatives - Directives and libraries. **(8)**

UNDERSTANDING PARALLELISM WITH GPUS

Introduction - Traditional Serial Code - Serial/Parallel Problems Concurrency: Locality - Types of Parallelism: Task - based parallelism - Data-based parallelism - Flynn's Taxonomy - Some Common Parallel Patterns: Loop-based patterns - Fork/join pattern - Tiling/grids - Divide and conquer. **(10)**

CUDA HARDWARE- GRIDS- BLOCKS- AND THREADS

PC Architecture - GPU Hardware-CPUs and GPUs - Setting up CUDA - Threads: Problem decomposition - Task execution model - Threading on GPUs - CUDA kernels - Blocks: Block arrangement - Grids: Stride and offset - X and Y thread indexes. **(10)**

MEMORY HANDLING WITH CUDA

Introduction- Caches : Types of data storage - Register Usage - Shared Memory: Sorting using shared memory - Constant Memory: Constant memory caching - Constant Memory Broadcast - Global Memory - Score boarding - Global memory sorting - Sample sort. **(8)**

CUDA IN PRACTICE

Introduction - Serial and Parallel Code - Design Goals of CPUs and GPUs - Processing Datasets Using ballot and other intrinsic operations - Profiling - Case Study on AES Algorithm. **(9)**

TOTAL : 45

REFERENCES

1. *Shane Cook, "CUDA Programming: A Developer's Guide to Parallel Computing with GPUs", Morgan Kaufman, 2012.*
2. *David Kirk, Wen-meiHwu, "Programming Massively Parallel Processors: A Hands-on Approach", Morgan Kaufman, 2010.*

20MCAE111 - DIGITAL IMAGE PROCESSING

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Describe different modalities and current techniques in image processing*

CO2 : *Provide mathematical foundations for digital manipulation of image acquisition, pre-processing, enhancement, segmentation and compression.*

CO3 : *Apply image processing techniques in both the spatial and frequency (Fourier) domains*

CO4 : *Learn different feature extraction techniques for image analysis and recognition.*

CO5 : *Develop and compare various Image Compression and Decompression Techniques.*

FUNDAMENTALS OF IMAGE PROCESSING

Introduction - Elements of visual perception- Steps in Image Processing Systems - Image Acquisition - Sampling and Quantization - Pixel Relationships - Colour Fundamentals and Models- File Formats, Introduction to the Mathematical tools. **(8)**

IMAGE ENHANCEMENT AND RESTORATION

Spatial Domain : Gray level Transformations- Histogram Processing- Spatial Filtering - Smoothing andSharpening. Frequency Domain: Filtering in Frequency Domain - DFT- FFT- DCT- Smoothing and Sharpening filters - Homomorphic Filtering- Noise models- Constrained and Unconstrained restoration **(10)**

IMAGE SEGMENTATION AND FEATURE ANALYSIS

Detection of Discontinuities - Edge Operators - Edge Linking and Boundary Detection - Thresholding - Region Based Segmentation - Motion Segmentation- Feature Analysis and Extraction. **(8)**

MULTI RESOLUTION ANALYSIS AND COMPRESSIONS

Multi Resolution Analysis : Image Pyramids - Multi resolution expansion - Wavelet Transforms- FastWavelet transforms- Wavelet Packets. Image Compression: Fundamentals - Models - Elements of Information Theory - Error Free Compression - Lossy Compression - Compression Standards - JPEG/MPEG. **(10)**

APPLICATIONS OF IMAGE PROCESSING

Representation and Description- Image Recognition- Image Understanding - Image Classification - Video Motion Analysis - Image Fusion - Steganography - Colour Image Processing **(9)**

TOTAL : 45

REFERENCE S

1. *Rafael C.Gonzalez and Richard E.Woods, "Digital Image Processing", 4th Edition, Pearson Education, 2018.*
2. *Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", 4th Edition, Brooks Cole, 2015.*
3. *Anil K.Jain, "Fundamentals of Digital Image Processing", Pearson Education, 2019.*
4. *Madhuri A. Joshi, "Digital Image Processing: An Algorithmic Approach", 2nd Edition, Prentice Hall India, 2018.*
5. *Rafael C.Gonzalez, Richard E.Woods and Steven L. Eddins, "Digital Image Processing Using MATLAB", 3rd Edition, Pearson Education, 2020.*

20MCAE112 - BLOCKCHAIN TECHNOLOGIES

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand the basics of distributed environment and decentralization.*

CO2 : *Describe the fundamentals of Blockchain.*

CO3 : *Analyze the working principles of Bitcoin.*

CO4 : *Develop Cryptography algorithms and protect Cryptocurrencies.*

CO5 : *Examine the development platform ethereum and Hyperledger.*

BLOCKCHAIN

Introduction - Distributed Systems- History of blockchain- Introduction to blockchain- Types of blockchain- CAP theorem and blockchain- Benefits and limitations of blockchain. Decentralization - Decentralization using blockchain- methods of decentralization- routes to decentralization- blockchain and full ecosystem decentralization- smart contract- decentralized autonomous organization- corporations- societies- application- Platforms for decentralization - Cryptography. **(10)**

CRYPTOCURRENCIES

Cryptographic primitives - Hash Functions- Bitcoin- keys and addresses-Public keys in bitcoinPrivate keys in bitcoin- Bitcoin currency units - Base58Check encoding- Vanity addresses- transactions- Types of transactions- blockchain- bitcoin payments- Alternative coins - theoretical foundations- bitcoin limitations - Block Chain Technologies. **(10)**

SMART CONTRACTS AND ETHEREUM

Smart Contracts - Recardian Contracts - Ethereum - Introduction- ethereum blockchain- elements- precompiled contracts- accounts- block- ether- messages- mining- clients and wallets- trading and investment- symbols- ethereum network- applications- scalability and security. **(9)**

CONTRACT DEVELOPMENT AND DEPLOYMENT

Ethereum development - Setting up a development environment- development tools and clients- Solidity Web3. **(9)**

HYPERLEDGER

Hyper ledger Projects - Fabric- Fabric architecture-block chain services- components of fabric- Sawtooth lake -PoET- CORDA-Architecture-components-Nodes-Permission services - Development environment-Case study in block chain management **(7)**

TOTAL : 45

REFERENCES

1. *Imran Bashir- "Mastering Blockchain", Packt Publishing, First Edition, 2017.*
2. *Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies", Princeton University Press, 2016.*
3. *Roger Wattenhofer, "The Science of the Blockchain", Inverted Forest Publishing, First Edition, 2016.*
4. *Don and Alex Tapscott, "Blockchain Revolution", Portfolio Penguin, 2016.*
5. *Andreas M. Antonopoulos, "Mastering Bitcoin: Programming the Open Blockchain", O'Reilly, Second Edition, 2017.*

20MCAE113 - SINGLE PAGE WEB APPLICATIONS

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Learn to build modern browser-based applications that take advantage of stronger client platforms and more predictable bandwidth.*

CO2 : *Learn the SPA design approach*

CO3 : *Explore new techniques like structured java scripts and responsive design*

CO4 : *Know how to capitalize trends like server side JavaScript and NoSQL data stores*

CO5 : *Develop frameworks that makes JavaScript more manageable and testable as a first class language.*

INTRODUCTION

Build first SPA - user benefits of well-written SPA. Re introducing JavaScript - variable scope, hoisting and execution context-scope chain, prototype chain and functions.

THE WEB SERVER

Role - the Node.js advance routing, authentication and authorization, Web Socket, Socket.IO. The server database, MongoDB, client data validation, CRUD

BUILD THE MODEL

Set up model and files. People object: design and build. Chat model, add avatar support. Chat feature and avatar feature, Data binding and jQuery. Create data module.

SPA CLIENT

Files and name spaces. The feature container - create, render and manage. Manage application state. Feature module: strategy, file design method API,. Implementation API, add frequencies.

READYING SPA FOR PRODUCTION

Optimising SPA for search engines, cloud and third party services, CDN, Caching and Cache Busting.

TOTAL : 45

REFERENCES

1. *Michael S. Mikowski and Josh C. Powell, "Single Page Web Applications", Manning Publicatons, September 2018.*
2. *Chris Love, "High Performance Single Page Web Applications", Chris Love, kinley edition January 11, 2014.*
3. *Emmit Scott, "SPA Design and Architecture: Understanding Single Page Web Applications", Manning Publications, 2015.*

20MCAE114 - DIGITAL MARKETING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Assess the impact of digital technology on the practice of marketing.*

CO2 : *Analyse the use of different forms of digital marketing in the development of an online presence.*

CO3 : *Develop a plan for marketing a product of business online.*

CO4 : *Integrate social media tools into a marketing communications strategy.*

CO5 : *Use a publishing platform to build a web presence with integrated data collection and links to social media.*

Understanding Marketing Management: Importance, Scope, Core Marketing Concepts, Marketing Tasks. Company Orientation towards Market Place: Evolution, New Marketing Realities. **(9)**

Introduction to Digital Marketing : Need for digital marketing - Commonly used terminology - 4Cs : Customer, Content, Context and Conversation - Three essential ingredients: Traffic, Insights and Conversions - Introduction to customer personas, buying process and their usability - Designing a basic digital marketing plan. **(9)**

Developing Marketing Strategies : Market Segmentation: Levels, Patterns, Bases, Effective Segmentation Criteria. Targeting: Approaches.Positioning:Steps, Differentiation Strategies. **(9)**

Building Online Presence : Introduction to Building online presence for businesses - basic terminology and technology - Website Domain: naming, working & registration - Website operation - Hosting website - Introduction to WordPress - basic concepts of linking content using HTML.

Building Traffic : Different techniques for driving traffic or visitors to a website - Introduction to search engine optimization, Social media marketing, Referral traffic, Display ads, Search engine marketing, Affiliate marketing and email marketing. **(9)**

Getting Insights : Collect and analyze data of visitors to websites - Introduction to Google Analytics and Google Webmaster Tools - Workings of web analytics - Set up Google Analytics for a website - Set up goals and filters in Google Analytics - Access and interpret reports - Set up and use Google Webmaster Tools for effectiveness of search engine optimization.

Driving Conversions : Convert website visitors into buyers - Basic conversion tracking using Google Analytics and ad platforms - Introduction to Landing Pages - Different types of conversions - Campaign optimization - Learn to create a landing page using UnBounce. **(9)**

TOTAL: 45

REFERENCES

1. *Seema Gupta, "Digital Marketing", McGraw Hill, 2018.*
2. *Philip Kotler, Kevin Lane Keller, Abraham Koshy & MithileshwarJha, "Marketing Management: A South Asian Perspective", 14th Edition, Pearson, New Delhi , 2014*
3. *Damian Ryan, "Understanding Digital Marketing - Marketing Strategies for Engaging the Digital Generation", 3rd Edition, Kogan Page Ltd., 2014*
4. *Dave Evans and Jake Mckee, "Social Media Marketing - The Next Generation of Business Engagement", Wiley India pvt. Ltd, New Delhi, 2011.*
5. *Perry Marshall, Thomas Melloche, "Ultimate Guide to Facebook Advertising", Tata McGraw Hill, New Delhi, 2011.*

20MCAE115 - SOFTWARE PROJECT MANAGEMENT

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PRE-REQUISITES

20MCA15

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Gain knowledge of how a project will be broken down into stages and what each stage contributes to the project*

CO2 *: Select appropriate techniques for use in the stages of a project*

CO3 *: Justify the appropriateness of these techniques- and apply them to practical situations*

CO4 *: Know the limitations of the project approach in developing information/software systems*

CO5 *: Test and apply metrics on the developed software to ensure compliance of requirements.*

INTRODUCTION

Projects - Software Projects Vs Other type of projects-Management-Requirement Specification. Step-wise Planning - Project Evaluation - strategic assessment - technical assessment - cost-benefit evaluation techniques- risk evaluation. Project analysis and contents list-choice of process models - Waterfall Model- V-Process Model - Software Prototyping - tools. **(9)**

SOFTWARE ESTIMATION & RISK MANAGEMENT

Software Estimation - Introduction-problems with over & under estimation - basis for estimation - various types of estimation. Activity Planning - objectives - project schedules and activities from different planning models. Risk Management: Nature-managing risk - evaluating risks. Resource Allocation: Nature - resource requirements-creating critical path and counting the cost. **(9)**

MONITORING AND CONTROL

Resposibility - assessing progress-setting check points - taking snapshots - collecting data - visualizing progress-cost monitoring-priority monitoring. Managing People & Organizing teams: Understanding behavior-organization behavior-Motivation - Olman Hackman job characteristics model - working in groups - becoming ateam - decision making & leadership. Planning for small projects - problems with students projects - content of project plan. **(9)**

SOFTWARE QUALITY ASSURANCE

Software Quality Factors - Quality Metrics - Software Quality Assurance approach - Software Quality Assurance Plan - ISO 9000 Quality System - SEI CMM - IEEE standards. Software Reliability - definition - concept of reliability and availability - software error and faults - reliability models - availability models. **(9)**

CASE STUDY

Using tool - project information - task information - Scheduling - resource allocation - leveling resources - cost estimation - reports - case studies and examples. **(9)**

TOTAL: 45

REFERENCES

1. *Bob Hughes , Mike Cotterell & Rajib Mall, "Software Project Management", Tata McGraw Hill, 6th Edition, 2017.*
2. *Roger S.Pressman, "Software Engineering: A Practitioners Approach", Tata McGraw Hill, 7th Edition, 2010.*
3. *"Microsoft Project Version 2002 Step by Step", Microsoft Press, 2002.*
4. *Walker Royce, "Software Project Management - A Unified Framework", Addison Wesley, 2004.*
5. *Ramesh Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2008.*

20MCAE116 - COMPUTER VISION

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PRE-REQUISITES

20MCAE101

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Implement fundamental image processing techniques required for computer vision.*

CO2 *: Perform shape analysis and implement boundary tracking techniques.*

CO3 *: Apply Hough Transform for line, circle, and ellipse detections.*

CO4 *: Apply 3D vision techniques and implement motion related techniques.*

CO5 *: Develop applications using computer vision techniques*

UNIT I IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques - classical filtering operations - thresholding techniques - edge detection techniques - corner and interest point detection - mathematical morphology - texture. **(8)**

UNIT II SHAPES AND REGIONS

Binary shape analysis - connectedness - object labeling and counting - size filtering - distance functions - skeletons and thinning - deformable shape analysis - boundary tracking procedures - active contours - shape models and shape recognition - centroidal profiles - handling occlusion - boundary length measures - boundary descriptors - chain codes - Fourier descriptors - region descriptors - moments. **(9)**

UNIT III HOUGH TRANSFORM

Line detection - Hough Transform (HT) for line detection - foot-of-normal method - line localization - line fitting - RANSAC for straight line detection - HT based circular object detection - accurate center location - speed problem - ellipse detection - Case study: Human Iris location - hole detection - generalized Hough Transform (GHT) - spatial matched filtering - GHT for ellipse detection - object location-GHT for feature collation. **(10)**

UNIT IV 3D VISION AND MOTION

Methods for 3D vision - projection schemes - shape from shading - photometric stereo - shape from texture - shape from focus - active range finding - surface representations - point-based representation - volumetric representations - 3D object recognition - 3D reconstruction - introduction to motion - triangulation - bundle adjustment - translational alignment - parametric motion - spline-based motion - optical flow - layered motion. **(9)**

UNIT V APPLICATIONS

Application: Photo album - Face detection - Face recognition - Eigen faces - Active appearance and 3D shape models of faces Application: Surveillance - foreground-background separation - particle filters - Chamfer matching, tracking, and occlusion - combining views from multiple cameras - human gait analysis Application: In-vehicle vision system : locating roadway - road markings - identifying road signs - locating pedestrians. **(9)**

TOTAL : 45

REFERENCES

1. *D. L. Baggio et al., "Mastering OpenCV 3", Second Edition, Packt Publishing, 2017.*
2. *E. R. Davies, "Computer Vision: Principles, Algorithms, Applications, Learning", Fourth Edition, Academic Press, 2017.*

3. *Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.*
4. *Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Fourth Edition, Academic Press, 2019.*
5. *R. Szeliski, "Computer Vision: Algorithms and Applications", 2nd Edition, Springer 2021.*
6. *Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, Hardback 2019.*

20MCAE117 - SOFTWARE TESTING AND QUALITY ASSURANCE

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PRE-REQUISITES

20MCA15

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Analyze different approaches to test software, and select applicable techniques for different situations and projects.*

CO2 : *Prepare a software quality plan for a software project considering process evaluation models including issues related to change management, configuration management, verification and validation, and measurement.*

CO3 : *Design test plans, create test procedures and design measures to evaluate result of tests.*

CO4 : *Apply black box and white box testing techniques at various testing levels for given requirements to achieve adequacy criteria.*

CO5 : *Use standards, models and techniques aimed at achieving quality assurance in different software development environments*

INTRODUCTION

The Role of Process in Software Quality - Testing as a Process - Overview of the Testing Maturity Model (TMM) - Basic Definitions - Software testing principles - Origins of defects - Defect classes, The defect repository, and Test Design - defect example : The coin problem. **(9)**

TESTING STRATEGIES

Test case design strategies - Black box approach - Random testing - Equivalence Class Partitioning - Boundary Value Analysis - Cause and Effect graphing - State Transition testing - Error Guessing- White Box approach - Test adequacy criteria - Coverage and Control Flow Graphs - Covering code logic- Data flow and White box test design - Loop testing - Mutation testing - Evaluating test Adequacy Criteria. **(12)**

LEVELS OF TESTING

Unit test: functions, procedures, classes and methods as units - Unit test planning - Designing the unit tests - The class as a Testable Unit -The test harness - Integration test : Goal- Integration Strategies for Procedures and Functions - Integration Strategies for Classes - Designing Integration Test - System Test : the different types - Regression testing - Alpha, Beta and Acceptance test- Test planning - Test Plan Components - Test Plan Attachments - Reporting Test Results. **(10)**

SOFTWARE QUALITY

Theory of software quality : Defining quality - Importance of Quality - Quality control v/s Quality Assurance - Quality Assurance at each phase of SDLC, Hierarchical Models of Quality : Hierarchical Models of Boehm and McCall, Planning for Software Quality Assurance : Software Quality Assurance Plans, Product Quality and Process Quality : Product Quality - Models for Software Product Quality - Process , Walkthroughs and Inspections **(7)**

SOFTWARE METRICS AND MODELS

Software Measurement and Metrics : Introduction to Selenium and Jmeter, Classification of Software Metrics, Defect Metrics, Requirement Related Metrics, Earned Value Analysis, Object Oriented Metrics. ISO 9000 series, ISO 9001 : Origins, ISO Standards Development Process, ISO 9000 Family, ISO 9001:2000, ISO Certification, Assessment Process. CMM Model - CMM and ISO Comparative analysis - CMM -I - P-CMM, SPICE, Malcolm Baldrige Award Model - EFQM Excellence Model **(7)**

TOTAL : 45

REFERENCES

1. *Ilene Burnstein, "Practical Software Testing", Springer International Edition, 1st Indian Reprint, 2004.*
2. *Stephan Goericke, "The future of Software Quality Assurance", Springer publications, 1st Edition Kindle, 2020*
3. *Dr.Anand Nayyar, "Software testing, An Approach to software testing, Principles,Applications, Techniques and Practices", BPB Publications, 2nd Edition, 2019.*
4. *Rex Black, Erik van veenendaal, Dorothy Graham, "Foundations of Software Testing" , Cengage Learning emea Publications, 4th Edition, 2019.*
5. *Abu Sayed Mahfuz, "Software Quality Assurance", Auerbach Publications; 1st Edition, 2016.*

20MCAE118 - OPEN SOURCE ECOSYSTEM

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Know about the professional management and implementation of Open Source Technologies*

CO2 : *Analyse the differential combination of new technologies with the matured one*

CO3 : *Decide on the boundaries of business which the web changed from building the business case to doing hands-on experimentation*

CO4 : *Self teach the issues faced in transitioning to the new technologies, ranging from business to social concern.*

CO5 : *Understand roles for open source software in organization.*

INTRODUCTION

Open Source Software : Definition- History- Successful Areas with Examples.The Good- Bad and the ugly of Open Source Systems. Open Source Opportunities - Create Lab - Migration - Build Applications - Bring the New Desktop Systems Underserved and Migrate Applications and Databases to Open Source. **(7)**

ADVANCED OPEN SOURCE OPPORTUNITIES

Introduction - Directory Services - Email - Complex Web Publishing - Manage User Desktops - Other Possibilities'.Open Source Operating Systems - Linux Distribution Vendors- Enterprise Distribution Vendors- Community Supported Distribution Vendors- International Alternatives **(12)**

SERVER AND DESKTOP APPLICATONS

Server Applications - Infrastructure services - Web Servers - Database Servers - Mail Servers - Systems Management. Desktop Applications - Graphical Desktops - Web Browsers - The Office Suit - Mail and Calendar Clients. **(12)**

IMPLEMENTATION AND ARCHITECTURE

Methodology- Language and Cross Platform Code. System Implementation Process- Principles- Key Documents and integration with Open Source Community. Architecture - Managing Tiered Design - Performance and Scalability - Interoperability - Platform. **(8)**

COST AND LISCENCING

Ownership Costs - Staffing- Hardware- Software and Third Party Applications. Pricing - Types of Costs and Scenarios. Licensing - Types - License in use - Dual Licensing - Intellectual Property Issues **(6)**

TOTAL : 45

REFERENCES

1. *Paul Kavanaugh, "Open Source Software, Implementation and Management", Elsevier Press, 2004.*
2. *Stephen Koch, "Free/Open Source Software Development", Idea Group Publishing, 2005.*
3. *Karl Fogel, "Producing Open Source Software: How to Run a Successful Free Software Project", under the Creative Commons Attribution, ShareAlike, 2018.*

20MCAE119 - ENTERPRISE MANAGEMENT AND COMPUTING

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Make computing available as a utility under the internet.*

CO2 : *Understand the fundamentals of enterprise architecture and enterprise computing.*

CO3 : *Implement cloud programming paradigms like MapReduce.*

CO4 : *Describe the emerging development paradigms and technologies and discuss how these will change the way the enterprise applications should be architected.*

CO5 : *Understand the benefits of open source technologies on enterprise computing.*

INTRODUCTION

Architecture - Mainframe- Client/Server- 3-tier Architecture with TP monitors- Dev 2.0 Platforms- Cloud Computing. Enterprise Architecture - Data and process- Components- Application Integration and SOA- Data Centre Infrastructure. **(9)**

CLOUD PLATFORMS

Cloud Economics -Virtualization Technology - Multi-tenant Software. Data in the Cloud- Big Table- HBase and Dynamo. Map Reduce and Extensions. Software Architecture- Enterprise software - ERP- SCM & CRM. Custom Enterprise Applications. **(10)**

WORKFLOW AND BUSINESS PROCESS

Implementing workflow- Meta Model using ECA rules- ECA WorkFlow Engine- Process Modelling and BPMN. Enterprise Analytics and Search. **(10)**

ENTERPRISE CLOUD COMPUTING

Ecosystem - Cloud Management Platforms and Tools- Tools for Building Private Clouds. Future of Enterprise Cloud Computing. **(8)**

OPEN SOURCE ENTERPRISE COMPUTING

Open Source Licenses- Management of Open Source Software Projects- Open Standards. Business Strategies - Revenue Streams- Analysis and Critical Success Factors. **(8)**

TOTAL : 45

REFERENCES

1. *Wolf Rogner, Allgemeinbeeideter and Gerichtlichzertifizierter Sachverstandiger "Open Enterprise Computing", Students Handbook, 2016*
2. *Gautam Shroff, "Enterprise Cloud Computing, Technology, Architecture and Applications", Cambridge University Press, UK, 2010.*
3. *Gunasekaran- Angappa, "Global Implications of Modern Enterprise Information Systems: Technologies and Applications", IGI Global, 2008*

20MCAE201 - DATA ANALYTICS

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Outline the definitions, concepts and enabling technologies of data analytics.*

CO2 *: Analyze different statistical analysis techniques to be applied on different types of datasets.*

CO3 *: Develop regression models using R for a given dataset.*

CO4 *: Apply text analysis methods to analyze unstructured data.*

CO5 *: Create solutions for real world business problems and effectively present results using data visualization techniques.*

INTRODUCTION

Introduction to Big Data Analytics : Big Data Overview - State of the Practice in Analytics - Key Role for the New Big Data.

Ecosystem- Examples of Big Data Analytics. Data Analytics Lifecycle: Overview - Discovery - Data Preparation - Model Planning- Model Building - Communicate Results - Operationalize - Case Study. **(10)**

BASIC DATA ANALYTIC METHOD USING R

Introduction to R - Exploratory Data Analysis - Statistical Methodsfor Evaluation. **(8)**

REGRESSION AND TIME SERIES ANALYSIS

Linear Regression - Logistic Regression- Time Series Analysis : Box-Jenkins Methodology-ARIMA Model: Autocorrelation Model - Auto Regressive Models - Moving Average Model ARMA and ARIMA Models. **(9)**

TEXT ANALYSIS

Text Analysis Steps with Example- Collecting- Representing Text - Term Frequency -Categorizing Documents by Topics - Determining Sentiments. **(10)**

DATA ANALYTICS PROJECT

Communicating and Operationalizing and Analytics Project - Creating the Final Deliverables Data Visualization. **(8)**

TOTAL : 45

REFERENCES

1. *EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley, 2015.*
2. *Thomas A. Runkler, "Data Analytics - Models and Algorithms for Intelligent Data Analysis", Springer, 2012.*

20MCAE202 - INTELLIGENT INFORMATION RETRIVEL

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand algorithms and techniques for information retrieval.*

CO2 : *Design a search engine or any text retrieval system.*

CO3 : *Apply data mining techniques and quantitative evaluation methods for IR systems.*

CO4 : *Develop applications with retrieval capabilities.*

CO5 : *Combine aspects of information visualization and mining for information retrieval and web information retrieval.*

BASICS OF INFORMATION RETRIVEL

Boolean Retrieval - The Term Vocabulary and Posting Lists - Scoring- Term Weighting and the Vector Space Model - Computing Scores in a Complete Search System - Evaluation in Information Retrieval. **(11)**

IR MODELS

XML Retrieval - Probabilistic Information Retrieval : Review - Ranking Principle Binary Independence Model - Language Models for Information Retrieval : Language Models - Query Likelihood Model **(10)**

TEXT CLASSIFICATION AND SVM MODEL

Text Classification and Naïve Bayes : Text Classification Problem - Naïve Bayes Text Classification Bernoulli Model - Properties of Naïve Bayes - Feature Selection. Support Vector Machines and Machine Learning on Documents : SVM Models - Machine Learning methods **(9)**

CLUSTERING AND MATRIX DECOMPOSITIONS

Flat Clustering : Problem Statement - K-means - Hierarchical Clustering: Agglomerative Clustering - Centroid Clustering - Divisive Clustering - Matrix Decompositions and Latent Semantic Indexing. **(9)**

WEB SEARCH AND IR

Web Search Basics - Web Crawling and Indexes : Overview - Crawling - Link Analysis : Pagerank. **(6)**

TOTAL : 45

REFERENCES

1. *Christopher Manning, Prabhakar Raghavan and Hinrich Schutze, "Introduction to Information Retrieval", Cambridge University Press, 2012.*
2. *Ricardo Baeza-Yates, Berthier Ribeiro-Neto, "Modern Information Retrieval: The concepts and Technology behind Search" (ACM Press Books), Second Edition, 2011.*
3. *D.A. Grossman, O. Frieder, "Information Retrieval: Algorithms and Heuristics", Springer, 2004.*
4. *Bruce Croft, Donald Metzler and Trevor Strohman, "Search Engines: Information Retrieval in Practice", Addison Wesley, First Edition, 2009.*
5. *Mark Levene, "An Introduction to Search Engines and Web Navigation", Wiley, Second Edition, 2010.*

20MCAE203 - BIG DATA TECHNOLOGIES

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Build single and multi-node Hadoop clusters on Linux or Windows platform*

CO2 : *Use Hadoop file system commands to load and execute programs on it.*

CO3 : *Write map-reduce programs for data intensive applications and execute them on the Hadoop platform.*

CO4 : *Use NoSQL databases like MongoDB in data processing applications.*

CO5 : *Choose appropriate big data technologies to analyse big data for a given analytic requirement.*

FUNDAMENTALS OF BIG DATA

Classification of Digital Data- Characteristics of Data-Evolution of Big Data-Definition-Challenges-Traditional Business Intelligence versus Big Data. **(6)**

BIG DATA ANALYTICS

Introductionto Big Data Analytics-Classification of Analytics-Challenges of Big Data-Terminologies used in Big Data Environments-Big Data technologies: NoSQL and Hadoop. **(6)**

HADOOP

Data Storage and Analysis-Comparison with Other Systems-A Brief History of Hadoop-Apache Hadoop and the Hadoop Ecosystem-Setting up a Hadoop Cluster. **(8)**

HADOOP DISTRIBUTED FILE SYSTEM

Design of HDFS -HDFS Concepts: Blocks-Name Nodes and Data Nodes-HDFS Federation-HDFS High-Availability-The Command-Line Interface-Basic File System Operations-Hadoop File Systems-The Java Interface-Reading Data From a Hadoop URL-Reading Data Using the File System API- Writing Data-Directories-Querying the File System-Deleting Data. **(9)**

MAP REDUCE

A Weather Dataset- Data Format- Analyzing the Data with Hadoop -Map and Reduce- Java Map Reduce-Scaling Out-Data Flow-Combiner Functions-Running a Distributed Map Reduce Job-Map Reduce Program Examples. **(9)**

NOSQL AND MONGODB

Introduction to NoSQL-Types of NoSQL Databases-Advantages and Use-SQL versus NoSQL. Introduction to MongoDB-Data Types-MongoDB Query Language. **(7)**

TOTAL : 45

REFERENCES

1. *Seema Acharya and Subhashini Chellappan, "Big Data and Analytics", 2nd Edition, Wiley, 2019.*
2. *Tom White, "Hadoop: The Definitive Guide, O'Reilly Media", 3rd Edition, Yahoo Press, 2012.*
3. *Chuck Lam, "Hadoop in Action", Manning Publications, 2011.*
4. *Srinath Perera,Thilina Gunarathne, "Hadoop Map Reduce Cookbook", Packt Publishing Limited, 2013.*

20MCAE204 - DATA MINING AND WAREHOUSING

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Examine a given dataset identify the analysis goals and providing data mining solutions to achieve those goals.*

CO2 : *Choose proper pre-processing techniques by studying the characteristics of the attributes of the dataset and prepare it for data mining.*

CO3 : *Apply association rule mining techniques such as Apriori and FP-Tree to a given dataset and generate association rules from it.*

CO4 : *Analyze the suitability of classification (Decision Tree) and clustering algorithms(K-Means and K-Medoids) for a given data analysis requirement.*

CO5 : *Mine hidden patterns from the dataset after applying pre-processing techniques and derive inference from the results of mining.*

INTRODUCTION

Definition- Need for Data Mining- Kinds of Data and Patterns- Applications and Issues. Types of data: Data objects and Attribute-Types-Measuring Data Similarity and Dissimilarity. Data Preprocessing: Overview- Data Cleaning-Data Integration-Data Reduction-Data Transformation-Data Discretization. **(12)**

DATA WAREHOUSE AND OLAP TECHNOLOGY

Data Warehouse-Basic Concepts-Data Warehouse Modeling-Data Warehouse Implementation. **(7)**

ASSOCIATION AND CLASSIFICATION TECHNIQUES

Mining Frequent Patterns and Associations : Basic Concepts-Frequent Itemset Mining Methods.

Classification : Basic Concepts-Decision Tree Induction- Bayes Classification Methods. **(12)**

CLUSTER AND OUTLIER ANALYSIS

Cluster Analysis Concepts-Partitioning Methods-Hierarchical Methods : Agglomerativeand Divisive Hierarchical Clustering-BIRCH. Outlier Detection : Outliers and Outlier Analysis-Outlier Detection Methods. **(7)**

MINING COMPLEX DATA TYPES

Mining Sequence Data-Mining Graphs and Networks-Mining Other Kinds of Data- Visual and Audio Data Mining. **(7)**

TOTAL : 45

REFERENCES

1. *Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining - Concepts and Techniques", 3rd Edition, Elsevier Publications, 2012.*
2. *Paul C. Zikopoulos, Chris Eaton, Dirk deRoos and George Lapis, "Understanding Big Data", Mc-Graw Hill, 2012.*
3. *Arun K. Pujari, "Data Mining Techniques", Universities Press, 2009.*
4. *Mohammed J. Zaki, Wagner Meira, "Data Mining and Machine Learning : Fundamental Concepts and Algorithms", 2nd Edition, Cambridge University Press, 2020.*

20MCAE205 - NATURAL LANGUAGE PROCESSING

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PRE-REQUISITES

20MCA21

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand core algorithms and data structures used in NLP*

CO2 : *Utilize corpora and annotations added to them*

CO3 : *Build statistical NLP components such as n-gram language models, text classifiers and Parts-of-speech taggers, that learns from such corpora*

CO4 : *Evaluate the merits of different machine learning methods for given NLP tasks*

CO5 : *Appreciate the relationship between linguistic representations and computational applications*

INTRODUCTION

Human languages- Models- Ambiguity - Processing paradigms; Phases in Natural Language Processing- Applications. Text Representation in Computers- Encoding Schemes - Linguistics Resources. **(8)**

Introduction to Corpus - Elements in Balanced Corpus- TreeBank- PropBank- WordNet- VerbNet. Resource Management with XML- Management of Linguistic Data with the help of GATE- NLTK. **(7)**

WORD LEVEL ANALYSIS

Regular Expressions and Automata- Morphology and Finite State Transducer- Probabilistic Models of Pronunciation and Spelling- N-grams- HMMs and Speech Recognition. **(9)**

SYNTACTIC ANALYSIS

Word classes and Part-of-Speech Tagging- Context - Free Grammars- Parsing with Context- Free Grammars- Features and Unification- Lexicalized and Probabilistic Parsing- Language and Complexity. **(11)**

SEMANTIC ANALYSIS AND DISCOURSE PROCESSING

Representing Meaning- Semantic Analysis- Lexical Semantics- Word Sense Disambiguation and Information Retrieval. Simple Applications in NLP. **(10)**

TOTAL : 45

REFERENCES

1. *Jurafsky D. and J. H. Martin, "Speech and language processing: An Introduction to Natural Language Processing: Computational Linguistics and Speech Recognition", 2nd Edition, Pearson Paperback, 2013*
2. *Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.*
3. *Jurafsky and Martin, "Speech and Language Processing", Prentice Hall, 1st Edition, 2000.*

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20MCAE206 - SOCIAL NETWORK ANALYSIS

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand concept of semantic web and related applications.*

CO2 : *Represent knowledge using ontology.*

CO3 : *Model social network data.*

CO4 : *Understand importance of communities in social network.*

CO5 : *Apply techniques for visualization of social networks.*

INTRODUCTION

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key Concepts and Measures in Network Analysis - Electronic Sources for Network Analysis: Electronic Discussion Networks- Blogs and Online communities - Web-based Networks - Applications of Social Network Analysis **(9)**

MODELLING- AGGREGATING AND KNOWLEDGE REPRESENTATION

Ontology and their role in the Semantic Web : Ontology-based Knowledge Representation - Ontology Languages for the Semantic Web: Resource Description Framework - Web Ontology Language. **(7)**

MODELLING AND AGGREGATING SOCIAL NETWORK DATA :

State-of the-art in network data representation - Ontological representation of Social Individuals - Ontological Representation of Social Relationships - Aggregating and Reasoning with Social Network Data - Advanced Representations. **(9)**

EXTRACTION AND MINING COMMUNITIES IN WEB S

Extracting Evolution of Web Community from a Series of Web Archive - Detecting communities in Social Networks - Definition of community - Evaluating Communities - Methods for Community Detection and Mining - Applications of Community Mining Algorithms - Tools for Detecting Communities Social Network Infrastructures and Communities - Decentralized Online Social Networks - Multi- Relational Characterization of Dynamic Social Network Communities. **(10)**

VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix Representation - Visualizing Online Social Networks- Visualizing Social Networks with Matrix-based Representations - Matrix and Node-Link Diagrams - Hybrid Representations - Applications - Cover Networks - Community Welfare - Collaboration Networks - Co-Citation Networks. **(10)**

TOTAL : 45

REFERENCES

1. *Peter Mika, "Social Networks and the Semantic Web", 1st Edition, Springer, 2007.*
2. *BorkoFurht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.*
3. *Guandong Xu, Yanchun Zhang and Lin Li, "Web Mining and Social Networking Techniques and Applications", 1st Edition, Springer, 2011.*

4. *Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.*
5. *Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access:Techniques for Improved User Modelling", IGI Global Snippet, 2009.*
6. *John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.*

20MCAE301 - COMPUTER NETWORKS

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Identify the components required to build different types of networks and have an understanding of network models.*

CO2 : *Analyze the layered functionality and data communication mechanisms used between nodes.*

CO3 : *Identify the protocols involved at the various layers and demonstrate the role of each protocol.*

CO4 : *Analyze and describe the working principles of Internet.*

CO5 : *Apply various routing protocols, demonstrate the best routing between nodes and describe the network functionalities for a given application.*

INTRODUCTION

Uses of computer networks - Network hardware - Network software - Reference models - Example networks: RFID and Sensor Networks. Physical Layer: Theoretical basis for data communication - Guided transmission media: Twisted pairs- Coaxial cable- Fiber Optics - Unguided transmission: The Electromagnetic spectrum - Radio wave transmission- Micro wave transmission - Infrared transmission. **(9)**

DATA LINK LAYER

Design issues - Services provided to the network layer - Framing - Flow Control - Error Control. Error detection and correction - Elementary data link protocols: A Simplex Stop- and-Wait protocol for an Error -Free Channel - Sliding window protocols: A One-Bit Sliding window Protocol. Example Data Link protocols: Packet over SONET. MAC Layer: Channel allocation problem - Multiple access protocols: ALOHA - CSMA. **(9)**

NETWORK LAYER

Design issues - Services provided to the Transport Layer - Routing algorithms: Shortest Path Algorithm - Distance Vector Routing - Link State Routing. Congestion control algorithms: Traffic aware routing - Admission Control. Internetworking: Tunneling - Internetwork Routing - Packet Fragmentation. **(9)**

TRANSPORT LAYER

Transport service - Services provided to upper layer - Transport Service primitives - Elements of transport protocols -Addressing - Connection Establishment and Release - Error Control and Flow Control - Multiplexing - A Simple transport protocol: TCP: Introduction -Service Model - Connection Establishment and Release **(9)**

APPLICATION LAYER

Domain Name System: The DNS Name Space - Domain Resource Records - Name Servers - Electronic mail: Architecture and Services - The User Agents - Message Formats - Message Transfer and Delivery - World Wide Web: Architectural overview - Static and Dynamic Web Pages- HTTP - Mobile Web - Web Search. **(9)**

TOTAL : 45

REFERENCES

1. *Andrew S Tanenbaum and David J. Wetherall, "Computer Networks", Pearson Education, Asia, 5th Edition, 2011.*
2. *Behrouz A.Forouzan, "Data Communications and Networking", McGraw-Hill Science/Engineering/Math Publication, 5th Edition, 2012.*

3. *James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Addison- Wesley, 6th Edition, 2008.*
4. *Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", Morgan Kaufmann Publishers, 5th Edition,2011.*
5. *William Stallings, "Data and Computer Communication", Pearson Education, 8th Edition, 2007.*

20MCAE302 - INTERNETWORKING PROTOCOLS AND MANAGEMENT

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Illustrate the working principles of link layer and network layer protocols used for data communication in the Internet.*

CO2 : *Determine the suitability of User Datagram Protocol for the given application in terms of reliability and Performance.*

CO3 : *Understand and experiment the working of Transmission Control Protocol for the given application based on its requirements.*

CO4 : *Analyze the requirements for monitoring and controlling a network using Simple Network Management Protocol and the Management Information Base.*

CO5 : *Develop TCP and UDP based socket programs for the given client server communication scenario.*

LAYER I & II PROTOCOLS

OSI and TCP/IP Reference model - Concepts of multiplexing and switching - MAC protocols - ALOHA, CSMA/CD - Address Resolution Protocol- IPv4 headers-IP forwarding- Host Processing of IP datagrams - IP Fragmentation - ICMPv4 - DHCP Auto configuration Protocol **(9)**

UDP AND APPLICATIONS

Introduction to UDP - UDP Header and Encapsulation - Broadcasting and Multicasting - Internet Group Management Protocol - Trivial File Transfer Protocol - Bootstrap Protocol **(9)**

TRANSMISSION CONTROL PROTOCOL

Introduction to TCP - TCP Header and Encapsulation - Connection Management - Timeout and Retransmission - Data Flow and Window Management - Congestion Control - TCP Timers **(9)**

NETWORK MANAGEMENT

Introduction - Network Monitoring - Network Control. SNMPv1: Concepts - Management Information Standard MIBs - Simple Network Management Protocol **(9)**

SOCKET PROGRAMMING

Introduction to Sockets - Socket Addresses - Elementary and advanced Socket System Calls-Client Server Communication using Sockets: Connection Oriented Protocol- Connection less Protocol - Socket Options **(9)**

TOTAL : 45

REFERENCES

1. *Kevin R. Fall, W. Richard Stevens, "TCP/IP Illustrated- Volume 1:The Protocols", Pearson Education Asia, 2nd Edition, 2012.*
2. *William Stallings, "SNMP, SNMPv2, SNMPv3 and RMON 1 and 2", Pearson Education Asia, 3rd Edition, 2013.*
3. *W. Richard Stevens, "UNIX Network Programming", Prentice-Hall of India Pvt.Ltd, 2nd Edition, 2009.*
4. *Behrouz A. Forouzan, "TCP/IP Protocol Suite", Tata McGraw-Hill Publishing Company Limited, New Delhi, 4th Edition, 2010.*
5. *Michael J.Donahoo, Kenneth L.Calvert, "TCP/IP Sockets in C - Practical Guide for Programmers", Morgan Kauffman, 2nd Edition, 2009.*

20MCAE303 - MOBILE COMPUTING

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Describe wireless and mobile computing systems and analyze the architecture- functions and emerging techniques in GSM*

CO2 : *Understand the issues and techniques used in the design of MACfor Wireless communication.*

CO3 : *Explain the structure and components for Mobile IP and Mobility Management*

CO4 : *Describe the types and functionalities of transport and application layer services for wireless communication*

CO5 : *Develop applications that are mobile-device specific and demonstrate current practice in mobile computing contexts.*

INTRODUCTION TO MOBILE COMPUTING

Introduction to MC- novel applications- limitations- and architecture. GSM : Mobile services- System architecture- Radio interface- Protocols- Localization and calling- Handover- Security- and New data services-Layouts, views and resources. **(8)**

WIRELESS MOBILE APPLICATION AND MEDIUM ACCESS CONTROL

Wireless Application Protocol - Introduction - protocol architecture - WDP - WTLS - WTP - WSP - WML - WML Script - WAE - WTA. Motivation for a specialized MAC (Hidden and exposed terminals- Near and far terminals)- SDMA- FDMA- TDMA- CDMA. **(10)**

LAYERS

Mobile Network Layer : Mobile IP - Goals- assumptions- entities and terminology - IP packet delivery - registration - optimizations - Dynamic Host Configuration Protocol (DHCP). Mobile Transport Layer- Traditional TCP- Indirect TCP- Mobile TCP- Transmission /time-out freezing- Selective retransmission- Transaction oriented TCP. **(9)**

ENHANCING ANDROID MOBILE APPLICATIONS

Android development environment -user interface - Application fundamentals - Extending the applications-preparing the working environment-adaptive layouts-adapters-localization-custom views-debugging the user interface-material design-Intents-observer patterns-fragments-files-accessibility-activity-themes and styles-Background tasks-Connecting to internet-preferences-alarms-broadcast receivers-notification-widgets-transferring data efficiently-publishing app. **(10)**

SECURITY SERVICES

Security and system permissions - multiple form factors - sensors - google cloud messaging- monetizing app - content resolvers and providers - fragment programming - security services-processes and threads-recycler view **(8)**

TOTAL : 45

REFERENCES

1. *Raj Kamal, “Mobile Computing”, 3rd Edition, Oxford University Press, 2018.*
2. *JochenSchiller, "Mobile Communications", Addison-Wesley, Second Edition, 2014.*
3. *Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2016*
4. *William Stallings, "Wireless Communications and Networks", 2nd Edition, Prentice Hall of India, Pearson Education, 2015.*
5. *Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt.Ltd, New Delhi, 2017.*

20MCAE304 - WIRELESS NETWORKS

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Study about wireless network basics, architecture, protocol stack and standards.*

CO2 *: Understand the working of wireless medium access control layer and network layer.*

CO3 *: Design and implement wireless network environment using wireless network protocols and standards.*

CO4 *: Analyze different routing protocols in mobile ad-hoc network.*

CO5 *: Conversant with advanced wireless networks 3G, 4G and 5G and their architecture.*

Wireless Network and LAN technologies: Introduction- Frequencies for Radio Transmission - Signals - Antennas - Signal Propagation-Multiplexing - Modulation - Wireless LAN technologies: Infrared, UHF narrow band, spread spectrum- IEEE 802.11: System Architecture. **(9)**

Medium Access Control Layer : Motivation for a specialized MAC - SDMA - FDMA - TDMA - Fixed TDM, Classical Aloha, Slotted Aloha, Carrier Sense Multiple Access, Demand Assigned Multiple Access, PRMA, Reservation TDMA, Multiple Access with Collision Avoidance, Polling, Inhibit Sense Multiple Access- CDMA - Spread Aloha Multiple Access- Comparison **(9)**

Network Layer : Mobile IP - Session Initiation Protocol - Mobile Ad-hoc Network: Characteristics - Classification of routing protocols - Table driven Routing Protocol - OLSR - Source-initiated On-demand Routing Protocol - DSR - Hybrid Routing Protocols - ZRP. **(8)**

Wireless Wide Area Networks : Overview of UMTS Terrestrial radio access network - UMTS core network architecture : 3G - MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC, SMS-IWMSC, Firewall, DNS, DHCP- High Speed Downlink Packet Access (HSDPA) - LTE network: Architecture and Protocol. **(10)**

4G and 5G Networks : 4G vision - Features and challenges - Applications of 4G - Introduction and Roadmap To 5G: Historical trend and evolution of LTE technology to beyond 4G - 5G use cases and System Concepts - 5G Architecture - Small cells for 5G mobile networks - IoT: relation to 5G. **(9)**

TOTAL : 45

REFERENCES

1. *Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education,2014.*
2. *Vijay K Garg, "Wireless Communication and Networking", First Edition, Elsevier, 2011.*
3. *Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley & Sons, Ltd, 2015.*

20MCAE305 - AD HOC NETWORKS

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Describe unique issues in ad-hoc networks and MAC protocols and their classifications*

CO2 : *Discuss challenges in designing routing and transport protocols for ad-hoc networks*

CO3 : *Demonstrate familiarity with common wireless sensor node architecture and the organization of MAC protocols developed for WSN.*

CO4 : *Demonstrate knowledge of routing in WSN and to analyze and classify wireless mesh networks.*

CO5 : *Develop simple routing solutions for ad-hoc- WSN and mesh networks.*

AD-HOC MAC

Introduction - Issues in Ad-hoc Wireless Networks. MAC Protocols - Issues- Classifications of MAC protocols- Multi channel MAC & Power Control MAC Protocol. **(9)**

AD-HOC NETWORK ROUTING & TCP

Issues - Classifications of routing protocols-Hierarchical and Power aware. Multicast routing - Classifications: Tree based- Mesh based. Ad-hoc Transport Layer Issues. TCP over Ad-Hoc- Feedback based- TCP with explicit link- TCO-Bus- Ad-Hoc TCP- and Split TCP. **(9)**

WSN - MAC

Introduction - Sensor Network Architecture- Data dissemination- Gathering. MAC Protocols - Self -organizing- Hybrid TDMA/ FDMA and CSMA based MAC **(9)**

WSN ROUTING- LOCALIZATION & QOS

Issues in WSN routing - OLSR- AODV- Localization - Indoor and Sensor network Localization. QoS in WSN **(9)**

MESH NETWORKS

Necessity for Mesh Networks - MAC enhancements - IEEE 802.11s Architecture - Opportunistic routing - Self configuration and Auto configuration - Capacity Models - Fairness- Heterogeneous Mesh Network -Vehicular Mesh Networks. **(9)**

TOTAL : 45

REFERENCES

1. *C. Siva Ram Murthy and B.S. Manoj, "Ad Hoc Wireless Networks : Architectures and Protocols", Pearson Education, 2008.*
2. *Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman Publishers, 2004.*
3. *C.K.Toh, "Ad Hoc Mobile Wireless Networks : Protocols and Systems", 2nd Edition, Pearson Education, 2002.*
4. *Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", O'Reilly Publishers, 2007 .*
5. *Charles E.Perkins, "Ad Hoc Networking", Addison Wesley, 2000.*

20MCAE401 - ORGANIZATIONAL BEHAVIOR

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Given a case study, analyze the behavior of the individual.*

CO2 : *Given a case study, analyze the behavioral pattern of group interaction in organization*

CO3 : *Given a scenario in an organization assess the attitude and personality of the individuals in the organization.*

CO4 : *Given a business problem form groups and finds a solution to the problem.*

CO5 : *Given a problem in an organization, apply emotional intelligence and solve the problem.*

INTRODUCTION TO ORGANIZATIONAL BEHAVIOR

Concept- Nature- Characteristics- Conceptual Foundations and Importance- Models of Organizational Behavior- Management Challenge- A Paradigm Shift- Relationship with Other Fields- Organizational Behavior : Cognitive Framework- Behavioristic Framework and Social Cognitive Framework **(8)**

PERCEPTION AND ATTRIBUTION

Concept- Nature- Process- Importance. Management and Behavioural Applications of Perception. Attitude: Concept- Process and Importance- Attitude Measurement. Attitudes and Workforce Diversity. Personality: Concept- Nature- Types and Theories of Personality Shaping- Personality Attitude and Job Satisfaction.

Learning : Concept and Theories of Learning. **(10)**

MOTIVATION

Concepts and Their Application- Principles- Theories- Employee Recognition- Involvement- Motivating a Diverse Workforce. Leadership: Concept- Function- Style and Theories of Leadership-Trait- Behavioural and Situational Theories. Analysis of Interpersonal Relationship- Group Dynamics: Definition- Stages of Group Development- Group Cohesiveness- Formal and Informal Groups- Group Processes and Decision Making- Dysfunctional Groups. **(10)**

ORGANIZATIONAL POWER AND POLITICS

Concept- Sources of Power- Distinction Between Power- Authority and Influence- Approaches to Power- Political Implications of Power: Dysfunctional Uses of Power. Knowledge Management & Emotional Intelligence in Contemporary Business Organisation.

ORGANIZATIONAL CHANGE

Concept- Nature- Resistance to change- Managing resistance to change- Implementing Change- Kurt Lewin Theory of Change. **(8)**

CONFLICT

Concept- Sources- Types- Functionality and Dysfunctionality of Conflict- Classification of Conflict Intra- Individual- Interpersonal- Intergroup and Organizational- Resolution of Conflict- Meaning and Types of Grievance and Process of Grievance Handling. Stress: Understanding Stress and Its Consequences- Causes of Stress- Managing Stress. Organizational Culture: Concept- Characteristics- Elements of Culture- Implications of Organisation culture- Process of Organisational Culture. **(9)**

TOTAL : 45

REFERENCES

1. *Newstrom John W., "Organizational Behaviour: Human Behavour at Work", Tata Mc Graw Hill- 12th Edition, 2017.*
2. *Luthans Fred, "Organizational Behaviour", Tata McGraw Hill, 3rd Edition, 2019.*
3. *Judge and Stephen P.Robbins,"Organizational Behavior", Pearson, 13th Edition, 2020.*
4. *Ace simpson, stewart Clegg, "Positive Organizational Behaviour- A reflective approach", Taylor & Francis, 5th Edition, 2020.*

20MCAE402 - PRINCIPLES OF MANAGEMENT

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Describe the principles of management.*

CO2 : *Prepare a decision tree for a given statement.*

CO3 : *Given a business plan, specify the management functions (planning- organizing- controlling and evaluating)*

CO4 : *Construct the organizational chart for given company.*

CO5 : *Prepare a flow chart of the selection process of a given company.*

MANAGEMENT

Concept- Nature- Importance- Management : Art and Science- Management as a Profession- Management Vs. Administration- Management Skills- Levels of Management- Characteristics of Quality Managers. Evolution of Management: Early contributions- Taylor and Scientific Management- Fayol's Administrative Management- Bureaucracy- Hawthorne Experiments and Human Relations- Social System Approach- Decision Theory Approach. Business Ethics and Social Responsibility: Concept- Shift to Ethics- Tools of Ethics. **(9)**

INTRODUCTION TO FUNCTIONS OF MANAGEMENT

Planning :Nature- Scope- Objectives and Significance of Planning- Types of Planning- Process of Planning-Barriers to Effective Planning- Planning Premises and Forecasting- Key to Planning- Decision Making. Organizing: Concept- Organisation Theories- Forms of Organisational Structure- Combining Jobs: Departmentation- Span of Control- Delegation of Authority- Authority & Responsibility- Organisational Design. **(11)**

STAFFING

Concept- System Approach- Manpower Planning- Job Design- Recruitment & Selection- Performance Appraisal Directing: Concept- Direction and Supervision Motivation: Concept- Motivation and Performance- Theories Of Motivation- Approaches for Improving Motivation- Pay and Job Performance- Quality of WorkLife- Morale Building. **(9)**

LEADERSHIP

The Core of Leadership: Influence- Functions of Leaders- Leadership Style- Leadership Development **(2)**

Communication : Communication Process- Importance of Communication- Communication Channels-Barriers to Communication. Controlling: Concept- Types of Control- Methods: Pre-control: Concurrent Control: Post-control- An Integrated Control System- The Quality Concept Factors affecting Quality- Developing a Quality Control System- Total Quality Control- Pre-control of Inputs- Concurrent Control of Operations. Post Control of Outputs. Change and Development: Model for Managing Change- Forces for Change- Need for Change- Alternative Change Techniques- New Trends in Organisational Change. **(7)**

Training and Development : Need for training- advantages of training programme- Types of training programmes- Training methods- Selection of a training method- Evaluation of training and development- Training practices in India. **(7)**

TOTAL : 45

REFERENCES

1. *Robbins S.P., Coulter Mary & Niharika Vohra, "Management", 10th Edition, Pearson Education, 2019.*
2. *S.A. Sherlekar, "Ethics in Management", Himalayan Publishing Company, 2016.*
3. *H.R. Appannaiah, G Dinakar, H.A. Bhaskar, "Principles of Management", 6th Edition, Himalaya, 2019.*
4. *Dr. L.M. Prasad, "Principles and practise of management", 10th Edition sultan chand & sons, 2020.*

20MCAE403 - ACCOUNTING AND FINANCIAL MANAGEMENT

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Prepare books of accounts and verify correctness using trial balance, for any business organization.*

CO2 : *Prepare statements of final accounts to ascertain the profit,forany trading or manufacturing organization.*

CO3 : *Perform cost estimation and determine the optimum cost/price/profit for a firm using Cost Sheet, CVP analysis and Marginal Costing Techniques.*

CO4 : *Prepare financial statements using ratio analysis, budgeting, working capital management, capital budgeting and budgetary control techniques and present facts to assist in strategic decision making, given a set of investment options for a business.*

CO5 : *Develop software solutions to automate a given accounting, costing or financial process, using MS-Excel.*

FINANCIAL ACCOUNTING

Introduction : Accounting Concepts, Principles and Conventions - basic accounting procedures - Journal and Ledger, Trial Balance. **(15)**

FINAL ACCOUNTS

Manufacturing and Trading Account - Profit and Loss Account - Balance Sheet. Final accounts with adjustments - Working with excel worksheets for automating Final Accounts. Depreciation. Type - Straight Line Method - Written-Down Value Method, Sinking Fund Method - Preparation of Depreciation Account **(15)**

COST ACCOUNTING

Methods and Techniques of Cost Accounting - Classification of Cost - Material Cost, Labour Cost, Overheads, Fixed and Variable Costs, Cost-Volume-Profit Analysis - Marginal Costing and Decision Making. **(9)**

FINANCIAL MANAGEMENT

Objective and scope of Financial Management - Analysis and Interpretation of Financial Management Ratio Analysis - financial system - Working Capital Management - Capital Investment Decision Through Pay-back Period Method - Average Rate of Return - Internal Rate of Return - Cost of Capital - Discounted Cash Flow Analysis by using Spread Sheet. **(12)**

BUDGETING AND BUDGETARY CONTROL

Types of budgets - Preparation of various functional budgets - Preparation of cash budget - Flexible budget - Advantages of Budgeting and budgetary control **(9)**

TOTAL : 60

REFERENCES

1. *M. C. Shukla, T. C. Grewal,S. C. Gupta , "Financial Accounting I", Sultan Chand & Sons, Paperback, 2019.*
2. *Maheshwari S.N., Dr Suneel K. Maheshwari, CA Sharad K. Maheshwari, "Principles of Management Accounting", Sultan Chand & Sons, 2021.*

3. *R L Gupta & V K Gupta, "Principles and Practice of Accountancy", S.Chand & Co.,Ltd., Paperback 2019.*
4. *Jain S.P. & Narang K.L., "Advanced Accountancy - Principles of Accountancy Vol 1", Kalyani Publishers, Paperback 2018.*
5. *Sashi K. Gupta & R.K Sharma, Neeti Gupta "Management Accounting", Kalyani Publishers, 2014.*
6. *Khan M.Y. and Jain P.K., "Financial Management", Tata McGraw Hill, Paperback 2017.*

20MCAE404 - E-COMMERCE

L	T	P	C
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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Specify Infrastructural requirements & Business models for an e-commerce start up. (From the prespective of Indian Businesses)*

CO2 : *Analyze different types of e marketing and e advertising stategies and e-payment alternatives commonly used in the industry and summarize the relative merits in Indian socio economic scenario.*

CO3 : *Discuss trends in CRM- SCM and Knowledge Management using web technologies and point out the suitable adaptations for a medium scale e-commerce firm in India.*

CO4 : *Appraise the impact of different types of mobile and wireless technologies on success of e- commerce in India.*

CO5 : *Understand ERP and EDI technologies can transform the Indian Business environment into paperless, cashless, easy-to-manage and regulated, with the use of cloud and open source technologies.*

INTRODUCTION

History - Early Business Information Interchange Efforts - Emergence of internet- WWW. E-Commerce - Advantages- Disadvantages - BAM Models - Transition to E-Commerce in India- E-Transmission Challenges- The Information Technology Act 2000 - Business Models - Enabling Technologies of WWW. Social Networks- Auctions- Portals: Social networks and online communities Online auctions - E-commerce portals. **(7)**

ELECTRONIC MARKETING- SECURITY AND PAYMENT

Traditional Marketing - Web Presence Goal - Browsing Behavior Model - Online Marketing- E-Advertising- Trends- E-branding- Strategies. E- Security - Internet Security- E-business Risk Management Issues- Information Security Environment in India. E-Payment - Concerns in Internet Banking- Digital Payment Requirements- Token Based E-Payment Classification- E-Cash- Cheque Payment- Risk and E-Payment. **(8)**

CRM- SCM & SKM

E-CRM Solutions - Business Touch Points - Case Studies. Supply Chain - The new way- e-logistics- Fulfilling Customer's Needs- Smart Chains Smarter Gains. Real Time Benefits and Strategies - Advantages. Knowledge as Key Business Asset- Changes in - Global Business Economy- Technology. Knowledge - Definition- Management - Knowledge Management- Data Warehousing and Data Mining. Virtual value chain - 7 Dimensions - E-Commerce Strategy - planning E-Commerce Project. **(10)**

MOBILE COMMERCE AND TECHNOLOGIES

E-Business Portals. What? - Issues - Wireless- Cellular- Wireless Spectrum. - Success Stories. Technologies - mobile commerce- WAP Wireless Generations. Portals - Different Types- benefits- features. Requirements for Intell. **(10)**

ERP & EDI

Introduction -ERP and E2RP - Business Problems- New Paradigm- Drivers - Business processes and supporting processes. Architecture- Implementation- ERP Processes. ERP - Cloud and Open Sources.EDI - Concepts and Technology. **(10)**

TOTAL : 45

REFERENCES

1. *P.T. Joseph S.J, "E-Commerce - An Indian Perspective", PHI Learning Private Limited, 4th Edition, 2012.*
2. *Kenneth C. Laudon, "E-Commerce : Business - Technology - Society", 4th Edition, Pearson, 2012.*
3. *Sandeep Desai, Abhishek Srivastava, "ERP to E2RP - A Case Study Approach", Eastern Economy Edition, PHI Learning Pvt. Ltd., 2013.*
4. *Kamalesh K. Bajaj, Debjani Nag, "E-Commerce - The Cutting Edge of Business", McGraw Hill Education (India) Private Limited, 2nd Edition, 2005.*
5. *Ravi Kalakota- Marcia Robinson, "E - Business 2.0 - Roadmap for Success", Addison Wesley Professional, 2001.*

20MCAE405 - DECISION MAKING

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Critically discuss different theories and theoretical perspectives in leadership - negotiation and decision making.*

CO2 : *Evaluate models to describe how leaders are perceived (leadership style)-analyse a leader's decision-making and role in negotiations.*

CO3 : *Analyse how decision-making and strategies in negotiations affect a leader's perception*

CO4 : *Use decision making tools to quantitatively analyse its impacts in a given situation*

CO5 : *Apply programmed and non-programmed decisions to effectively manage uncertainty*

INTRODUCTION TO DECISION MAKING

Basic concepts of decision making - The art of decision management- Fundamentals of Decision Making - The strategy pyramid. The DM portfolio- drivers of poor decision management- The ten cardinal decision issues and reviews- rationalistic versus evolutionary strategic decision making- Players in a decision- Representation of decision problem. **(9)**

STRATEGIC DECISION ANALYSIS

Introduction to strategic decision analysis - The decision analysis cycle- Sensitivity analysis- Expert and stakeholder opinions- Risk analysis- Public perception and risk communication- Deliberative democracy and public participation- Good heuristics for decision analysis- Negotiation and bargaining. **(9)**

RATIONAL DECISION MAKING

The Importance and Limitations of Rational Decision Making: Limited or "bounded" rationality. The Decision Process- Quantitative and qualitative factors- marginal analysis- cost effective analysis. **(9)**

DECISION ANALYSIS & UNCERTAINITY

Modelling Uncertainity- utility model- risk attitude- Subjective Expected Utility (SEU) modelling- Decision Tress and Influence diagrams. Programmed and Non-Programmed Decisions- the Uncertainty Problem: deal with unknowns. The Madness and wisdom of crowds. **(9)**

INFORMATION AND COMMUNICATION

Negotiation-Information to support decisions-Framing and Communicating Decisions. **(9)**

TOTAL : 45

REFERENCES

1. *French- Simon. Maule- John. & Papamichail- Nadia, "Decision Behaviour- Analysis and Support", New Delhi: Cambridge University Press, 2010.*
2. *James M. Kouzes, Barry Z.Posner, John Wiley & Sons "The Leadership challenge, How to make Extraordinary things happen in organizations", 2016.*
3. *J.Edward Russo and Paul J.H. Shoemaker "Winning decisions : getting it right the first time", Special markets, Currency books, 1st Edition, 2002.*
4. *Mark Koscinski, "Decision Making Essentials", 2nd Edition, Vibrant Publishers, 2020*
5. *Pankaj Garg, "Mastering the Art of Decision Making", 4th Edition, Notion Press, 2020*

20MCAE406 - ENTREPRENEURSHIP DEVELOPMENT

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Highlight the characteristics of a successful entrepreneur.*

CO2 : *Understand the role of entrepreneurship in the economic development of a country.*

CO3 : *Formulate the business plans for an efficient and successful \ business.*

CO4 : *Justify the need for developing rural entrepreneurship and agripreneurship in India.*

CO5 : *State the economic factors influencing the emergence and development in country.*

ENTERPRENEURSIP

Entrepreneur - Types of Entrepreneurs - Difference between Entrepreneur and Intrapreneur - Entrepreneurship in Economic Growth- Factors Affecting Entrepreneurial Growth. **(9)**

MOTIVATION

Major Motives Influencing an Entrepreneur - Achievement Motivation Training- Self Rating - Business Games- Thematic Apperception Test - Stress Management - Entrepreneurship Development Programs - Need - Objectives. Rural entrepreneurship and agri-preneurship development **(9)**

BUSINESS

Small Enterprises - Definition- Classification - Characteristics- Ownership Structures - Project Formulation - Steps involved in setting up a Business - identifying- selecting a Good Business opportunity- Market Survey and Research- Techno Economic Feasibility Assessment - Preparation of Preliminary Project Reports - Project Appraisal - Sources of Information - Classification of Needs and Agencies. **(9)**

FINANCING AND ACCOUNTING

Need - Sources of Finance- Term Loans- Capital Structure- Financial Institution- Management of working Capital- Costing- Break Even Analysis- Taxation - Income Tax- Excise Duty - Sales Tax. **(9)**

SUPPORT TO ENTREPRENEURS

Sickness in small business - Concept- Magnitude- Causes and Consequences- Corrective Measures - Business Incubators - Government Policy for Small Scale Enterprises - Growth Strategies in small industry - Expansion- Diversification- Joint Venture- Merger and Sub Contracting. **(9)**

TOTAL : 45

REFERENCES

1. *Khanka. S.S., "Entrepreneurial Development", S.Chand& Co. Ltd., Ram Nagar, New Delhi, 2013.*
2. *Donald F Kuratko, "Entrepreneurship Theory Process and Practice", Cengage Learning, 9th Edition, 2014.*
3. *Hisrich R D, Peters M P, "Entrepreneurship", Tata McGraw-Hill, 8th Edition, 2013.*
4. *Poornima M Charantimath "Entrepreneurship Development And Small Business Enterprise", Pearson Publication, Paper Back, 2006.*

20MCAE407 - PRINCIPLES OF ENVIRONMENTAL SCIENCE

L	T	P	C
3	0	0	3

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Predict the values of biodiversity for the development*

CO2 : *Design the methods for the prevention of environmental pollution and solid waste management.*

CO3 : *Ilustrate the use of alternate energy resources for growing energy needs*

CO4 : *Classify the environmental segments, the causes for its deterioration, he measure taken for its prevention and the need for sustainable development.*

CO5 : *Identify the threats to environment, social issues related to it, the necessity for environmental legislation, sustainable development and the applications of bio technology and green chemistry for environmental protection.*

ENVIRONMENTAL CHEMISTRY

Chemistry and the Environment - Environmental segments - Composition and Characteristics of Atmosphere, Hydrosphere, Lithosphere, and Biosphere: Chemical species and particulates present in the environment - reactions occur in the atmosphere. Photochemical smog. Impact of man on the environment. Impact of Environment upon humans. **(9)**

ECOSYSTEMS AND BIODIVERSITY

Concepts of an ecosystem : types, structure and functions of the ecosystem. Food chains, food webs and ecological pyramids. Biodiversity: Definition - Genetic, species, ecosystem and landscape diversities - India as a mega diversity nation - Hot spots of biodiversity. Importance of biodiversity - loss of biodiversity - causes of reduction in biodiversity. Conservation of biodiversity - restoration of biodiversity. **(9)**

ENVIRONMENTAL POLLUTION

Sources, causes, effects and management of Air, Water, Soil, Marine, Noise and Radioactive pollution. Sources of Solid, Hazardous, Biomedical and Chemical wastes. Solid Waste Disposal and treatment **(9)**

ENERGY AND ENVIRONMENT

Energy resources - Growing energy needs - renewable and non-renewable energy sources - use of alternate energy sources - Solar, Wind, Tidal, Geothermal and OTEC - (Principles only) merits and limitations. **(3)**

SOCIAL ISSUES AND THE ENVIRONMENT

Sustainable development - Urban Population - problems related to energy - Water Conservation. Rainwater harvesting - Environment Ethics - Green house effect, Global warming, climate change, Nuclear hazards and accidents. Issues involved in enforcement of environment legislation - precautionary principle - polluter pays principle - the Beneficiary pays principle - role of an Individual in Environment protection - Environment (Protection) Act - Air (Prevention and Control of Pollution) Act. Water (Prevention andControl of Pollution) Act. Wildlife Protection Act and Forest (Conservation)Act. **(9)**

BIOTECHNOLOGY AND GREEN CHEMISTRY

Biotechnology and its applications in environmental protection - Bioinformatics - Bioremediation. Biological purification of contaminated air. Green chemistry for clean technology: Significance of green chemistry - Basic components of Green chemistry. Industrial applications of green chemistry. Green fuels - e-green Propellants and Biocatalysts. **(6)**

TOTAL : 45

REFERENCES

1. *Dara, S.S. "A Text Book of Environmental Chemistry and Pollution Control", S. Chand and Company Ltd, 8th Revised Edition, 2008.*
2. *Kaushik, A. and Kaushik, C.P. "Environmental Science and Engineering", 2nd Edition, New Age International (P) Limited Publishers, 2006.*
3. *Dr. Raghavan Nambiar, K. "Text Book of Environmental Studies", Scitech Publications (India) Pvt. Ltd, Chennai, 2007.*
4. *Benny Joseph, "Environmental Studies", Tata McGraw Hill Publishing Company Ltd, 2008.*
5. *Surinder Deswal and Anupama Deswal, "A Basic course in Environmental Studies" Dhanpat Rai and Co. (P) Ltd, 2006.*

20MCAEL01 - MOBILE APPLICATION DEVELOPMENT LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Use the components of Android development environment for mobile application development*

CO2 *: Design GUI forms using layouts,views, event handling, notifications and content providers in Android studio.*

CO3 *: Implement database applications using SQLite and perform CRUD operations*

CO4 *: Develop mobile applications that make use of camera and media player in Android.*

CO5 *: Use location based services, network services and graphics to develop innovative mobile apps.*

CONCEPTS TO BE COVERED

1. Android Development Environment
   Download and Install SDK and ADT
   Working of Eclipse and Android Emulator
2. Generic UI development
   Views and View groups
   Event Handling and Listeners
   Layouts and spinner
3. Storing and Retrieving Data
   Android storing and retrieving data using SQL file
   Working with content provider
4. Notification and Alarms
   Action Bars-Menus-Dialogs
   Notifications and Toast
5. Camera and Media player
   Camera Application
   Media player and media recorder
6. Location Based Services
   Finding locations and Tracking Movement
   Map based activity and Proximity alerts
7. Communication via Network and Web
   SMS and MMS
   Bluetooth and WI-FI
8. Graphics and Animation
   Different shapes of different colours
   Moving from one direction to another
   Tweened animation

20MCAEL02 - GRAPHICS AND MULTIMEDIA LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Design graphical primitives using algorithms*

CO2 *: Develop 2D Transformations.*

CO3 *: Design interactive graphics applications.*

CO4 *: Design objects and layers for scene in animation.*

CO5 *: Develop animated application software.*

CONCEPTS TO BE COVERED COMPUTER GRAPHICS

1. Primitive Algorithms
   Line - Bresenham- DDA- Midpoint. Circle - Midpoint- Trigonometric Ellipse - Midpoint- Trigonometric
2. Polygon- Polygon Filling.
3. Transformations - 2D Translations- Scaling- Rotation

MULTIMEDIA AND ANIMATIONS

1. Flash Programming (OR) Maya
2. Creating Layers- Symbol objects- effects for objects
3. Creating scene by combining objects and layers
4. Creating Animations using various technologies
5. Creating Interactive Animation.
6. Adding audio to animations.
7. Creating small animation projects.

20MCAEL03 - INTERNET OF THINGS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Choose the required sensor and perform calibration, for a given requirement.*

CO2 *: Devise interface circuit for connecting a chosen sensor to Galileo board.*

CO3 *: Develop software for Galileo board to interact with the sensor to meet requirements.*

CO4 *: Develop software to interact(send/receive data) with Web/Application server located in the Internet.*

CO5 *: Use data analytics tool to analyze the data collected and present the report to the end user.*

CONCEPTS TO BE COVERED

1. Programs for exploring the features of Contiki such as protothreds- timers- networking primitives by using Cooja simulator.
2. Developing applications using Galileo board- exploiting all features of the board.
3. Application on wireless sensor networks
4. NesC Programming language
5. WSNs Projects of the SENSES Lab
6. A simple application blink

20MCAEL04 - DATA ANALYTICS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Understand the basics in R programming in terms of constructs, control statements, string functions.*

CO2 *: Able to perform different exploratory analysis for the real time dataset.*

CO3 *: Identify and apply appropriate regression models for the given dataset.*

CO4 *: Apply text analysis methods to analyze unstructured data.*

CO5 *: Represent the analysis results using different visualization methods such as charts, tables etc.*

CONCEPTS / TOOLS TO BE COVERED

1. Basic constructs of R Programming
2. Descriptive and Exploratory Analysis
3. Data Visualization - Histogram, Bar Charts, Text Tables, Line Charts, Scatter Plots, Gantt Bar, Charts, Pie Charts, Box Plots, Packed Bubble Charts.
4. Linear Regression
5. Multiple Linear Regression
6. Logistic Regression
7. Program involving Regular Expressions
8. Text Pre-processing with TF-IDF
9. Forecasting time series using ARIMA model.
10. Sentiment Analysis of Social Media Data
11. Customer Churn Detection

20MCAEL05 - DATA MINING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Learn to use open source data mining tools such as Weka and/Rapidminer and build data mining applications using these tools.*

CO2 : *Select appropriate data pre-processing techniques to be applied on standard datasets various domains such as healthcare, finance, insurance etc and prepare the data for the mining process based on the analysis goal.*

CO3 : *Apply association rule mining techniques to derive useful and new pattern information from the given datasets.*

CO4 : *Apply classification algorithms to classify a given dataset and derive useful and new insights from the dataset.*

CO5 : *Represent the analysis results using different visualization methods such as charts, graphs etc.*

CONCEPTS / TOOLS USED

1. Apply pre-processing techniques on datasets downloaded from Internet under different domains.
2. Apply core data mining techniques on different datasets like Iris, Cancer, Accidents etc.
   a) Association Rule mining algorithms such as Apriori, FP Tree and other algorithms.
      Compare the results.
   b) Classification algorithms - Decision Tree
   c) Clustering algorithms - K-Means, K-Medoids
3. Application of text mining algorithms.
4. Use different data visualization techniques to display the mined results and derive inference from them. Shiny tool can be used apart from the usual data mining tools.

20MCAEL06 - GPU AND PARALLEL PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : LABORATORY

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Learn the basics of CUDA programming.*

CO2 *: Implement data transfer from host to device and vice-versa.*

CO3 *: Develop CUDA code to perform operations on large arrays.*

CO4 *: Implement the concepts of shared memory both static and dynamic*

CO5 *: Develop parallel programming solutions for small real world applications using CUDA/GPU*

CONCEPTS TO BE COVERED

1. Querying device properties
2. Handling CUDA errors
3. Host-Device Synchronization: Copying data between host and device
4. Measuring data transfer times
5. Simple expression evaluation for kernel launch
6. Vector addition
7. Reversing arrays using shared memory Static and Dynamic
8. Matrix Operations
9. Any real time application development like image processing, machine learning etc.

   Recommended Software: CUDA C/C++ or CUDA Python

REFERENCE

1. https://developer.nvidia.com/blog/even-easier-introduction-cuda/

20MCAEL07 - IMAGE PROCESSING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Implement the mathematical transforms necessary for image processing.*

CO2 *: Apply various enhancement and segmentation techniques.*

CO3 *: Apply image restoration process on different noises using filters.*

CO4 *: Execute various transforms and filtering on any digital image.*

CO5 *: Solve real life problems using image processing.*

CONCEPTS TO BE COVERED

1. Display of Grayscale Images.
2. Histogram Equalization.
3. Filtering in frequency domain.
4. Display of color images.
5. Conversion between color spaces.
6. Non-linear Filtering.
7. Edge detection using Operators.
8. DFT of images.
9. DWT of images.
10. Apply any segmentation technique on a digital image.

20MCAEL08 - WEB FRAMEWORKS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Build a robust framework to support daily development needs*

CO2 *: Create dynamic web sites and web applications*

CO3 *: Create data models using MongoDB and ExpressDB*

CO4 *: Build components and bind data to it*

CO5 *: Develop single page applications with the front end facilities in the stack*

CONCEPTS / TOOLS TO BE COVERED

1. Installing and setting up the framework, environment
2. Server side Node.js. and Express

   Add a model with Test for the model,

   Add properties,

   Add Controller,

   Add Route,

   Add Categories,

   Add Functionality

   Add Authentication.
3. MongoDB - Working with basic Shell Commands,List the database, collections and category collections. Create category, Create Category with different schema Update and delete Category
4. AngularJS Creating the first module,Creating Angular UI Bootstrap,Working with Angular Directives, Add functionality for controller, route and View. Unit Testing and end to end testing in AngularJS

20MCAEL09 - NATURAL LANGUAGE PROCESSING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Apply basic algorithms in the area of Natural Language Processing.*

CO2 *: Perform morphological analysis on text.*

CO3 *: Apply techniques for syntactic analysis.*

CO4 *: Use algorithms at semantics level and resources of natural language data-corpora.*

CO5 *: Apply techniques for information extraction.*

CONCEPTS TO BE COVERED

Topics will include (but are not restricted to) machine translation, sequence tagging, constituent and dependency parsing, information extraction, semantics.

1. Language Models
2. Machine Translation
3. Morphological and Syntactical analysis
4. Text Classification
5. Sequence Tagging
6. Constituency Parsing
7. Dependency Parsing
8. Information Extraction
9. Machine Comprehension
10. Text Summarization

20MCAEL10 - SOCIAL NETWORK ANALYSIS LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Input data, represent social networks as a graph and apply visualization techniques.*

CO2 *: Visualize network datasets.*

CO3 *: Perform different network measurements.*

CO4 *: Build and implement social network designs.*

CO5 *: Apply social network theory to social network datasets.*

CONCEPTS TO BE COVERED

1. Data Management
2. Network Visualization
3. Cohesion, centralization and core-periphery
4. Node-level measurements
5. Statistical measurements, multivariate
6. Creating sub-groups
7. Ego-networks
8. Personal networks
9. Triad analysis, roles and equivalence
10. Testing hypotheses

20MCAEL11 - NETWORK PROGRAMMING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 : *Understand the key protocols that support the communication.*

CO2 : *Develop and implement connection-oriented and connection-less communication using Socket API*

CO3 : *Develop and implement concurrent and iterative servers and analyze their functionality*

CO4 : *Apply advanced programming techniques such as Broadcasting, Multicasting and networking between client and server.*

CO5 : *Develop and implement simple network applications using NS-2 for a given set of requirements and demonstrate its working.*

CONCEPTS TO BE COVERED

1. Basic Network commands
2. Connection oriented one-way communication
3. Connection oriented two-way communication
4. Connection less one-way communication
5. Connection less two-way communication
6. Iterative and Concurrent Server Implementation
7. Broadcasting using UDP
8. Develop a mail client
9. Develop a DHCP client/server communication
10. Develop a DNS client/server communication
11. Multicast Communication using UDP
12. Applications using TCP/IP Protocols
13. Simulation of TCP and UDP communication using NS-2
14. Networking between different machines.

20MCAEL12 - DIGITAL MARKETING LABORATORY

L	T	P	C
0	0	4	2

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : PRACTICAL

COURSE OUTCOMES

Upon completion of the course students will be able to

CO1 *: Generate market context with practical needs of digital marketing.*

CO2 *: Develop conversational interfaces with customers using connection oriented/connectionless services.*

CO3 *: Analyse a web site and its traffic using tools*

CO4 *: Understand the methods of optimizing the website for search engines.*

CO5 *: Know the improved latest technologies for efficient marketing*

CONCEPTS TO BE COVERED

1. Customer, Content and Conversation Management
2. Improve visits for a web site
    a. Meta element keywords (Search Engine Optimization)
    b. Push advertisement
    c. Email marketing
3. Analysing a web site using tools
4. Page ranking methods
5. Develop android app
6. Chat bot facilities / Voice Automation Facilities

20MCAB11- BASICS OF DATA STRUCTURES

L	T	P	C
1	0	0	0

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

BASIC CONCEPTS

System Life Cycle - Algorithm Specification - Data Abstraction - Primitive Data Structures - Iterative and Recursive algorithms - Performance Analysis - best case - worst case - average case complexities - Notations. **(3)**

ARRAYS

Array as an Abstract Data Type (ADT) - Polynomial ADT - Sparse Matrix ADT - Representation of Multidimensional Arrays - String ADT. **(3)**

STACKS AND QUEUES

Stack ADT - Queue ADT - Mazing Problem - Evaluation of Expressions - Multiple Stacks and Queues. **(3)**

LINKED LISTS

Pointers - Singly Linked Lists - Dynamically Linked Stacks and Queues. **(3)**

SEARCHING AND SORTING

Searching and List Verification - Insertion Sort - Quick Sort. **(3)**

TOTAL : 15

REFERENCES

1. *Ellis Horowitz, Sartaj Sahni, Anderson-Freed, "Fundamentals of Data Structures in C", Universities Press, 2nd Edition, 2008.*
2. *Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures, A Pseudocode Approach with C", Cengage Learning, 2nd Edition, 2007 .*
3. *Yashavant P. Kanetkar, "Data Structures through C", BPB Publications, 2nd Edition, 2003.*
4. *Seymour Lipschutz, "Data Structures with C", Schaum's Outline Series, McGraw Hill Publications, 2nd Edition, 2014.*

20MCAB12 - PROGRAMMING IN C

L	T	P	C
1	0	0	0

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

ARRAYS AND POINTERS

Array manipulation: single, two and multi dimensional arrays. declaration, assignment and accessing using index values. Algorithms using arrays. Matrix operations, sort, search and applications using arrays. Pointers - Declaration. Accessing pointers. Pointers and Arrays. **(4)**

RECURSIVE FUNCTIONS

Recursive Function basic need for it. Declaration, Definition and Calling. Parameter passing - Local variables in recursive functions - Applications of recursive functions - Real time applications **(3)**

STRUCTURES, UNION AND ENUMERATION

Structure definition, declaration and using structures in programs. Pointers and structures. Structured arrays - creation and manipulation. Linked structures - Creation and manipulation. Applications of Linked Structures. Enumerations. **(4)**

FILE AND ERROR HANDLING

File concept - File opening in various modes and closing of a file - Reading from a file - Writing onto a file. Preprocessor: Conditional Compilation directives - Macros - Command Line Arguments. **(4)**

TOTAL : 15

REFERENCES

1. *Herbert Schildt, "C - The Complete Reference, McGraw Hill", 4h Edition, 2017.*
2. *R.G. Dromey, "How to solve it by Computer", Pearson Education, 5th Edition, 2007.*
3. *Kernighan B.W. and Ritchie D.M., "C Programming Language (ANSI C)", Paperback-1, Pearson Education, 2015.*
4. *Yashawant Kanetkar, "Let us C", BPB, 16th Edition, 2018.*
5. *Terrence W Pratt, "Programming language: Design and Implementation", Prentice Hall of India, 4th Edition, 2001.*

20MCAB13 - COMPUTER HARDWARE AND ORGANIZATION

L	T	P	C
1	0	0	0

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

BASIC STRUCTURE OF COMPUTERS

Computer Types, Functional unit, Basic OPERATIONAL concepts, Bus structures, Software, Performance, multiprocessors and multi computers. Data Representation. Fixed Point Control memory, Address sequencing, microprogram example and control, Basic concepts semiconductor RAM memories. Read-only memory Computer Fundamentals. **(3)**

COMPUTER HARDWARE

History and Generations of Computer, Description of Different parts of a Computer and System Software and Application Software, Learn and apply basic safety procedures, Assemble a personal computer in accordance with configuration, Performing installation of operating system and other application, Usage of relevant tools and diagnostic techniques Configure Internet and Email, Perform routine, The software and Hardware parts, Preliminary information of hardware components. **(3)**

PREVENTIVE MAINTENANCE

Perform repairs to personal computers, The different types of Operating Systems and its importance, Complete information computer configuration activities, How to assemble the computer according customer requirements in a real environment, How to install computer Software, devices drivers as well as configuration of peripheral devices, How to install and configure networking devices setting and applications, How to configure internet and email configuration according to the requirements, How to diagnose, repair and maintain the computer according to the standards. Identifying, using, and connecting hardware components and devices. **(3)**

INPUT-OUTPUT ORGANIZATION

Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt Direct memory Access, Input -Output Processor (IOP) Serial communication; Introduction to peripheral component, Interconnect (PCI) bus. Introduction to standard serial communication protocols like RS232, USB, IEEE1394. **(3)**

PIPELINE, VECTOR & MULTI PROCESSORS

Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors, Characteristics or Multiprocessors, Interconnection Structures, Interprocessor Arbitration. InterProcessor Communication and Synchronization Cache Coherance. Shared Memory Multiprocessors. **(3)**

TOTAL : 15

REFERENCES

1. *Carl Hamacher, Zvonks Vranesic, SafeaZaky, "Computer Organization", Vth Edition, McGraw Hill. 2016.*
2. *M.Moris Mano, "Computer Systems Architecture" IIIrd Edition, Pearson/PHI 2017.*
3. *Morris Rosenthal "The Laptop Repair Workbook: An Introduction to Troubleshooting and Repairing Laptop Computers", 2nd Edition, PHI, 2016.*
4. *Jyotika Deshmukh, "A text book of Computer Hardware and Networking", Prentice Hall, 4th Edition, 2019.*
5. *Richand M. Roberts "Computer Service & Repair, 4th Edition, PHI, 2019.*

20MCAB21 - BASICS OF INTERNET

L	T	P	C
1	0	0	0

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

INTRODUCTION

Internet Today - The WWW - History - Resources - Architecture - Client / Server Technology - Accessing the Web: Browsers, its features, extension, plugins, Services by google to the web. **(2)**

INTERNET AND RESOURCES

The network technology - Network Addresses - Protocols - URL - format - accessing the web. Resources: The Web pages, applications, database and attachments. MIME types. Applications:- Intermediaries - agents - monitors - resource identifiers - Data Exchange by commercial applications. **(2)**

TECHNOLOGIES

Static & Dynamic Page Development: HTML, DHTML, CSS, XML, - Versions and Standards - Scripting languages - Java Script - accessing the tags and web content using java script. Script Event Programming. Web Server - Accessing the Server - HTTP methods - Requests/Response. Server Page Development: JSP. Servlet Technologies. **(4)**

WEB BACKEND

Web database: XML, Structure - tags, attributes. XSD - Resource standards. Exchange data using XSD format. XSD and SOAP technologies. Connecting to databases on both client and Server Side. **(4)**

INTERNET SECURITY

Fire Wall - Setting up the firewall security, Data exchange security: Encryption/ Decryption standards. Threats and VIRUS. How to Save? Security Methods. **(3)**

TOTAL : 15

REFERENCES

1. *Harvey Deitel, Abbey Deitel, "Internet and World Wide Web How To Program", Fifth Edition, Pearson, 2012.*
2. *John R. Vacca, "Cyber Security and IT Infrastructure Protection", Paperback, Elsevier Science, 2013.*

20MCAB22 - SOFTWARE PROJECT MANAGEMENT

L	T	P	C
1	0	0	0

PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

Introduction to Software Project Management : Introduction Software Project Management Importance, Project definition, Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, Project Charter, Stakeholders, Setting Objectives, Project Management Life Cycle, Traditional versus Modern Project Management Practices. **(3)**

Project Evaluation and Programme Management : Introduction, Business Case, Project Portfolio Management, Evaluation of Individual Projects, Risk Evaluation, Programme Management, Managing the Allocation of Resources within Programmes, Strategic Programme Management, Creating a Programme Management. **(3)**

Project Planning Selection and managing resource : Introduction to Step Wise Project Planning, Software Processes and Process Models, The Waterfall Model, Software Prototyping, Managing People in Software Environments: Introduction, Selecting the Right Person for the Job, Working in Teams: Introduction, Becoming a Team, Decision Making, Organization and Team Structures, Coordination Dependencies, Dispersed and Virtual Teams, Communication Genres, Communication Plans, Leadership. **(3)**

Software Effort Estimation and Risk Management : Introduction, Estimates methodology, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom- up Estimating, The Top-down Approach and Parametric Models, Cost Estimation, Staffing Pattern, Introduction, Risk, Categories of Risk, Risk Management Approaches, A Framework for Dealing with Risk, Risk Identification, Risk Assessment, Risk Planning. **(3)**

Software Quality management and Project Closeout : Introduction, The Place of Software Quality in Project Planning, Importance of Software Quality, Defining Software Quality, Software Quality Models, ISO 9126, Product and Process Metrics, Product versus Process Quality Management, Quality Management Systems, Process Capability Models, Techniques to Help Enhance Software Quality, Testing, Software Reliability, Quality Plans.Introduction, Reasons for Project Closure, Project Closure Process, Performing a Financial Closure, Project Closeout Report. **(3)**

TOTAL : 15

REFERENCES

1) *Bob Hughes, Mike Cotterell, Rajib Mall, "Software Project Management", 6th Edition, Tata Mcgraw Hill, 2017.*
2) *Shailesh Mehta "SPD Project Management and Tools & Technologies - An overview", PHI, 1st Edition, 2016.*
3) *Walker Royce, "Software Project Management", 1st Edition, Addison Wesley/Pearson, 2015.*
4) *Rober K.Wysocki, "Effective Software Project Management", 2nd Edition, Wiley Publication, 2016.*
5) *Gopalaswamy Ramesh, "Managing Global Software Projects", 3rd Edition, McGraw Hill Education (India), 2019.*

20MCAB23 - OBJECT ORIENTED PRINCIPLES AND PROGRAMMING IN C++

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PRE-REQUISITES

Consent of the Instructor

ASSESSMENT : THEORY

INTRODUCTION

Object Oriented Principles - Key concepts of object oriented programming - Object identification- Software Complexity - The Object model - Classes and Objects - Classification. **(1)**

BASIC FACILITIES IN C++

Overview of C++ - Types and Declarations - Arrays, Pointers, Structures, References and Functions - Function Overloading - Name spaces - Source Files and Programs. **(2)**

ABSTRACT DATA TYPE IN C++

Class - Class members and Access control - Constructors- Static members - Default copy constructor - this pointer - Inline function definition - Concrete classes - Destructors - new and delete. **(3)**

OPERATOR OVERLOADING

Operator Functions - Binary and Unary Operators - Member and Non Member Operators - Friend Functions - Function call - Increment and Decrement - A String class. **(3)**

INHERITANCE

Derived Classes - Class Hierarchies - Virtual Functions - Abstract classes. **(3)**

EXCEPTION HANDLING AND LIBRARY CLASSES

Grouping of exceptions - Catching exceptions - Exceptions that are not errors - Uncaught Exceptions - Standard exceptions - The standard library - I/O streams - File streams. **(3)**

TOTAL : 15

REFERENCES

1. *Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Addison Wesley, 2013.*
2. *Herbert Schildt, "The Complete Reference C++", 6th Edition, Tata McGraw Hill, 2013.*
3. *Stanley B Lippman, Jove Lajoie, and Barbara Moo, "C++ Primer", 5th Edition, Addison Wesley, 2012.*