

MCA COURSE STRUCTURE – GE24

(Applicable from the Academic Year 2024-25 onwards)

MCA I Year I Semester

S.No	Course Code	Category	Title	L	T	P	Credits
1	24MC101	PC	Data Structures	3	0	0	3
2	24MC102	PC	Computer Organization	3	0	0	3
3	24MC103	PC	Database Management Systems	3	0	0	3
4	24MC104	PC	Operating Systems	3	0	0	3
5	24MC105	BS&H	Mathematical and Statistical Foundations	3	1	0	4
6	24MC106	PC	Database Management Systems Lab	0	0	3	1.5
7	24MC107	PC	Data Structures using C Lab	0	0	4	2
8	24MC108	PC	Operating Systems and Linux Lab	0	0	3	1.5
Total				15	1	10	21

MCA I Year II Semester

S.No	Course Code	Category	Title	L/D	T	P	Credits
1.	24MC201	PC	Computer Networks	3	0	0	3
2.	24MC206	PC	Network Security and Cyber Security	3	0	0	3
3.	24MC206	PC	Object Oriented Programming Using JAVA	3	0	0	3
4.	24MC204	PC	Software Engineering	3	0	0	3
5.	24MC206	PC	Artificial Intelligence	3	0	0	3
6.	24MC206A	PC/PE	Program Elective-1 1. Design and Analysis of Algorithms 2. Advanced Unix Programming 3. Data Warehousing and Data Mining 4. MOOCS-1 (NPTEL/Swayam)	3	0	0	3

			(Recommended 12 week course with 3 Credits)				
7.	24MC207	PC	Object Oriented Programing Using JAVA Lab	0	0	3	1.5
8.	24MC208	PC	Network and Security Lab	0	0	3	1.5
9.	24MC209	AC	Employability Skills-1	1	0	0	0
	Total			19	0	6	21

Regulation GE24	GIET Engineering College (Autonomous)	I MCA			
Course Code 24MC101	Data Structures	L	T	P	C
Prerequisites	Knowledge of at least one programming language, Organising and problem solving techniques.	3	0	0	3

Course Objectives

The objective of this course is to explore basic data structures such as stacks and queues, introduce a variety of data structures such as hash tables, search trees, tries, heaps, graphs, sorting and pattern matching algorithms.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Implement basic programs by using C concepts.
CO2	Apply code reusability with functions and pointers.
CO3	Select the data structures that efficiently model the information in a problem.
CO4	Assess efficiency trade-offs among different data structure implementations or combinations.
CO5	Implement and know the application of algorithms for sorting and pattern matching.

Unit-1: Introduction to C

CO1 10L

Introduction to C

Constants and variables, Operators and Expressions, Managing Input and Output operators, Decision making-branching and looping, Arrays.

Unit-2:

CO2 12L

Functions, Structures and Unions, Pointers, File handling in C.

Unit-3: Data structure and Linear list

CO3 10L

Data structure

Definition, types of data structures Recursion Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion. Preliminaries of algorithms, analysis and complexity.

Linear list

Singly linked list, Double linked list and circular linked list - implementation, insertion, deletion and searching operations on linear list.

Unit-4: Stacks, Queues and Hash Table Representation

CO4 10L

Stacks

Operations, array and linked representations of stacks, stack applications.

Queues

Operations, array and linked representations.

Hash Table Representation

Hash functions, collision resolution separate chaining, open addressing-linear probing, quadratic probing, double hashing and rehashing, extendible hashing.

Unit-5: Sorting Techniques, Trees and Search Trees

CO5 9L

Sorting Techniques

Insertion sort, selection sort, exchange-bubble sort, quick sort and merge sort Algorithms.

Trees

Binary Trees, terminology, representation and traversals- pre, posts in order traversals.

Search Trees

Binary Search Trees, Definition, Implementation, Operations- Searching, Insertion and Deletion, AVL Trees, Red-Black Trees.

Textbook(s)

1. Programming in ANSI C,5e, E.Balagurusamy,TMH
2. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
3. Data Structures using C – A. S. Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

Reference book(s)

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A. Forouzan, Cengage Learning.

Web reference(s)

1. <https://archive.nptel.ac.in/courses/106/102/106102064/>
2. https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020/video_galleries/lecture-videos/
3. <https://www.cs.usfca.edu/~galles/visualization/Algorithms.html>
4. <https://visualgo.net/en>
5. <https://elearn.daffodilvarsity.edu.bd/course/view.php?id=11771>

Regulation GE24	GJET Engineering College (Autonomous)	I MCA			
Course Code 24MC102	Computer Organization	L	T	P	C
Prerequisites	Basic Computer Science Concepts, Programming Fundamentals and Mathematics.	3	0	0	3

Course Objectives

The objectives of this course are to

- Conceptualize the basics of organizational and architectural issues of a digital computer.
- Learn the function of each element of a memory hierarchy.
- Study various data transfer techniques in digital computer.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Students will be able to explain the fundamental principles of computer architecture, including the CPU, memory hierarchy, and input/output mechanisms
CO2	Understand the basic organization of computer and different instruction formats and addressing modes.
CO3	Students will comprehend the design and functioning of input/output systems and their role in overall system performance.
CO4	Students will gain insights into memory hierarchy, including cache memory, virtual memory.
CO5	Understand concepts of instruction pipelining, parallel processing, and their impact on performance.

Unit-1: Basic Structure Of Computers

CO1 12L

Basic Structure Of Computers:

Computer Types, Functional units, Basic Operational concepts, Bus structures, Software, Performance, multiprocessor and multi computers, Historical perspective.

Unit-2: Machine Instructions and Programs

CO2 10L

Machine Instructions and Programs

Numbers, Arithmetic Operations and Characters, Memory locations and addresses, Memory operations, Instructions and Instruction sequencing, Addressing Modes, Assembly Languages, stacks and Queues Basic Input/output Operations, role of Stacks and Queues Additional Instructions

Unit-3: Input/ Output Organization

CO3 15L

Input/ Output Organization

Accessing I/O Devices, Interrupts, Processor examples, Direct Memory Access, Buses, Interface Circuits, and Standard I/O Interfaces.

Unit-4: The Memory Systems**CO4 10L****The Memory Systems**

Some Basic concepts, Semiconductor RAM Memories, Memory System Consideration, Read-Only Memories, Speed, size, and cost, Cache Memories, Performance considerations, Virtual Memories, Memory Management Requirements, Secondary Storage.

Unit-5: Parallel Processing**CO5 10L****Parallel Processing**

Basic concepts, Pipeline Processors, Multiprocessor.

Textbook(s)

1. Computer Organization, Carl Hamacher, Zvonks Vranesic, Safea Zaky, 5th ed, McGraw Hill.
2. Computer Architecture and Organization, John P. Hayes, 3rd Edition, McGraw Hill.

Reference book(s)

1. Computer Organization and Architecture, William Stallings Sixth Edition Pearson/PHI.
2. Structured Computer Organization, Andrew S. Tanenbaum, 4th Edition PHI/Pearson.
3. Fundamentals of Computer Organization and Design, Siva rama Dandamudi Springer Int. Edition.

Web reference(s)

1. <https://nptelvideos.com/course.php?id=396>.
2. https://onlinecourses.nptel.ac.in/noc20_cs64/preview.
3. <https://www.learncomputerscienceonline.com/computer-organization-and-architecture/>.
4. <http://williamstallings.com/COA/COA8e-student/index.html>.

Regulation GE24	GIET Engineering College (Autonomous)	I MCA			
Course Code 24MC103	Database Management Systems	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

The objectives of this course are to

- Explain the concept of databases, database management systems, database structures and how they work.
- Make use of Entity-Relationship Modeling and Relational Modeling for creating simple databases from the real world scenarios.
- Write relational algebra and structured query language (SQL) statements.
- Normalize a database using Normalization Rules.
- Discuss the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing

Course Outcomes

After completion of this course, the learners will be able to

CO1	Illustrate the concept of databases, database management systems, database languages, database structures and their work.
CO2	Apply ER modeling and Relational modeling for designing simple databases.
CO3	Understand and analyze various issues related to memory hierarchy Summarize the concepts related to relational model and SQL and Write database queries using relational algebra and structured query language.
CO4	Design and develop databases from the real world by applying the concepts of Normalization.
CO5	Outline the issues associated with Transaction Management and Recovery, Tree Structured and Hash-Based Indexing.

Unit-1: Overview of Database System and Introduction to Database Design **CO1 10L**

Overview of Database System

Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/Altering Tables and Views.

Introduction to Database Design

Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Additional Features of the ER Model, Conceptual Design with the ER Model, Extended ER features

Unit-2: Relational Model, Relational Algebra and Relational Calculus **CO2 10L**

Relational Model

Introduction to the Relational Model, Integrity Constraints over Relations, Enforcing Integrity Constraints, Querying Relational Data, Logical Database Design: ER to Relational, Introduction to Views, Destroying/Altering Tables and Views.

Relational Algebra

Selection and Projection, Set Operations, Renaming, Joins, Division, More Examples of Algebra Queries,

Relational Calculus

Tuple Relational Calculus, Domain Relational Calculus

Unit-3: SQL: Queries, Constraints, Triggers and Normal Forms **CO3** **10L****SQL: Queries, Constraints, Triggers**

The Form of a Basic SQL Query, UNION, INTERSECT and EXCEPT, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers, Exceptions, Procedures, Functions.

Normal Forms

Introduction to Schema Refinement, Functional Dependencies, Reasoning about FDs, Normal Forms, Properties of Decompositions, Normalization.

Unit-4: Schema Refinement, Transaction Management and Concurrency Control **CO4** **12L****Schema Refinement**

Multivalued dependencies, Fourth Normal form, Join Dependencies, Fifth Normal Form, Lossless join, dependency preservation.

Transaction Management

Transaction Concepts, Transaction state, Implementation of Atomicity and Durability, Concurrent Execution, Serializability, Recoverability.

Concurrency Control

Lock-based Protocols: Locks, Granting of Locks, Two Phase Locking Protocol, Implementation of locking; Timestamp-Based Protocols: Time Stamps, Time Stamp Ordering protocol, Thomas Write Rule, Validation-Based Protocols

Unit-5: Overview of Storage and Indexing and Tree Structured Indexing **CO5** **10L****Overview of Storage and Indexing**

Data on External Storage, File organization and indexing: Clustered Indexes, Primary and Secondary Indexes; Index Data Structures: Hash and Tree based indexing; Comparison of File organizations.

Tree Structured Indexing

Intuitions for Tree Indexes, Indexed Sequential Access Method (ISAM), B+ Trees: A Dynamic Index Structure, Search, Insert, Delete, Duplicates, B+ Trees in Practice

Textbook(s)

1. Database Management Systems, 3/e, Raghurama Krishnan, Johannes Gehrke, Mc Graw-Hill.
2. Database System Concepts, 6/e, Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Mc Graw Hill.
3. Database Systems, 9/e, Carlos Coronel, Steven Morris, Peter Rob, Cengage.

Reference book(s)

1. Introduction to Database Systems, 8/e, C J Date, Pearson.
2. Database Systems, 6/e Ramez Elmasri, Shamkant B. Navathe, Pearson.

Web reference(s)

1. <https://nptel.ac.in/courses/106105175>
2. https://onlinecourses.swayam2.ac.in/cec22_cs18/preview
3. <https://cs186berkeley.net/>
4. <https://www.youtube.com/playlist?list=PL52484DF04A264E59>
5. <https://courses.cs.washington.edu/courses/cse414/17au/calendar/lecturelist.html>

Regulation GE24	GIET Engineering College (Autonomous)	I MCA			
Course Code 24MC104	Operating Systems	L	T	P	C
Prerequisites	Basic Computer Science Concepts, Programming Fundamentals and Mathematics.	3	0	0	3

Course Objectives

The objectives of this course are to

- Introduce different types of operating systems.
- Learn process management techniques.
- Learn various memory management techniques.
- Introducing the architecture of the Linux operating system.
- Learn multiple operation systems like Unix and Windows.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Explain the fundamental concepts and functions of operating systems.
CO2	Understand process concepts and be able to manage processes and threads within an operating system.
CO3	Students will be able to handle concurrent execution and synchronization issues in an operating system.
CO4	Understand file system structures and be able to manage files and directories within an operating system.
CO5	Students will gain hands-on experience with operating systems using practical tools and programming exercises.

Unit-1: Introduction to Operating System Concept

CO1 12L

Introduction to Operating System Concept

Types of Operating Systems, Operating Systems Concepts, Operating System Operations. Operating Systems Structures-Operating System Services, User Operating-System Interface, Introduction to System calls, Types of System Calls.

Unit-2: Process Management

CO2 10L

Process Management

Process concept, Process State Diagram, Process control block, Process Scheduling, Inter process Communication, Threads-Threading Issues, Scheduling-Basic Concepts, Scheduling Criteria, Scheduling Algorithms

Unit-3: Process Synchronization and Principles of deadlock

CO3 15L

Process Synchronization

The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Principles of deadlock

System Model, Deadlock characterization, Deadlock handling, Deadlock Prevention, Detection and Avoidance, Recovery Starvation, Critical Regions form Deadlock.

Unit-4: Memory Management and File-System Interface

CO4 10L

Memory Management

Swapping, Contiguous Memory Allocation, Paging, structure of the Page Table, Segmentation Virtual Memory Management-Demand Paging, Page-Replacement Algorithms, Thrashing.

File-System Interface

File Concept, Access Methods, Directory structure, File-System mounting, Files Sharing, Protection. File-System implementation- File-System Structure, Allocation Methods, Free-Space Management, Disk Structure, Disk Scheduling.

Unit-5: Case Studies: Linux System and Windows 7

CO5 10L

Linux System

Design Principles, kernel Modules, Process Management, File Systems, Input and Output, Interprocess Communication, Network Structure, Security.

Windows 7

Design Principles, System Components, Terminal Services and Fast User, File System, Networking, Programmer Interface.

Textbook(s)

1. Operating System concepts, Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, John Wiley & Sons, Inc., Edition 9, 2011.
2. Introduction to UNIX and Shell Programming, M.G.VenkateshMurthy, Pearson, 2005.
3. UNIX & Shell Programming, B.M.Harwani, OXFORD University Press, 2013.

Reference book(s)

1. Advanced Programming in the UNIX Environment, W.Richard Stevens, Stephen Rago, Wesley Professional, 2013.
2. UNIX Network Programming, W. Richard Stevens, 1990.
3. Operating Systems, William Stallings, PHI/Pearson, 6/E, 2009.
4. Operating Systems, Dietal, Dietal, Pearson, 3/e, 2007.
5. Operating Systems, Dhamdhere, TMH, 2/e, 2009.

Web reference(s)

1. https://onlinecourses.swayam2.ac.in/cec20_cs06/preview.
2. <https://www.cse.iitb.ac.in/~mythili/os/>.
3. https://onlinecourses.nptel.ac.in/noc21_cs72/preview.
4. <https://web.stanford.edu/~ouster/cgi-bin/cs140-spring20/lectures.php>.
5. <https://oscourse.org/>.
6. <https://www.cs.jhu.edu/~huang/cs318/fall21/schedule.html>.

Regulation GE24	G IET Engineering College (Autonomous)	I MCA			
Course Code 24MC105	MATHEMATICAL AND STATISTICAL FOUNDATIONS	L	T	P	C
Prerequisites	Nil	3	1	0	4

Course Objectives

The objectives of this course are to

- Understand the mathematical fundamentals that is prerequisites for variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems bioinformatics, Machine learning.
- Develop the understanding of the mathematical and logical basis to many modern techniques in computer science technology like machine learning, programming language design, and concurrency.
- Study various sampling and classification problems.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Apply the basic rules and theorems of probability theory such as Baye's Theorem, determine probabilities that help to solve engineering problems and to determine the expectation and variance of a random variable from its distribution.
CO2	Able to perform and analyze of sampling, means, proportions, variances and estimates the maximum likelihood based on population parameters.
CO3	Learn how to formulate and test hypotheses about sample means, variances and proportions and to draw conclusions based on the results of statistical tests.
CO4	Design various ciphers using number theory
CO5	Apply graph theory for real time problems like network routing problem

Unit-1: Basic Probability and Random Variables

CO1 12L

Basic Probability and Random Variables

Random Experiments, Sample Spaces Events, the Concept of Probability the Axioms of Probability, Some Important Theorems on Probability Assignment of Probabilities, Conditional Probability Theorems on Conditional Probability, Independent Events, Bayes Theorem or Rule. Random Variables, Discrete Probability Distributions, Distribution Functions for Random Variables, Distribution Functions for Discrete Random Variables, Continuous Random Variables

Unit-2: Sampling and Estimation Theory

CO2 12L

Sampling and Estimation Theory

Population and Sample, Statistical Inference Sampling with and Without Replacement Random Samples, Random Numbers Population Parameters Sample Statistics Sampling Distributions, Frequency Distributions, Relative Frequency Distributions, Computation of Mean, Variance, and Moments for Grouped Data. Unbiased Estimates and Efficient Estimates Point Estimates and Interval Estimates. Reliability Confidence Interval

Estimates of Population Parameters, Maximum Likelihood Estimates.

Unit-3: Tests of Hypothesis and Significance

CO3 15L

Tests of Hypothesis and Significance

Statistical Decisions Statistical Hypotheses. Null Hypotheses Tests of Hypotheses and Significance Type I and Type II Errors Level of Significance Tests Involving the Normal Distribution One-Tailed and Two-Tailed Tests P Value Special Tests of Significance for Large Samples Special Tests of Significance for Small Samples Relationship between Estimation Theory and Hypothesis Testing Operating Characteristic Curves. Power of a Test Quality Control Charts Fitting Theoretical Distributions to Sample Frequency Distributions, The Chi-Square Test for Goodness of Fit Contingency Tables Yates' Correction for Continuity Coefficient of Contingency

Unit-4: Algebraic Structures and Number Theory

CO4 12L

Algebraic Structures and Number Theory

Algebraic Systems, Examples, General Properties, Semi Groups and Monoids, Homomorphism of Semi Groups and Monoids, Group, Subgroup, Abelian Group, Homomorphism, Isomorphism. Properties of Integers, Division Theorem, The Greatest Common Divisor, Euclidean Algorithm, Least Common Multiple, Testing for Prime Numbers, The Fundamental Theorem of Arithmetic, Modular Arithmetic (Fermat's Theorem and Euler's Theorem)

Unit-5: Graph Theory

CO5 13L

Graph Theory

Basic Concepts of Graphs, Sub graphs, Matrix Representation of Graphs: Adjacency Matrices, Incidence Matrices, Isomorphic Graphs, Paths and Circuits, Eulerian and Hamiltonian Graphs, Multi graphs, Planar Graphs, Euler's Formula, Graph Colouring and Covering, Chromatic Number, Spanning Trees, Algorithms for Spanning Trees (Problems Only and Theorems without Proofs).

Text Books

1. Foundation Mathematics for Computer Science, 1 st Edition, John Vince, Springer,2015
2. Probability & Statistics, 3rd Edition, Murray R. Spiegel, John J. Schiller and R. Alu Srinivasan, Schaum's Outline Series, Tata McGraw-Hill Publishers, 2018
3. Probability and Statistics with Reliability,2nd Edition, K. Trivedi, Wiley, 2011
4. Discrete Mathematics and its Applications with Combinatorics and Graph Theory, 7th Edition, H. Rosen, Tata McGraw Hill, 2003

Reference book(s)

1. Probability and Computing: Randomized Algorithms and Probabilistic Analysis,1 st Edition, M. Mitzenmacher and E. Upfal,2005

2. Applied Combinatorics, 6 th Edition, Alan Tucker, Wiley,2012.

Web reference(s)

1. <https://archive.nptel.ac.in/courses/106/102/106102064/>
2. https://ocw.mit.edu/courses/6-006-introduction-to-algorithms-spring-2020/video_galleries/lecture-videos/
3. <https://www.cs.usfca.edu/~galles/visualization/Algorithms.html>
4. <https://visualgo.net/en>
5. <https://elearn.daffodilvarsity.edu.bd/course/view.php?id=11771>

Regulation GE24	GIET Engineering College (Autonomous)	I MCA			
Course Code 24MC106	DATABASE MANAGEMENT SYSTEMS LAB	L	T	P	C
Prerequisites	Nil	0	0	3	1.5

Course Objectives

This Course will enable learners to

- Populate and query a database using SQL DDL/DML Commands.
- Declare and enforce integrity constraints on a database.
- Writing Queries using advanced concepts of SQL.
- Programming PL/SQL including procedures, functions, cursors and triggers.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Utilize SQL to execute queries for creating database and performing data manipulation operations
CO2	Examine integrity constraints to build efficient databases
CO3	Apply Queries using Advanced Concepts of SQL
CO4	Build PL/SQL programs including stored procedures, functions, cursors and triggers

List of Experiment(s)

1. Execute all DDL, DML and DCL commands on sample tables.
2. Implementation of different types of operators and built-in functions with suitable examples
3. Implementation of different types of joins with suitable examples
4. Create views, partitions, Sequence, Indexes and locks for a particular DB
5. Implement different types of constraints on relations.
6. Implementation of sub queries and nested queries.
7. Implement Queries on Group By & Having Clauses, ALIAS, Sequence By, Order By
8. Control Structure:
 - a) Write a PL/SQL block for Addition of Two Numbers
 - b) Write a PL/SQL block for IF, IF and else condition
 - c) Write a PL/SQL block for implementation of loops
 - d) Write a PL/SQL block for greatest of three numbers using IF and ELSEIF
9. Exception Handling- Implement the following with respect to exception handling, Raising Exceptions, User Defined Exceptions, Pre-Defined Exceptions
10. Write PL/SQL block for an application using exception handling Procedures
 - a) Write a PL/SQL Procedure using Positional Parameters
 - b) Write a PL/SQL Procedure using notational parameters
 - c) Write a PL/SQL Procedure for GCD Numbers
 - d) Write a PL/SQL Procedures for cursor implementation (explicit and implicit cursors)
11. Functions:
 - a) Write a PL/SQL block to implement factorial using functions
 - b) Write a PL/SQL function to search an address from the given database

12. Write a DBMS program to prepare PL/SQL reports for an application using functions.
13. Triggers:
 - a) Write a Trigger to pop-up the DML operations
 - b) Write a Trigger to check the age valid or not Using Message Alert.
 - c) Create a Trigger to Raise appropriate error code and error message.
 - d) Create a Trigger on a table so that it will update another table while inserting values
14. Write PL/SQL block for an application using cursors and all types of triggers.
15. Write a PL/SQL block for transaction operations of a typical application using package

Reference(s)

1. Oracle: The Complete Reference by Oracle Press.
2. Nilesh Shah, "Database Systems Using Oracle", PHI, 2007.
3. Rick F Vander Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

Web Resource(s)

1. <https://moodle.sit.ac.in/blog/database-management-system-lab-component-bcs403/#P01>
2. <https://elearn.daffodilvarsity.edu.bd/course/view.php?id=10250>
3. <https://cs50.harvard.edu/x/2024/weeks/7/>
4. <https://courses.cs.washington.edu/courses/cse414/17au/calendar/hwlist.html>
5. <http://db.lcs.mit.edu/6.5830/2021/assign.php>

Regulation GE24	GIET Engineering College (Autonomous)	I MCA			
Course Code 24MC107	Data Structures Using C Lab	L	T	P	C
Prerequisites	Knowledge of C programming language, Organizing and problem solving techniques.	0	0	4	2

Course Objectives

This Course will enable students to

- Design and implement various data structures.
- Implement operations like searching, insertion, and deletion, traversing mechanism.
- Develop applications using data structure algorithms.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Implement various basic data structures and its operations.
CO2	Apply sorting and searching algorithms to given numbers.
CO3	Implement various tree operations.
CO4	Implement various graphs algorithms.
CO5	Develop applications using various data structures.

List of Experiment(s)

1. Experiment-1

- Write a program in C to display the n terms of even natural number and their sum.
- Write a program in C to display the n terms of harmonic series and their sum.
 $1 + 1/2 + 1/3 + 1/4 + 1/5 \dots 1/n$ terms.
- Write a C program to check whether a given number is an Armstrong number or not.
- Write a C program to calculate the factorial of a given number.

2. Experiment-2

- Write a program in C for multiplication of two square Matrices.
- Write a program in C to find transpose of a given matrix.

3. Experiment-3

- Write a program in C to check whether a number is a prime number or not using the function.
- Write recursive program which computes the nth Fibonacci number, for appropriate values of n.
- Write a program in C to add numbers using call by reference.

4. Experiment-4

- Write a program in C to append multiple lines at the end of a text file.
- Write a program in C to copy a file in another name.

5. Experiment-5

Write recursive program for the following

- Write recursive and non-recursive C program for calculation of Factorial of an

integer.

- b. Write recursive and non-recursive C program for calculation of GCD (n, m).
- c. Write recursive and non-recursive C program for Towers of Hanoi: N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

6. Experiment-6

- a. Write C program that use both recursive and non-recursive functions to perform Linear search for a key value in a given list.
- b. Write C program that use both recursive and non-recursive functions to perform Binary search for a key value in a given list.

7. Experiment-7

- a. Write C program that implement stack (its operations) using arrays.
- b. Write C program that implement stack (its operations) using Linked list.

8. Experiment-8

- a. Write a C program that uses Stack operations to convert infix expression into postfix expression.
- b. Write C program that implement Queue (its operations) using arrays.
- c. Write C program that implement Queue (its operations) using linked lists.

9. Experiment-9

Write a C program that uses functions to create a singly linked list and perform various operations on it.

10. Experiment-10

Write a C program to store a polynomial expression in memory using linked list and perform polynomial addition.

11. Experiment-11

- a. Write a recursive C program for traversing a binary tree in preorder, in-order and post-order.
- b. Write a non-recursive C program for traversing a binary tree in preorder, in-order and post-order.

12. Experiment-12

Implementation of Hash table using double hashing as collision resolution function.

13. Experiment-13

Implementation of Binary Search trees- Insertion and deletion.

14. Experiment-14

Implementation of AVL Tree- Insertion and deletion.

15. Experiment-15

- a. Write C program that implement Bubble sort, to sort a given list of integers in ascending order.
- b. Write C program that implement Quick sort, to sort a given list of integers in ascending order.
- c. Write C program that implement merge sort, to sort a given list of integers in ascending order

Reference(s)

1. M.A. Weiss, Data Structures and Algorithm Analysis in C, Pearson, 2002.
2. T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, Introduction to Algorithms, MIT Press, 2009.
3. E. Horowitz and S. Sahni, Fundamentals of Data Structures in C, University Press, 2008.

Web Resource(s)

1. <https://ds1-iiith.vlabs.ac.in/>
2. https://profile.iiita.ac.in/bibhas.ghoshal/teaching_ds_lab.html
3. <https://moodle.sit.ac.in/blog/data-structures-laboratory/>
4. <https://dsalab.netlify.app/>
5. <https://www.vtuloop.com/data-structure-lab-programs-all/>

Regulation GE24	GIET Engineering College (Autonomous)	I MCA			
Course Code 24MC108	OPERATING SYSTEMS AND LINUX LAB	L	T	P	C
Prerequisites	Basic Understanding of Operating Systems Concepts and Linux and Command Line Basics.	0	0	3	1.5

Course Objectives

This Course will enable students to implement CPU scheduling algorithms, Disk scheduling algorithms, execute different types of Linux commands and Write shell scripts.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Implement various CPU scheduling algorithms and compare results.
CO2	Implement various disk scheduling algorithms and compare results.
CO3	Implement page replace algorithms.
CO4	Implement various memory management techniques.
CO5	Execute basic Linux commands.

List of Experiment(s)

UNIX Lab- Introduction to UNIX

1. Study of Unix/Linux general purpose utility commands
2. Study of Bash shell, Bourne shell and C shell in Unix/Linux operating system.
3. Study of UNIX/LINUX File System (tree structure).
4. C program to emulate the UNIX `ls -l` command
5. C program that illustrates how to execute two commands concurrently with a command pipe. Ex: `- ls -l | sort`
6. Multiprogramming-Memory Management-Implementation of `fork ()`, `wait ()`, `exec ()` and `exit ()`, System calls

Operating Systems Lab

1. Simulate the Following CPU Scheduling Algorithms
A) FCFS B) SJF C) Priority D) Round Robin
2. Multiprogramming-Memory Management- Implementation of `fork ()`, `wait ()`, `exec ()` and `exit ()`.
3. Simulate The Following
 - a. Multiprogramming with A Fixed Number Of Tasks (MFT)
 - b. Multiprogramming with A Variable Number Of Tasks (MVT)
4. Write a program to implement first fit, best fit and worst fit algorithm for memory management.
5. Simulate Bankers Algorithm for Dead Lock Avoidance.
6. Simulate Bankers Algorithm for Dead Lock Prevention.
7. Simulate The Following Page Replacement Algorithms.

- a) FIFO b) LRU
8. Simulate the Following File Allocation Strategies
- a) Sequenced b) Indexed c) Linked c) LFU

Linux Lab

1. Write a Shell program to check whether given number is prime or not.
2. Write a shell script which will display Fibonacci series up to the given range.
3. Write a shell script to check whether the given number is Armstrong or not.
4. Write a shell script to calculate the value of
5. Write a shell script to accept student number, name, marks in 5 subjects.
6. Find total, average and grade using the following rules:
Avg \geq 80 then grade A
Avg $<$ 80&&Avg \geq 70 then grade B
Avg $<$ 70&&Avg \geq 60 then grade C
Avg $<$ 60&&Avg \geq 50 then grade D
Avg $<$ 50&&Avg \geq 40 then grade E
7. Write a shell script to find minimum and maximum elements in the given list of elements.
8. Write a shell program to check whether the given string is palindrome or not.
9. Write an awk program to print sum, avg of students marks list.
10. Write a shell script to compute no. of characters and words in each line of given file.

Reference(s)

1. Computer Organization and Architecture, William Stallings 6th Edition, Pearson/PHI
2. Operating Systems, 6th Edition, William Stallings, PHI/Pearson.

Web Resource(s)

1. https://profile.iiita.ac.in/bibhas.ghoshal/teaching_os_lab.html
2. https://profile.iiita.ac.in/bibhas.ghoshal/OS_2019/teaching_os_lab.html
3. <https://dextutor.com/courses/operating-system-programs/>
4. <https://oscourse.org/labs/>
5. <https://labex.io/courses/linux-practice-labs>
6. <https://www.101labs.net/courses/101-labs-linux-lpic1/>

MCA COURSE STRUCTURE – GE24

(Applicable from the Academic Year 2024-25 onwards)

MCA I Year I Semester

S.No	Course Code	Category	Title	L	T	P	Credits
1	24MC101	PC	Data Structures	3	0	0	3
2	24MC102	PC	Computer Organization	3	0	0	3
3	24MC103	PC	Database Management Systems	3	0	0	3
4	24MC104	PC	Operating Systems	3	0	0	3
5	24MC105	BS&H	Mathematical and Statistical Foundations	3	1	0	4
6	24MC106	PC	Database Management Systems Lab	0	0	3	1.5
7	24MC107	PC	Data Structures using C Lab	0	0	4	2
8	24MC108	PC	Operating Systems and Linux Lab	0	0	3	1.5
Total				15	1	10	21

MCA I Year II Semester

S.No	Course Code	Category	Title	L/D	T	P	Credits
1.	24MC201	PC	Computer Networks	3	0	0	3
2.	24MC206	PC	Network Security and Cyber Security	3	0	0	3
3.	24MC206	PC	Object Oriented Programming Using JAVA	3	0	0	3
4.	24MC204	PC	Software Engineering	3	0	0	3
5.	24MC206	PC	Artificial Intelligence	3	0	0	3
6.	24MC206A	PC/PE	Program Elective-1 1. Design and Analysis of Algorithms 2. Advanced Unix Programming 3. Data Warehousing and Data Mining 4. MOOCS-1 (NPTEL/Swayam)	3	0	0	3

			(Recommended 12 week course with 3 Credits)				
7.	24MC207	PC	Object Oriented Programing Using JAVA Lab	0	0	3	1.5
8.	24MC208	PC	Network and Security Lab	0	0	3	1.5
9.	24MC209	AC	Employability Skills-1	1	0	0	0
	Total			19	0	6	21

Regulation GE24	GIET Engineering College (Autonomous)	I-II MCA			
Course Code 24MC201	COMPUTER NETWORKS	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

At the end of the course, the learners will be able to:

- Understands the fundamental concepts of computer networking and OSI Reference model.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Learn and understand the advanced networking concepts, preparing the student for entry advanced courses in computer networking.
- Develop and gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

Course Outcomes

At the end of the course, learners will be able to

CO1	Explain the network architecture, TCP/IP and OSI reference models.
CO2	Identify and understand various techniques and modes of transmission.
CO3	Demonstrate the data link protocols, multi-channel access protocols and IEEE 802 standards for LAN.
CO4	Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme.
CO5	Discuss the elements, protocols of transport layer and define various protocols such as FTP, HTTP, Telnet, DNS.

Unit-1: Introduction and Physical Layer

CO1 12L

Introduction

Network Topologies WAN, LAN, MAN. Reference models- The OSI Reference Model, The TCP/IP Reference Model, A Comparison of the OSI and TCP/IP Reference Models.

Physical Layer

Introduction to physical layer, Data and Signals, Periodic analog signals, digital signals, transmission impairment, Data rate limits, performance, Introduction to Guided Media, Twisted-pair cable, Coaxial cable and Fiber optic cable and Unguided media: Wireless- Radio waves, microwaves, infrared

Unit-2: The Data Link Layer and Elementary Data Link Protocols

CO2 10L

The Data Link Layer

Services Provided to the Network Layer, Framing, Error Control, Flow Control, Error Detection and Correction, Error-Correcting Codes, Error Detecting Codes.

Elementary Data Link Protocols

Simplex Protocol, A Simplex Stop and Wait Protocol for an Error free channel, A Simplex Stop and Wait Protocol for a Noisy Channel, Sliding Window Protocols, A One Bit Sliding Window Protocol, Go-Back-N, Selective Repeat.

Unit-3: Medium Access Control Sub layer & Wireless LAN Protocols CO3 15L**The Medium Access Control Sublayer**

The Channel Allocation Problem, Static Channel Allocation, Assumptions for Dynamic Channel Allocation, Multiple Access Protocols, Aloha, Pure aloha, slotted aloha, Carrier Sense Multiple Access Protocols, Collision-Free Protocols, Limited Contention Protocols.

Wireless LAN Protocols

Ethernet, Classic Ethernet Physical Layer, Classic Ethernet MAC Sub-layer Protocol, Ethernet Performance, Fast Ethernet, Wireless LANs, The 802.11 Architecture and Protocol Stack, The 802.11 Physical Layer, The 802.11 MAC Sublayer Protocol, The 805.11 Frame Structure, Services.

Unit-4: The Network Layer Design Issues and Congestion Control algorithms and Internet Working

CO5 10L

The Network Layer Design Issues

Store and Forward Packet Switching, Services Provided to the Transport layer, Implementation of Connection less Service, Implementation of Connection Oriented Service, Comparison of Virtual Circuit and Datagram Networks, Routing Algorithms, The Optimality principle, Shortest-path, Flooding, Distance vector, Link state, Hierarchical.

Congestion Control algorithms

General principles of congestion control, Congestion prevention policies, Approaches to Congestion Control, Traffic Aware Routing, Admission Control, Traffic Throttling, Load Shedding.

Internet Working

How networks differ, How networks can be connected, Tunneling, internetwork routing, Fragmentation, network layer in the internet, IP protocols, IP Version 4 protocol, IP addresses, Subnets, IP Version 6, The main IPV6 header, Internet control protocols- ICMP, ARP, DHCP.

Unit-5: Transport Layer, Application Layer & Domain Name System CO5 10L**The Transport Layer**

Transport layer protocols: Introduction, services, port number, User datagram protocol, User datagram, UDP services, UDP applications.

Transmission control protocol: TCP services, TCP features, Segment, A TCP connection, windows in TCP, flow control, Error control.

Application Layer

World Wide Web: HTTP, FTP, Two connections, control connection, Data connection, security of FTP, Electronic mail, Architecture, web based mail, email security, TELENET, local versus remote Logging.

Domain Name System

Name Space, DNS in Internet, Resolution, Caching, Resource Records, DNS messages, Registrars, security of DNS Name Servers.

Textbook(s)

1. Computer Networks: Andrew S Tanenbaum David J. Wetherall, 5/e, Pearso

2. Data communications and networking: Behrouz Forouzan, 5/e, McGraw Hill

Reference book(s)

1. Computer Networks – A System Approach, Peterson, Bruce Davie, 2/e, Harcourt Asia
2. Compute communications and networking technologies, Gallo, Hancock, Cengage
3. An Engineering approach to compute networking, Kesha, Pearson

Web reference(s)

1. https://onlinecourses.swayam2.ac.in/cec23_cs07/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs18/preview
3. <https://ocw.mit.edu/courses/6-829-computer-networks-fall-2002/pages/lecture-notes/>
4. <https://www.sanfoundry.com/computer-network-basics/>
5. https://www.cisco.com/c/en_in/solutions/enterprise-networks/what-is-computer-networking.html
6. <https://www.cs.vu.nl/~ast/CN5/>

Regulation GE24	GIET Engineering College (Autonomous)	I-II MCA			
Course Code 24MC202	NETWORK SECURITY AND CYBER SECURITY	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

At the end of the course, the learners will be able to:

- To learn various cryptographic algorithms including secret key cryptography, hashes and message digests, public key algorithms,
- To Familiar in design issues and working principles of various authentication protocols and various secure communication standards
- To understand the cybercrime fundamentals and preventive steps

Course Outcomes

At the end of the course, learners will be able to

CO1	Students will be able to explain fundamental concepts, principles of cryptography and apply symmetric encryption algorithms.
CO2	Students will be proficient in asymmetric (public-key) encryption techniques and use cryptographic hash functions.
CO3	Students will be able to implement and analyze digital signatures and certificate management.
CO4	Students will understand various cryptographic protocols and their applications.
CO5	Students will be aware of common cryptographic attacks and defenses.

Unit-1: Basic Principles

CO1 12L

Basic Principles

Security Goals, Cryptographic Attacks, Services and Mechanisms, Mathematics of Cryptography. Symmetric Encryption: Mathematics of Symmetric Key Cryptography, Introduction to Modern Symmetric Key Ciphers, Data Encryption Standard, Advanced Encryption Standard.

Unit-2: Asymmetric Encryption and Cryptographic Hash Functions

CO2 10L

Asymmetric Encryption

Mathematics of Asymmetric Key Cryptography-Primes, primality Testing, Factorization, Asymmetric Key Cryptography-RSA Cryptosystem, Rabin Cryptosystem, ElGamal Cryptosystem, Elliptic Curve Cryptosystem.

Cryptographic Hash Functions

Applications of Cryptographic Hash Functions, Two Simple Hash Functions Requirements and Security Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), SHA-3.

Unit-3: Digital Signatures and Electronic Mail Security

CO3 15L

Digital Signatures

Elgamal Digital Signature Scheme, Schnorr Digital Signature, NIST Digital Signature

Algorithm.

Electronic Mail Security

Internet Mail Architecture, Email Formats, Email Threats and Comprehensive Email Security, S/MIME. IP Security: IP Security Policy, Encapsulating Security Payload, Combining Security Associations Internet Key Exchange.

Unit-4: Introduction to Cybercrime

CO4 10L

Introduction to Cybercrime

Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Cybercriminals, Classifications of Cybercrime, Cyber stalking, Cyber cafe and Cybercrimes, Botnets. Attack Vector, Proliferation of Mobile and Wireless Devices, Security Challenges Posed by Mobile Devices, Attacks on Mobile/Cell Phones.

Unit-5: Proxy Servers and Anonymizers

CO5 10L

Proxy Servers and Anonymizers

Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, Sniffers, Spoofing, Session Hijacking Buffer overflow, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Identify theft, FootPrinting and Social Engineering, Port Scanning, E-mail Investigation, E-Mail Tracking, IP Tracking, E-Mail Recovery, Password Cracking

Textbook(s)

1. Network Security and Cryptography, First Edition, Bernard Meneges, Cengage Learning, 2018.
2. Suni Belapure Nina Godbole "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", WILEY, 2011.

Reference book(s)

1. Network Security and Cryptography, First Edition, Bernard Meneges, Cengage Learning, 2018.
2. Cryptography and Network Security, William Stallings, Global Edition, 7e, Person, 2017.

Web reference(s)

1. <https://archive.nptel.ac.in/courses/106/105/106105162/>
2. <https://ebooks.inflibnet.ac.in/csp11/chapter/introduction-to-network-security/>
3. <https://www.fortinet.com/resources/cyberglossary/what-is-cryptography>
4. <https://ischoolonline.berkeley.edu/cybersecurity/curriculum/cryptography/>
5. <https://www.mitel.com/articles/web-communication-cryptography-and-network-security>
6. <https://www.nist.gov/cybersecurity>
7. <https://www.codecademy.com/learn/introduction-to-cybersecurity>

Regulation GE24	GIET Engineering College (Autonomous)	I-II MCA			
Course Code 24MC203	Object Oriented Programming with java	L	T	P	C
Prerequisites	Basic Programming Concepts, Basic Object-Oriented Concepts and Basic Mathematics.	3	0	0	3

Course Objectives

The objectives of this course are to

- To understand the basic concepts of Object-Oriented Programming concepts.
- To introduce the principles of inheritance and polymorphism and demonstrate how they are related to the design of abstract classes.
- To understand the implementation of packages and interfaces.
- To introduce the concept of multithreading and exception handling.
- To learn and understand the design of Graphical User Interface using applets and swing controls.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Describe the uses OOP concepts.
CO2	Apply OOP concepts to solve real world problems.
CO3	Distinguish the concept of packages and interfaces.
CO4	Demonstrate the exception handling, multithread applications with synchronization.
CO5	Design the GUI based applications using AWT and Swings.

Unit-1: Java Basics & Basics of object-oriented programming (OOP) CO1 12L Basics of Object-Oriented Programming (OOP)

Need for OO paradigm, A way of viewing world, Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, overriding and exceptions, summary of OOP concepts, coping with complexity, abstraction mechanisms.

Java Basics

Data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects1 concepts of classes, objects, constructors methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling.

Unit-2: Inheritance, Packages and Interfaces

CO2 10L

Inheritance

Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance costs of inheritance. Member access rules, super uses, using final

with inheritance, polymorphism, abstract classes.

Packages and Interfaces

Defining, Creating and Accessing a package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, Implementing interface, applying interfaces variables in interface and extending interfaces.

Unit-3: Exception handling and Multithreading

CO3 15L

Exception handling and Multithreading

Concepts of exception handling, benefits of exception handling, Termination or presumptive models, exception hierarchy, usage of try, catch, throws and finally, built in exceptions, creating own exception sub classes. Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups

Unit-4: Event Handling

CO4 10L

Event Handling

Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, list panes- scroll pane, dialogs, menu bar, graphics, layout manager- layout manager types1boarder, grid, flow, card and grid bag.

Unit-5: Applets and Swings

CO5 10L

Swings

Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JFrame and JComponent, Icons and Labels, text fields, buttons-The JButton class, Check boxes, Radio Buttons, Combo boxes, Tabbed panes, Scroll panes, Trees and Tables.

Textbook(s)

1. Java-The complete reference,7/e, Herbert Schildt, TMH.

Reference book(s)

1. JAVA: How to program, 8/e, Dietal, PHI.
2. Introduction of programming with JAVA, S. Dean, TMH.
3. Introduction to JAVA programming, 6/e, Y. Daniel Liang, Pearson.
4. Core Java2, Vol1(Vol2) Fundamentals (Advanced),7/e, Cay.S.Horstmann, GaryCornell, Pearson.
5. Big Java 2,3/e, Cay. S. Horstmann, Wiley.
6. Object Oriented Programming through Java, P. Radha Krishna, University Press.

Web reference(s)

1. https://onlinecourses.nptel.ac.in/noc20_cs58/preview
2. <https://www.iitk.ac.in/esc101/05Aug/tutorial/information/resources.html>
3. <https://docs.oracle.com/javase/tutorial/index.html>
4. <https://www.javacodegeeks.com/best-java-programming-resources>

Regulation GE24	GIET Engineering College (Autonomous)	I-II MCA			
Course Code 24MC204	SOFTWARE ENGINEERING	L	T	P	C
Prerequisites	Understanding of Software Development Life Cycle, Object Oriented Programming.	3	0	0	3

Course Objectives

- To understand the nature of software development and software life cycle models
- To understand methods of capturing, specifying, visualizing and analyzing software requirements.
- Understand the concept of Design patterns and its importance.
- Understand the behavioral knowledge of the problem and solutions.
- Relate the Creational, Structural, behavioral Design patterns.
- Apply the suitable design patterns to refine the basic design for given context.

Course Outcomes

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

CO1	Define various software application domains and remember different process model used in software development.
CO2	Explain needs for software specifications also they can classify different types of software requirements and their gathering techniques.
CO3	Convert the requirements model into the design model and demonstrate use of software and user interface design principles.
CO4	Illustrate the appropriate design patterns to solve object-oriented design problems.
CO5	Apply structural patterns to solve design problems and Evaluate the design solutions by using behavioral patterns.

Unit-1: Introduction and Software Development Life Cycles

CO1 8L

Introduction to Software Engineering

Software Engineering and its history, Software crisis, Evolving of a Programming System Product, Characteristics of Software, Brooks’ No Silver Bullet, and Software Myths.

Software Development Life Cycles

Software Development Process, Code-and-Fix model, Waterfall model, Evolutionary Model, Incremental Implementation, Prototyping, Spiral Model, Software Reuse, Critical Comparisons of SDLC models.

An Introduction to Non-Traditional Software Development Process

Rational Unified Process, Rapid Application Development, Agile Development Process-Introduction, Agile-SCRUM (Sprint, Review, Retrospective, Planning) XP, KANBAN, SAFE agile.

Unit-2: Requirements and Classes of User Requirements

CO2 10L

Requirements

Importance of Requirement Analysis, User needs, Software Features and Software Requirements.

Classes of User Requirements

Enduring and Volatile, Sub phases of Requirement Analysis, Functional and Non-functional requirements, Barriers to Eliciting User requirements, The software requirements document and SRS standards, Requirements Engineering, Case Study of SRS for a Real Time System.

Tools for Requirements Gathering

Document Flow Chart, Decision Table, Decision Tree, Introduction to non-traditional Requirements.

Unit-3: Software Design and Structured Design

CO3 10L

Software Design

Goals of good software design, Design strategies and methodologies, Data oriented software design.

Structured Design

Structure chart, Coupling, Cohesion, Modular structure, Packaging, Object oriented design, Top-down and bottom-up approach, Design patterns.

Structured Analysis

DFD, Data Dictionary, Software Measurement and Metrics: Various Size Oriented Measures: Halstead's software science, Function Point (FP) based measures, Cyclomatic Complexity Measures: Control flow graphs Development: Selecting a language, Coding guidelines, Writing code, Code documentation.

Unit-4: Software Testing

CO4 12L

Software Testing

Testing process, Design of test cases, Functional Testing: Boundary value analysis, Equivalence class testing, Decision table testing, Cause effect graphing, Structural testing, Path testing, Data flow and mutation testing, Unit testing, Integration and system testing, Debugging, Alpha & beta testing, testing tools & standards.

Unit-5: Software Maintenance

CO5 10L

Software Maintenance

Management of maintenance, Maintenance process, Maintenance models, Regression testing, Reverse engineering, Software reengineering, Configuration management, documentation.

.

Textbook(s)

1. Software Engineering: A Practitioner's Approach, Roger S. Pressman, 9th ed, Mc Graw Hill Sept 2019.

Reference book(s)

1. Software Engineering K. K. Aggarwal, Yogesh Singh, New Age International Publishers, Third Edition, 2007.
2. Software Engineering, Ian Sommerville, Addison Welsley, 9th Edition, 2010.
3. An Integrated Approach to Software Engineering, PankajJalote, Narosa Publishing House, 3rd Edition, 2007.

Web reference(s)

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2. <https://nptelvideos.com/course.php?id=444>
3. <https://softengbook.org/>
4. <https://www.coursera.org/learn/introduction-to-software-engineering?msockid=39a584c9c8ac6773281697f5c91e6633>

Regulation GE24	GIET Engineering College (Autonomous)	I-II MCA			
Course Code 24MC205	Artificial Intelligence	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

- To learn the basic State space representation. Intelligent Systems Categorization of Intelligent concepts and techniques of AI and machine learning
- To explore the various mechanisms of Knowledge and Reasoning used for building an expert system.
- To become familiar with supervised and unsupervised learning models
- To design and develop AI and machine learning solutions using modern tools.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Understand the fundamental concepts in Artificial Intelligence.
CO2	Analyze the applications of search strategies and problem reductions.
CO3	Apply the mathematical logic concepts.
CO4	Develop the Knowledge representations in Artificial Intelligence.
CO5	Explain the Expert System and Fuzzy logic systems.

Unit-1: Introduction to AI

CO1 8L

Introduction to AI

Definition, Problem, System, Components of AI Program, Foundations of AI, Applications of AI, Current trends in AI, Intelligent Agents: Anatomy, structure, Types.

Unit-2: Problem solving

CO2 12L

Problem solving

Solving problems by Searching: Problem Solving Agent, Formulating Problems. Uninformed Search Methods: Breadth First Search (BFS), Depth First Search (DFS), Depth First Iterative Deepening (DFID), Informed Search Methods-Greedy best first Search, A* Search, Memory bounded heuristic Search. Local Search Algorithms and Optimization Problems- Hill climbing search Simulated annealing and local beam search.

Unit-3: Knowledge and Reasoning, First Order Logic

CO3 10L

Knowledge and Reasoning

Knowledge based Agents, The Wumpus World, and Propositional logic.

First Order Logic

Syntax and Semantic, Inference in FOL, Forward chaining, backward Chaining, Knowledge Engineering in First-Order Logic, Unification and Resolution.

Unit-4: Agents**CO4 10L****Agents**

Definition of agents, Agent architectures (e.g., reactive, layered, cognitive), Multi. agent systems- Collaborating agents, Competitive agents Swarm Systems and biologically inspired models. Expert Systems: Representing and Using Domain Knowledge, Expert System Shells, Explanation, Knowledge Acquisition.

Unit-5: Expert Systems**CO5 13L****Expert Systems**

Architecture of expert systems, Roles of expert systems, Knowledge Acquisition, Meta knowledge, Heuristics. Expert systems- MYCIN, DART, XOON, Expert systems shells.

Textbook(s)

1. Artificial Intelligence, Sarojkaushik, Cengage Learning India, 2011.
2. Artificial Intelligence and Machine Learning, Vinod Chandra S.S., Anand Hareendran S.
3. Stuart J. Russell and Peter Norvig, "Artificial Intelligence: A Modern Approach" 2nd Edition, Pearson.

Reference book(s)

1. Ivan Bratko "PROLOG Programming for Artificial Intelligence", Pearson Education, Third Edition
2. Elaine Rich and Kevin Knight "Artificial Intelligence ", Third Edition
3. Han Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann Publishers
4. G. Luger, W. A. Stubblefield, "Artificial Intelligence", Third Edition, AddisonWesley Longman, 1998

Web reference(s)

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2. <https://openlearning.mit.edu/news/explore-world-artificial-intelligence-online-courses-mit>
3. <https://cse.iitk.ac.in/users/cs365/2015/resources.html>
4. <https://microsoft.github.io/AI-For-Beginners/>
5. <https://artint.info/3e/resources/index.html>
6. <https://web.dev/explore/ai>

Regulation GE24	G IET Engineering College (Autonomous)	I-II MCA			
Course Code 24MC26A	Design and Analysis of Algorithms	L	T	P	C
Prerequisites	Basic knowledge of mathematics concepts and Data structures (DSA).	3	0	0	3

Course Objectives

- To analyze the asymptotic performance of algorithms.
- To understand and write rigorous correctness proofs for algorithms.
- To familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Synthesize efficient algorithms in common engineering design situations.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Describe asymptotic notation used for denoting performance of algorithms.
CO2	Analyze the performance of a given algorithm and denote its time complexity using the asymptotic notation for recursive and non-recursive algorithms.
CO3	List and describe various algorithmic approaches.
CO4	Solve problems using divide and conquer, greedy, dynamic programming, backtracking and branch and bound algorithmic approaches.
CO5	Apply graph search algorithms to real world problems, Demonstrate an understanding of NP- Completeness theory and lower bound theory.

Unit-1: Introduction

CO1 10L

Introduction

Algorithm, Pseudo code for expressing algorithms, performance Analysis-Space complexity, Time complexity, Asymptotic Notation- Big oh notation, Omega notation, Theta notation and Little oh notation, probabilistic analysis, Amortized analysis. Disjoint Sets- disjoint set operations, union and find algorithms, spanning trees, connected components and bi- connected components.

Unit-2: Divide and conquer

CO2 11L

Divide and conquer

General method, applications-Binary search, Quick sort, Merge sort, Stassen's matrix multiplication. Greedy method: General method, applications-Job sequencing with deadlines, 0/1 knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

Unit-3: Dynamic Programming

CO3 12L

Dynamic Programming

General method, applications-Matrix chain multiplication, Optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem, Reliability design.

Unit-4: Backtracking**CO4 8L****Backtracking**

General method, applications-n-queen problem, sum of subsets problem, graph colouring, Hamiltonian cycles.

Unit-5: Branch and Bound**CO5 10L****Branch and Bound**

General method, applications - Travelling sales person problem, 0/1 knapsack problem- LC Branch and Bound solution, FIFO Branch and Bound solution. NP-Hard and NP-Complete problems: Basic concepts, non deterministic algorithms, NP - Hard and NP Complete classes, Cook's theorem.

Textbook(s)

1. Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahni and Rajasekharam, Universities Press.
2. The Algorithm Design Manual, 2nd edition, Steven S. Skiena, Springer.
3. Introduction to Algorithms, second edition, T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein, PHI Pvt. Ltd.

Reference book(s)

1. Introduction to the Design and Analysis of Algorithms, AnanyLevitin, PEA.
2. Design and Analysis of Algorithms, Pearson Education, Parag Himanshu Dave, Himansu Balachandra Dave.
3. Introduction to Design and Analysis of Algorithms A strategic approach, R.C.T. Lee, S.S.Tseng, R.C.Chang and T.Tsai, Mc GrawHill.
4. Design and Analysis of algorithms, Pearson education, Aho, Ullman and Hopcroft.

Web reference(s)

1. <https://nptel.ac.in/courses/106106131>
2. <http://openclassroom.stanford.edu/MainFolder/CoursePage.php?course=IntroToAlgorithms>
3. <https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/resources/lecture-notes/>
4. <https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/resources/lecture-notes/>
5. <https://aofa.cs.princeton.edu/home/>

Regulation GE24	GJET Engineering College (Autonomous)	I-II MCA			
Course Code 24MC26B	ADVANCED UNIX PROGRAMMING	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

The objectives of this course are to

- To understand the fundamental design of the Unix Programming
- To become fluent with the systems calls provided in the Unix environment
- To be able to design and build an application/service over the unix Operating System.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Install and configure Android application development tools.
CO2	Design and develop user Interfaces for the Android platform.
CO3	Save state information across important operating system events.
CO4	Apply Java programming concepts to Android application development.
CO5	Understand how to integrate third-party APIs and services into mobile applications, including handling network requests and managing data.

Unit-1: Review of Unix Utilities and Shell Programming

CO1 12L

Review of Unix Utilities

File handling utilities, security by file permissions, process utilities, disk utilities, networking commands, backup utilities, text processing utilities.

Shell Programming

shell, shell responsibilities, pipes and input redirection, output redirection, here documents, the shell as a programming language, shell metacharacters, shell variables, shell commands, the environment, control structures, shell script examples.

Unit-2: Unix Files and Directory handling system calls

CO2 10L

Unix Files

Unix file structure, directories, files and devices, System calls, library functions, low level file access, usage of open, create, read, write, close, lseek, stat, fstat, octl, umask, dup, dup2, Differences between system call and library functions. File and directory maintenance: chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd.

Directory handling system calls

opendir, readdir, closedir, rewinddir, seekdir, telldir.

Unit-3: Unix Process and Signals**CO3 15L****Unix Process**

Threads and Signals: process, process structure, starting new process, waiting for a process, zombie process, orphan process, process control, process identifiers, system call interface for process management, - fork, vfork, exit, wait, waitpid, exec, system.

Signals

Signal functions, unreliable signals, interrupted system calls, kill and raise functions, alarm, pause functions, abort, sleep functions.

Unit-4: Inter process Communication, Message Queues & Semaphores CO4 10L**Inter process Communication**

Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pipes, FIFOs, message queues, semaphores and shared memory. Differences between pipes and FIFOs. Implementing a client server program using pipes and FIFOs.

Message Queues

IPC, permission issues, Access permission modes, message structure, working with mess client/server example.

Semaphores

Creating semaphore sets, Unix kernel support for semaphores, Unix APIs for semaphores, file locking using semaphores.

Unit-5: Shared Memory and Sockets**CO5 10L****Shared Memory**

Working with shared memory segments, Unix kernel support for shared memory, client/server example.

Sockets

Berkeley sockets, socket structure, socket system calls for connection-oriented protocol and connectionless protocol, implementing client server programs using TCP and UDP Sockets.

Textbook(s)

1. Advanced programming in the unix environment, w- Richard Stevens, 2nd Edition Pearson education.
2. Unix Concepts and applications, 3/e, Sumitabha Das, TMH.

Reference book(s)

1. Unix and shell Programming, Sumitabha Das, TMH.
2. A Beginner's Guide to Unix, N. P. Gopalan, B. Siva Selva, PHI.
3. Unix Shell Programming, Stephen G. Kochan, Patrick Wood.
4. Unix Shell Programming, Lowell Jay Arthus & Ted Burns, 3/e, Gal Gotia.

Web reference(s)

1. <https://archive.nptel.ac.in/courses/117/106/117106113/>
2. <https://stevens.netmeister.org/631/>
3. <https://www.cs.fsu.edu/~asriniva/courses/aup02/lectures.html>

Regulation GE24	G I E T Engineering College (Autonomous)	I-II MCA			
Course Code 24MC26C	Data Warehousing and Data Mining	L	T	P	C
Prerequisites	Programming Language, Operating System and Database Knowledge.	3	0	0	3

Course Objectives

- Be familiar with mathematical foundations of data mining tools.
- Understand and implement classical models and algorithms in data warehouses and data mining.
- Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
- Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Understand the basics of types of data, quality of data, suitable techniques required for pre-processing and measures required to perform data analysis.
CO2	Describe the need of classification, identify suitable technique(s) to perform classification, model building and evaluation.
CO3	Identify the requirements and usage of association rule mining on categorical and continuous data.
CO4	Compare and Identify suitable clustering algorithm(s) (apply with open source tools), interpret, evaluate and report the result.
CO5	Describe the requirements and the need of web mining.

Unit-1: Introduction

CO1 8L

Introduction

Introduction to Data mining, types of Data, Data Quality, Data Processing, Measures of Similarity and Dissimilarity, Exploring Data: Data Set, Summary Statistics, Visualization, Data Warehouse, OLAP and multi dimensional data analysis.

Unit-2: Classification of Problems

CO2 10L

Classification

Basic Concepts, Decision Trees and model evaluation: General approach for solving a classification problem, Decision Tree induction, Model over fitting: due to presence of noise, due to lack of representation samples, Evaluating the performance of classifier. Nearest Neighbourhood classifier, Bayesian Classifier, Support vector Machines: Linear SVM, Separable and Non-Separable case.

Unit-3: Association Analysis**CO3 10L****Association Analysis**

Problem Definition, Frequent Item-set generation, rule generation, compact representation of frequent item sets, FP-Growth Algorithms. Handling Categorical, Continuous attributes, Concept hierarchy, Sequential, Sub graph patterns.

Unit-4: Clustering**CO4 12L****Clustering**

Over view, K-means, Agglomerative Hierarchical clustering, DBSCAN, Cluster evaluation: overview, Unsupervised Cluster Evaluation using cohesion and separation, using proximity matrix, Scalable Clustering algorithm.

Unit-5: Web data mining**CO5 10L****Web data mining**

Introduction, Web terminology and characteristics, Web content mining, Web usage mining, web structure mining, Search Engines: Characteristics, Functionality, Architecture, Ranking of WebPages, Enterprise search.

Textbook(s)

1. Introduction to Data Mining, Tan, Steinbach and Vipin Kumar, Pearson Education, 2016
2. Data Mining: Concepts and Techniques, 2nd Edition, Jiawei Han and Micheline Kamber, ELSEVIER.
3. Data Mining, Vikram Pudi and P. Radha Krishna, Oxford University Press.

Reference book(s)

1. Data Mining: The Textbook, Springer, May 2015, Charu C. Aggarwal.

Web reference(s)

1. <https://nptel.ac.in/courses/106/105/106105174/>
2. https://www.saedsayad.com/data_mining.htm
3. <https://ocw.mit.edu/courses/15-062-data-mining-spring-2003/pages/lecture-notes/>
4. <https://www2.cs.uh.edu/~arjun/courses/dm/>
5. <https://www.rdatamining.com/resources/online-documents-books-and-tutorials>
6. https://dataminingbook.info/book_html/

Regulation GE24	G I E T Engineering College (Autonomous)	I-II MCA			
Course Code 24MC207	Object Oriented Programming Using Java Lab	L	T	P	C
Prerequisites	Basic Programming Concepts, Understanding of Java, OOP Principles & Concepts.	0	0	3	1.5

Course Objectives

- To understand how to design, implement, test, debug, and document programs that use basic datatypes and computation, simple I/O, conditional and control structures, string handling and functions.
- To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
- Discuss the principles of inheritance, interface and packages and demonstrate through problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
- To understand importance of Multithreading & different exception handling mechanisms.
- To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.
- To understand Java Swings for designing GUI applications based on MVC architecture.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Apply OOP concepts to solve real world problems.
CO2	Implement different forms of inheritance.
CO3	Create packages and to reuse them.
CO4	Implement multi-threaded programs using synchronization concepts.
CO5	Create user defined exceptions.
CO6	Design GUI applications using AWT and SWINGS.

List of Experiment(s)

1. The Fibonacci sequence is defined by the following rule. The first 2 values in the sequence are 1, 1. Every subsequent value is the sum of the 2 values preceding it. Write a Java Program that uses both recursive and non-recursive functions to print the nth value of the Fibonacci sequence.
2. Write a Java Program that prompts the user for an integer and then prints out all the prime numbers up to that Integer.
3. Write a Java Program that checks whether a given string is a palindrome or not. Ex. MALAYALAM is a palindrome.
4. Write a Java Program for sorting a given list of names in ascending order.
5. Write a Java Program that illustrates how runtime polymorphism is achieved.
6. Write a Java Program to create and demonstrate packages.
7. Write a Java Program, using String Tokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.

8. Write a Java Program that reads on file name form the user then displays information about whether the file exists, whether the file is readable/ writable, the type of file and the length of the file in bytes and display the content of the using File Input Stream class.
9. Write a Java Program that displays the number of characters, lines and words in a text/text file.
10. Write a Java Program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +-*?% operations. Add a text field to display the result.
11. Write a Java Program for handling mouse events.
12. Write a Java Program demonstrating the life cycle of a thread.
13. Write a Java Program that lets users create Pie charts. Design your own user interface (with Swings& AWT).
14. Write a Java Program to implement a Queue, using user defined Exception Handling (also make use of throw, throws).

Reference(s)

1. Core Java 2, Vol 1(Vol 2) Fundamentals (Advanced), 7/e, Cay.S.Horstmann, Gary Cornell, Pearson.
2. JAVA& Object Orientation an Introduction, 2/e, John Hunt, Springer.

Web Resource(s)

1. <https://www.iitk.ac.in/esc101/05Aug/tutorial/information/resources.html>
2. <https://labex.io/skilltrees/java>
3. <https://docs.oracle.com/javase/tutorial/index.html>
4. <https://introcs.cs.princeton.edu/java/home/>

Regulation GE24	G IET Engineering College (Autonomous)	I-II MCA			
Course Code 24MC208	NETWORKS AND SECURITY LAB	L	T	P	C
Prerequisites	Nil	0	0	3	1.5

Course Objectives

- To learn basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
- To understand and implement encryption and decryption using Caesar Cipher, Substitution Cipher, Hill Cipher.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Explain the network architecture, TCP/IP and OSI reference models
CO2	Identify and understand various techniques and modes of transmission
CO3	Demonstrate the data link protocols, multi-channel access protocols and IEEE 802 standards for LAN
CO4	Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme
CO5	Describe routing and congestion in network layer with routing algorithms and classify IPV4 addressing scheme
CO6	Discuss the elements and protocols of transport layer

List of Experiment(s)

1. Implement the data link layer framing methods such as character stuffing and bit stuffing
2. Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 and CRC CCIP.
3. Implement Dijkstra's algorithm to compute the Shortest path through a graph.
4. Take an example subnet graph with weights indicating delay between nodes. Now obtain.
5. Routing table at each node using distance vector routing algorithm.
6. Take an example subnet of hosts. Obtain broadcast tree for it.
7. Write a C program that contains a string (char pointer) with a value 'Hello World'. The program should XOR each character in this string with 0 and display the result.
8. Write a C program that contains a string (char pointer) with a value 'Hello World'. The program should AND or and XOR each character in this string with 127 and display the result. Write a programme to create an integer variable using shared memory concept and increment the variable.
9. Write a Java program to perform encryption and decryption using the following algorithms:
 - a) Caesar Cipher
 - b) Substitution Cipher
 - c) Hill Cipher Design
10. Write a Java program to implement the DES algorithm logic.

11. Write a C/JAVA program to implement the Blow Fish algorithm Logic.
12. Write a C/JAVA program to implement the Rijndael algorithm logic.
13. Using Java Cryptography, encrypt the text "Hello world" Blow Fish.
14. Create your own key using Java key tool.
15. Write a Java program to implement RSA Algorithm.
16. Write a Java program to implement Public key Algorithm like El Gamal.
17. Implement the Diffie-Hellman Key Exchange mechanism using HTML.

Reference(s)

1. An Engineering approach to compute networking, Kesha, Pearson
2. Computer Networks – A System Approach, Peterson, Bruce Davie, 2/e, Harcourt Asia.

Web reference(s)

1. <https://csrc.nist.gov/publications/nistpubs/800-12/800-12-html/chapter19.html>
2. <http://vlabs.iitkgp.ac.in/ant/>
3. <https://networklessons.com/labs/network-fundamentals-lab-1>
4. <https://elearn.daffodilvarsity.edu.bd/course/view.php?id=10230>
5. <https://www.cybrary.it/practice-lab/cryptography-basics>
6. <https://www.infosecinstitute.com/resources/cryptography/cryptographic-algorithms-lab/>

Regulation GE24	GJET Engineering College (Autonomous)	I-II MCA			
Course Code 24MC209	Employability Skills - I	L	T	P	C
Prerequisites	Nil	1	0	0	0

Course Objectives

The objectives of this course are to

- To learn how to make effective presentations and impressive interviews
- To learn skills for discussing and resolving problems on the work site
- To assess and improve personal grooming
- To promote safety awareness including rules and procedures on the work site
- To develop and practice self-management skills for the work site.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Recite the soft skills
CO2	Make presentations effectively with appropriate body language
CO3	Be composed with positive attitude
CO4	Apply their core competencies to succeed in professional and personal life
CO5	Outside of class, students will also be gathering the requirements, identifying the challenges, usability, importance etc

Unit-1: Analytical Thinking & Listening Skills and Communication Skills CO1 12L

Analytical Thinking & Listening Skills

Self-Introduction, Shaping Young Minds

A Talk by AzimPremji (Listening Activity), Self – Analysis, Developing Positive Attitude, Perception.

Communication Skills

Verbal Communication; Non-Verbal Communication (Body Language).

Unit-2: Self-Management Skills and Etiquette CO2 10L

Self-Management Skills

Anger Management, Stress Management, Time Management, Six Thinking Hats, Team Building, Leadership Qualities.

Etiquette

Social Etiquette, Business Etiquette, Telephone Etiquette, Dining Etiquette

Unit-3: Standard Operation Methods and Verbal Ability CO3 10L

Standard Operation Methods

Note Making, Note Taking, Minutes Preparation, Email & Letter Writing.

Verbal Ability

Synonyms, Antonyms, One Word Substitutes-Correction of Sentences-Analogies,

Spotting Errors, Sentence Completion, Course of Action

Unit-4: Job-Oriented Skills –I

CO4 8L

Job-Oriented Skills –I: Group Discussion, Mock Group Discussions

Unit-5: Job-Oriented Skills –II

CO5 8L

Job-Oriented Skills –II

Resume Preparation, Interview Skills, Mock Interviews.

Textbook(s)

1. Barun K. Mitra, Personality Development and Soft Skills, Oxford University Press, 2011.
2. S.P. Dhanavel, English and Soft Skills, Orient Blackswan, 2010.
3. R.S.Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand & Company Ltd., 2018.
4. Raman, Meenakshi & Sharma, Sangeeta, Technical Communication Principles and Practice, Oxford University Press, 2011.
5. Managing Soft Skills for Personality Development – edited by B.N.Ghosh, McGraw Hill India, 2012.
6. English and Soft Skills – S.P.Dhanavel, Orient Blackswan India, 2010.

Reference book(s)

1. Core Java 2, Vol 1 (Vol 2) Fundamentals (Advanced), 7/e, Cay.S.Horstmann, Gary Cornell pearson
2. Big Java2, 3/e, Cay.S. Horstmann, Wiley
3. Object Oriented Programming through Java, P.Radha Krishna, University Press
4. JAVA& Object Orientation an Introduction, 2/e, John Hunt, Springer
5. Introduction to JAVA Programming, 7/e, Y. Daniel Liang, Pearson. , TMH

Web reference(s)

1. <http://www.Indiabix.com>
2. <http://www.freshersworld.com>

MCA COURSE STRUCTURE – GE24

(Applicable from the Academic Year 2024-25 onwards)

MCA II Year I Semester

S.No	Course Code	Category	Title	L	T	P	Credits
1	24MC301	PC	Machine Learning using Python	3	0	0	3
2	24MC302	PC	Full Stack Development	3	0	0	3
3	24MC303	PC	Big Data Technologies	3	0	0	3
4	24MC304	PE	Program Elective-2 A. Cloud Computing B. Image Processing C. Internet of Things D. MOOCS-2(NPTEL /SWAYAM) Recommended 12 week course with 3 credits.	3	0	0	3
5	24MC305	BS&H	Human Resource Management	3	0	0	3
6	24MC306	PC	Full Stack Development Lab	0	0	3	1.5
7	24MC307	PC	Machine Learning with Python Lab	0	0	4	2
8	24MC308	PC	Big Data Technologies Lab	0	0	3	1.5
9	24MC309	AC	Employability Skills–2 [§]	1	0	0	0
10	24MC310	MC	Internship/Industry Oriented Mini Project [#]	0	0	0	2
Total				16	0	10	22

[§]Internal Evaluation

[#]This can be done during semester break and evaluated at the end of 3rd Sem.

MCA II Year II Semester

S.No	Course Code	Category	Title	L/D	T	P	Credits
1.	24MC401	PE	Program Elective-3 A. Unified Modeling Language B. Blockchain Technologies C. Advanced UNIX Programming D. MOOCS-3(NPTEL /SWAYAM) Recommended 12 week course with 3 credits.	3	0	0	3
2.	24MC402	PE	Program Elective-4 A. Mobile Adhoc Networks B. Quantum Computing C. Agile Methodologies D. MOOCS-3(NPTEL /SWAYAM) Recommended 12 week course with 3 credits.	3	0	0	3
3.	24MC403		Project Work/Dissertation	0	0	0	10
Total				6	0	0	16

*Students going for Industrial Project/ Thesis will complete these courses through MOOCs (or even in earlier semester)

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC301	MACHINE LEARNING USING PYTHON	L	T	P	C
Prerequisites	Basic Programming Skills, Mathematics Fundamentals	3	0	0	3

Course Objectives

The objectives of this course are to

- Learn patterns and concepts from data without being explicitly programmed in various IOT nodes.
- Design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
- Explore supervised and unsupervised learning paradigms of machine learning.
- Explore Deep learning technique and various feature extraction strategies.

Course Outcomes

At the end of the course, learners will be able to

CO1	Understand ML basics and Python libraries setup.
CO2	Apply supervised learning algorithms for classification and regression.
CO3	Perform unsupervised learning, clustering, and dimensionality reduction.
CO4	Engineer features and build optimized ML pipelines.
CO5	Analyze text data and implement NLP applications.

Unit-1:

CO1 12L

Introduction to Machine Learning with Python:

Introduction to Machine Learning, basic terminology, Types of Machine Learning and Applications, Using Python for Machine Learning: Installing Python and packages from the Python Package Index, Introduction to NumPy, SciPy, matplotlib and scikit-learn, Tiny application of Machine Learning.

Unit-2:

CO2 10L

Supervised Learning:

Types of Supervised Learning, Supervised Machine Learning Algorithms: k-Nearest Neighbors, Linear Models, Naive Bayes Classifiers, Decision Trees, Ensembles of Decision Trees, Kernelized Support Vector Machines, Uncertainty Estimates from Classifiers.

Unit-3:**CO3 10L****Unsupervised Learning:**

Types of Unsupervised Learning, challenges, Preprocessing and scaling, Dimensionality Reduction, Feature Extraction, Manifold Learning, Clustering: K Means Clustering, Agglomerative Clustering, DBSCAN, Comparing and Evaluating Clustering Algorithms.

Unit-4:**CO4 10L****Representing Data and Engineering Features:**

Categorical Variables, Binning, Discretization, Linear Models, Trees, Interactions and Polynomials, Univariate Nonlinear Transformations, Automatic Feature Selection. Parameter Selection with Preprocessing, Building Pipelines, The General Pipeline Interface

Unit-5:**CO5 12L****Working with Text Data (Data Visualization):**

Types of Data Represented as Strings, Example Application: Sentiment Analysis of Movie Reviews, Representing Text Data as a Bag of Words, Stop Words, Rescaling the Data with tf-idf, Investigating Model Coefficients, Approaching a Machine Learning Problem, Testing Production Systems, Ranking, Recommender Systems and Other kinds of Learning.

Textbook(s)

1. Introduction to Machine Learning with Python: A Guide for Data Scientists, Andreas C. Muller & Sarah Guido, O'Reilly Publications, 2019.
2. Python Machine Learning, Sebastian Raschka & Vahid Mirjalili, 3rd Edition, 2019.
3. Building Machine Learning Systems with Python, Luis Pedro Coelho, Willi Richert, 2nd Edition, 2015.

Reference book(s)

1. Machine Learning, Tom M. Mitchell, Mc Graw-Hill Publication, 2017

Web reference(s)

1. https://matplotlib.org/stable/contents.html?utm_source=chatgpt.com
2. https://scikit-learn.org/stable/supervised_learning.html?
3. <https://scikit-learn.org/stable/modules/clustering.html?>
4. https://scikit-learn.org/stable/modules/compose.html?utm_source=chatgpt.com#pipeline
5. <https://www.kaggle.com/code/ryanholbrook/sentiment-analysis-with-python>

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC302	FULL STACK DEVELOPMENT	L	T	P	C
Prerequisites	Basic programming knowledge, Fundamentals of HTML & CSS and Introduction to Databases & SQL.	3	0	0	3

Course Objectives

The objectives of this course are to

- provide understanding on the essential javascript, bootstrap, ReactJS concepts for web development and to store and model data in a no sql database.

Course Outcomes

At the end of the course, learners will be able to

CO1	Apply JavaScript fundamentals for interactive web programming.
CO2	Manipulate DOM and handle events in web pages.
CO3	Build React components and validate forms using MERN.
CO4	Manage React state and integrate APIs with applications.
CO5	Perform MongoDB CRUD and optimize apps using Webpack.

Unit-1:

CO1 10L

Basic JavaScript Instructions, Statements, Comments, Variables, Data Types, Arrays, Strings, Functions, Methods & Objects, Decisions & Loops.

Unit-2:

CO2 10L

Document Object Model: DOM Manipulation, Selecting Elements, Working with DOM Nodes, Updating Element Content & Attributes, Events, Different Types of Events, How to Bind an Event to an Element, Event Delegation, Event Listeners.

Unit-3:

CO3 12L

Form enhancement and validation. Introduction to MERN: MERN components, Server less Hello world. React Components: Issue Tracker, React Classes, Composing Components, Passing Data Using Properties, Passing Data Using Children, Dynamic Composition.

Unit-4:

CO4 15L

React State: Initial State, Async State Initialization, Updating State, Lifting State Up, Event Handling, Stateless Components, Designing Components, State vs. Props, Component Hierarchy, Communication, Stateless Components. Express, REST API, GraphQL, Field Specification, Graph Based, Single Endpoint, Strongly Typed, Introspection, Libraries, The About API GraphQL Schema File, The List API, List API Integration, Custom Scalar types, The Create API, Create API Integration, Query Variables, Input Validations, Displaying Errors.

Unit-5:**CO5 12L**

MongoDB: Basics, Documents, Collections, Databases, Query Language, Installation, The Mongo Shell, MongoDB CRUD Operations, Create, Read, Projection, Update, Delete, Aggregate, MongoDB Node.js Driver, Schema Initialization, Reading from MongoDB, Writing to MongoDB. Modularization and Webpack ,Back-End Modules Front-End Modules and Webpack Transform and Bundle, Libraries Bundle ,Hot Module Replacement, Debugging Define Plugin: Build Configuration, Production Optimization.

Textbook(s)

1. Jon Duckett, "JavaScript & jQuery: Interactive Front-End Web Development", Wiley, 2014.
2. Vasan Subramanian, Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node. Apress, 2019.

Reference book(s)

1. Marijn Haverbeke – Eloquent JavaScript: A Modern Introduction to Programming, No Starch Press.
2. Vasan Subramanian – Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node, Apress.
3. Shannon Bradshaw, Eoin Brazil, Kristina Chodorow – MongoDB: The Definitive Guide (3rd Edition), O'Reilly.

Web reference(s)

1. <https://github.com/vasansr/pro-mern-stack>
2. <https://nptel.ac.in/courses/106106156>
3. <https://archive.nptel.ac.in/courses/106/105/106105084/>

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC303	BIG DATA TECHNOLOGIES	L	T	P	C
Prerequisites	Basic Programming Knowledge, Understanding of Databases and Operating System & Networking Basics.	3	0	0	3

Course Objectives

The objectives of this course are to

- Implement Map Reduce programs for processing big data, realize storage and processing of big data using MongoDB, Pig, Hive and Spark and analyze big data using machine learning techniques.

Course Outcomes

At the end of the course, learners will be able to

CO1	Understand Big Data concepts, evolution, and analytics technologies including Hadoop and NoSQL.
CO2	Explain Hadoop architecture, HDFS, YARN, and develop basic MapReduce programs.
CO3	Demonstrate MongoDB fundamentals, data types, and query language for NoSQL databases.
CO4	Use Hive and Pig for big data querying and processing; understand event handling.
CO5	Apply Apache Spark for big data analysis and perform text, web mining, and analytics.

Unit-1:

CO1 10L

Classification of data, Characteristics, Evolution and definition of Big data, What is Big data, Why Big data, Traditional Business Intelligence Vs Big Data, Typical data warehouse and Hadoop environment. Big Data Analytics: What is Big data Analytics, Classification of Analytics, Importance of Big Data Analytics, Technologies used in Big data Environments, Few Top Analytical Tools , NoSQL, Hadoop.

Unit-2:

CO2 12L

Introduction to Hadoop:

Introducing hadoop, Why hadoop, Why not RDBMS, RDBMS Vs Hadoop, History of Hadoop, Hadoop overview, Use case of Hadoop, HDFS (Hadoop Distributed File System), Processing data with Hadoop, Managing resources and applications with Hadoop YARN(Yet Another Resource Negotiator). Introduction to Map Reduce Programming: Introduction, Mapper, Reducer, Combiner, Partitioner, Searching, Sorting, Compression.

Unit-3:**CO3 8L****Introduction to MongoDB:**

What is MongoDB, Why MongoDB, Terms used in RDBMS and MongoDB, Data Types in MongoDB, MongoDB Query Language.

Unit-4:**CO4 12L****Introduction to Hive:**

What is Hive, Hive Architecture, Hive data types, Hive file formats, Hive Query Language (HQL), RC File implementation, User Defined Function (UDF). Introduction to Pig: What is Pig, Anatomy of Pig, Pig on Hadoop, Pig Philosophy, Use case for Pig, Pig Latin Overview, Data types in Pig, Running Pig, Execution Modes of Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types, Piggy Bank, User Defined Function, Pig Vs Hive.

Unit-5:**CO5 10L****Spark and Big Data Analytics:**

Spark, Introduction to Data Analysis with Spark. Text, Web Content and Link Analytics: Introduction, Text Mining, Web Mining, Web Content and Web Usage Analytics, Page Rank, Structure of Web and Analyzing a Web Graph.

Textbook(s)

1. Seema Acharya, Subhashini Chellappan "Big data and Analytics" Wiley India Publishers, 2nd Edition, 2019.
2. Rajkamal, Preeti Saxena, "Big Data Analytics, Introduction to Hadoop, Spark and Machine Learning" , McGraw Hill Publication, 2019.

Reference book(s)

1. Adam Shook and Donald Mine, "MapReduce Design Patterns: Building Effective Algorithms and Analytics for Hadoop and Other Systems" - O'Reilly 2012.
2. Tom White, "Hadoop: The Definitive Guide" 4th Edition, O'reilly Media, 2015.
3. Thomas Erl, Wajid Khattak, and Paul Buhler, Big Data Fundamentals: Concepts, Drivers & Techniques, Pearson India Education Service Pvt. Ltd., 1st Edition, 2016.
4. John D. Kelleher, Brian Mac Namee, Aoife D'Arcy -Fundamentals of Machine Learning for Predictive Data Analytics: Algorithms, Worked Examples, MIT Press 2020, 2nd Edition

Web reference(s)

1. <https://www.kaggle.com/datasets/grouplens/movielens-20m-dataset>
2. <https://www.youtube.com/watch?v=bAyrObI7TYE&list=PLEiEAq2VkuUJqp1k>
3. <https://www.youtube.com/watch?v=VmO0QgPCbZY&list=PLEiEAq2VkuUJqp1kg5W>
4. <https://www.youtube.com/watch?v=GG-VRm6XnNk>
5. https://www.youtube.com/watch?v=JgIO2Nv_92A

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC304A	CLOUD COMPUTING	L	T	P	C
Prerequisites	Programming Skills, Operating Systems, Networking Basics and Basic Virtualization Concepts.	3	0	0	3

Course Objectives

The objectives of this course are to

- To explain the evolving computer model caned cloud computing.
- To introduce the various levels of services that can be achieved by cloud.
- To describe the security aspects in cloud.
- To motivate students to do programming and experiment with the various cloud computing environments.

Course Outcomes

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

CO1	Understand system models, clustering, virtualization, and cloud computing basics.
CO2	Explain virtualization concepts, tools, and resource management in data centers.
CO3	Describe cloud platform architectures, service models, and security mechanisms.
CO4	Develop cloud applications using major platforms and understand cloud storage systems.
CO5	Apply resource management and scheduling techniques in cloud environments.

Unit-1:

CO1 10L

Systems modeling, Clustering and virtualization:

Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing, Software environments for distributed systems and clouds, Performance, Security And Energy Efficiency.

Unit-2:

CO2 10L

Virtual Machines and Virtualization of Clusters and Data Centers:

Implementation Levels of Virtualization, Virtualization Structures/ Tools and mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization for Data Centre Automation.

Unit-3:

CO3 10L

Cloud Platform Architecture:

Cloud Computing and service Models, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Trust Management. Service Oriented Architecture, Message Oriented Middleware.

Unit-4:**CO4 12L****Cloud Programming and Software Environments:**

Features of Cloud and Grid Platforms, Parallel & Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.

Storage Systems:

Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., Apache Hadoop, BigTable, Megastore, Amazon Simple Storage Service(S3).

Unit-5:**CO5 12L****Cloud Resource Management and Scheduling :**

Policies and Mechanisms for Resource Management Applications of Control Theory to Task Scheduling on a Cloud, Stability of a Two Level Resource Allocation Architecture, Feedback Control Based on Dynamic Thresholds. Coordination of Specialized Autonomic Performance Managers, Resource Bundling, Scheduling Algorithms for Computing Clouds, Fair Queuing, Start Time Fair Queuing, Borrowed Virtual Time, Cloud Scheduling Subject to Deadlines, Scheduling MapReduce Applications Subject to Deadlines.

Textbook(s)

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
3. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madiseti, University Press

Reference book(s)

1. Cloud Computing: A Practical Approach. Anthony T.Velte. Toby J.VeFte, Robert Elsenpeter. Tata McGraw Hill. rp2011.
2. Enterprise Cloud Computing Gautam Shroif, Cambridge University Press. 2010.
3. Cloud Computing: Implementation, Management and Security, John W. Rittinouse, James F Ransome. CRC Press, rp2012.
4. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud. George Reese, O'Really SPD, rp2011.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Ktriaraswamy, Shahed Latif, O'Redç SPD, rp2011.

Web reference(s)

1. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-824-distributed-computer-systems-engineering-fall-2016/index.htm?utm_source=chatgpt.com
2. https://www.redhat.com/en/topics/virtualization?utm_source=chatgpt.com
3. https://aws.amazon.com/architecture/?utm_source=chatgpt.com
4. https://research.google/pubs/pub51/?utm_source=chatgpt.com

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC304B	IMAGE PROCESSING	L	T	P	C
Prerequisites	Digital Image Basics, Machine Learning Basics and Basic Signal Processing.	3	0	0	3

Course Objectives

The objectives of this course are to

- To comprehend the relation between human visual system and machine perception and processing of digital images.
- To provide a detailed approach towards image processing applications like enhancement, segmentation, and compression.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Understand image formation, coordinate systems, and camera models.
CO2	Apply image processing techniques for noise removal, blurring, and edge detection.
CO3	Perform image segmentation using various algorithms and models.
CO4	Utilize machine learning methods for vision tasks like classification and sequence learning.
CO5	Implement object tracking and recognition using advanced models and techniques.

Unit-1:

CO1 10L

Image Formation and Coordinate Transformations Camera Matrix, Motion, Stereo Pin-hole model, Human eye, cognitive aspects of colour, 3D space; illumination; Sampling and Quantization Coordinate transformations and camera parameters.

Unit-2:

CO2 10L

Image Processing - Noise Removal, Blurring, Edge Detection: Canny, Gaussian, Gabor, Texture Edges, Curvature, Corner Detection

Unit-3:

CO3 12L

Segmentation - Concept of Figure vs. Ground, Watershed, Change Detection, Background Subtraction, Texture Segmentation, Gaussian Mixture Models, Applications in Color, Motion based Image Segmentation, Background Modeling and Shape Clustering.

Unit-4**CO4 10L**

Machine Learning techniques in Vision, Bayesian Classification, Maximum Likelihood Methods, Neural Networks; Non-parametric models; Manifold estimation Support Vector Machines ; Temporal sequence learning.

Unit-5:**CO5 12L**

Introduction to Object Tracking, Exhaustive vs. Stochastic Search Shapes, Contours, Appearance Models. Mean-shift tracking; Contour-based models, Object Modeling and Recognition Fundamental matrix, Epipolar geometry Adaboost approaches: Face Detection, Recognition Large Datasets; Attention models.

Textbook(s)

1. David Forsyth and Jean Ponce, Computer Vision: A modern Approach, PHI.
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2008.

Reference book(s)

1. E.R. Davies, Machine Vision, Theory Algorithms Practicalities, Elsevier 2005.
2. Milan Sonka, Vaclav Hlavac, Roger Boyle, Image Processing, Analysis, and Machine Vision. Brooks, Cole, Thomson 1999
3. Russell, Norvig: AI: A modern Approach, Prentice Hall 2000.
4. Richard Hartley, Andrew Zisserman, Multiple View Geometry in Computer Vision, Cambridge Univ Press 2000
5. Richard O. Duda, Peter E. Hart, David G. Stork, Pattern Classification, 2nd ed., Wiley Asia, 2002

Web reference(s)

1. http://cs231n.stanford.edu/?utm_source=chatgpt.com
2. https://www.geeksforgeeks.org/edge-detection-methods-in-image-processing/?utm_source=chatgpt.com
3. https://docs.opencv.org/4.x/d3/db4/tutorial_py_watershed.html?utm_source=chatgpt.com
4. https://www.deeplearning.ai/?utm_source=chatgpt.com
5. https://ieeexplore.ieee.org/document/995967?utm_source=chatgpt.com

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC304C	INTERNET OF THINGS	L	T	P	C
Prerequisites	Basic Networking Concepts, Programming Fundamentals, Computer Architecture and Cloud Computing Basics.	3	0	0	3

Course Objectives

The objectives of this course are to

- Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.
- Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).
- Design and carry out an empirical evaluation of different algorithms on problem formalization, and state the conclusions that the evaluation supports.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Explain IoT concepts, technologies, and communication protocols.
CO2	Understand business models, system layers, and standards in IoT/M2M.
CO3	Apply web and message communication protocols for connected devices.
CO4	Manage data acquisition, organization, and analytics in IoT systems.
CO5	Utilize cloud platforms for IoT data storage, processing, and services.

Unit-1:

CO1 10L

The Internet of Things:

An Overview of Internet of things, Internet of Things Technology, behind IoT Sources of the IoTs, M2M Communication, Examples of IoTs, Design Principles For Connected Devices Internet Connectivity Principles, Internet connectivity, Application Layer Protocols: HTTP, HTTPS, FTP, Telnet.

Unit-2:

CO2 12L

Business Models for Business Processes in the Internet of Things, IoT/M2M systems LAYERS AND designs standardizations ,Modified OSI Stack for the IoT/M2M Systems, ETSI M2M domains and High-level capabilities, Communication Technologies, Data Enrichment and Consolidation and Device Management Gateway Ease of designing and affordability.

Unit-3:

CO3 10L

Design Principles for the Web Connectivity for connected-Devices, Web Communication

protocols for Connected Devices, Message Communication protocols for Connected Devices, Web Connectivity for connected-Devices.

Unit-4:

CO4 10L

Data Acquiring, Organizing and Analytics in IoT/M2M, Applications /Services / Business Processes, IOT/M2M Data Acquiring and Storage, Business Models for Business Processes in the Internet of Things, Organizing Data, Transactions, Business Processes, Integration and Enterprise Systems.

Unit-5:

CO5 10L

Data Collection, Storage and Computing Using a Cloud Platform for IoT/M2M Applications/Services, Data Collection, Storage and Computing Using cloud platform Everything as a service and Cloud Service Models, IOT cloud-based services using the Xively

Textbook(s)

1. Internet of Things: Architecture, Design Principles and Applications, 1st ed, Rajkamal, McGraw Hill Higher Education, 2017.
2. Internet of Things, 1st ed, A.Bahgya and V.Madisetti, Univesity Press, 2014

Reference book(s)

1. Designing the Internet of Things, 1st ed, Adrian McEwen and Hakim Cassimally, Wiley, 2013.
2. Getting Started with the Internet of Things, 1st ed, CunoPfister, Oreilly, 2011.

Web reference(s)

1. https://learn.microsoft.com/en-us/azure/iot-fundamentals/iot-protocols?utm_source=chatgpt.com
2. https://www.iotforall.com/iot-business-models?utm_source=chatgpt.com
3. https://developer.mozilla.org/en-US/docs/Web/HTTP/Overview?utm_source=chatgpt.com
4. https://www.ibm.com/cloud/learn/iot-data-analytics?utm_source=chatgpt.com
5. https://aws.amazon.com/iot-core/?utm_source=chatgpt.com

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC305	HUMAN RESOURCE MANAGEMENT	L	T	P	C
Prerequisites	Basic Management Principles, Communication Skills, Basic Economics and Business Environment and Organizational Behavior.	3	0	0	3

Course Objectives

The objectives of this course are to

- Contribute to the development, implementation, and evaluation of employee recruitment, selection, and retention plans and processes.
- Administer and contribute to the design and evaluation of the performance management program.
- Develop, implement, and evaluate employee orientation, training, and development programs.
- Facilitate and support effective employee and labour relations in both non-union and union environments.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Understand HRM fundamentals, ethics, policies, and global challenges.
CO2	Apply HR planning, recruitment, selection, training, and development techniques.
CO3	Analyze wage administration, job design, and welfare management concepts.
CO4	Evaluate performance appraisal methods and compensation strategies.
CO5	Manage industrial relations, labor laws, safety, and workplace stress.

Unit-1:

CO1 12L

HRM:

Significance, Definition and Functions, evolution of HRM, Principles, Ethical Aspects of HRM, HR policies, Strategies to increase firm performance, Role and position of HR department, aligning HR strategy with organizational strategy, HRM at global perspective challenges, cross-cultural problems, emerging trends in HRM..

Unit-2:

CO2 10L

Investment perspectives of HRM:

HR Planning, Demand and Supply forecasting, Recruitment and Selection, Sources of recruitment, Tests and Interview Techniques, Training and Development, Methods and techniques, Training evaluation, retention, Job Analysis, job description and specifications, Management development, HRD concepts.

Unit-3:

CO3 112L

Wage and Salary Administration:

Concept, Wage Structure, Wage and Salary Policies, Legal Frame Work, Determinants of Payment of Wages, Wage Differentials, Job design and Evaluation, Incentive Payment

Systems. Welfare management: Nature and concepts, statutory and non-statutory welfare measures, incentive mechanisms.

Unit-4:**CO4 10L****Performance Evaluation:**

Importance, Methods, Traditional and Modern methods, Latest trends in performance appraisal, Career Development and Counseling- Compensation, Concepts and Principles, Influencing Factors, Current Trends in Compensation, Methods of Payments, compensation mechanisms at international level.

Unit-5:**CO5 10L****Managing Industrial Relations:**

Trade Unions, Employee Participation Schemes, Collective Bargaining, Grievances and disputes resolution mechanisms, Safety at work, nature and importance, work hazards, safety mechanisms, Managing work place stress.

Textbook(s)

1. K Aswathappa: "Human Resource and Personnel Management", Tata McGraw Hill, New Delhi, 2013
2. N.Sambasiva Rao and Dr. Nirmal Kumar: "Human Resource Management and Industrial Relations", Himalaya Publishing House, Mumbai
3. Mathis, Jackson, Tripathy: "Human Resource Management: A South-Asian Perspective", Cengage Learning, New Delhi, 2013
4. Subba Rao P: "Personnel and Human Resource Management-Text and Cases", Himalaya Publications, Mumbai, 2013.
5. Madhurima Lall, Sakina Qasim Zaidi: "Human Resource Management", Excel Books, New Delhi, 2010

Reference book(s)

1. Human Resource Management, Gary Dessler, Pearson Publications.

Web reference(s)

1. https://www.cipd.co.uk/knowledge/fundamentals/people/hr/hr-management-factsheet?utm_source=chatgpt.com
2. https://www.hrhelpboard.com/hr-glossary/hr-planning.htm?utm_source=chatgpt.com
3. https://www.investopedia.com/terms/j/job-evaluation.asp?utm_source=chatgpt.com
4. https://www.hrstudycircle.com/compensation-management/?utm_source=chatgpt.com
5. https://www.osha.gov/workplace-safety?utm_source=chatgpt.com

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC309	EMPLOYABILITY SKILLS-2	L	T	P	C
Prerequisites	Basic Arithmetic Skills, Fundamentals of Algebra, Elementary Number Concepts, Basic Geometry and Logical Reasoning Basics.	1	0	0	0

Course Objectives

The objectives of this course are to

- The main objective of the course is to to develop a range of skills and attributes essential for success in the workplace

Course Outcomes

After completion of this course, the learners will be able to

CO1	Understand and solve problems on number systems, HCF, LCM, averages, ratios, and percentages.
CO2	Apply arithmetic concepts to solve problems on ages, time, work, pipes, time, distance, and trains.
CO3	Analyze and solve problems on interest, permutations, probability, calendar, and clocks.
CO4	Calculate geometric mensuration including areas and volumes.
CO5	Interpret and analyze data using tables, bar graphs, pie charts, and line graphs.

Unit-1:

CO1 8L

Numerical ability I:

Number system, HCF & LCM, Average, Simplification, Problems on numbers

Numerical ability II:

Ratio & Proportion, Partnership, Percentages, Profit & Loss

Unit-2:

CO2 10L

Arithmetical ability I:

Problems on ages, Time & Work, Pipes & Cistern, Chain Rule.

Arithmetical ability II:

Time & Distance, Problems on boats & Steams, Problems on Trains

Unit-3:

CO3 10L

Arithmetical ability III:

Allegation, Simple interest and compound interest, Races & Games of skills, Calendar and Clock,.

Logical ability:

Permutations and Combination and Probability.

Unit-4:

CO4 12L

Mensuration:

Geometry, Areas, Volumes.

Unit-5:

CO5 10L

Data interpretation:

Tabulation, Bar graphs, Pie charts, line graphs.

Textbook(s)

1. R. S. Aggarwal "Quantitative Aptitude", Revised ed., S Chand publication, 2017
ISBN:8121924987

Reference book(s)

1. Fast Track Objective Arthamatic, Rajesh Verma, Arihant Publications.

Web reference(s)

1. https://blog.feedspot.com/aptitude_youtube_channels/
2. https://www.tutorialspoint.com/quantitative_apititude/
3. <https://www.careerbless.com/aptitude/qa/home.php>

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC306	FULL STACK DEVELOPMENT LAB	L	T	P	C
Prerequisites	Nil	0	0	3	1.5

Course Objectives

- To understand the essential javascript concepts for web development. To style Web applications using bootstrap.
- To utilize React JS to build front end User Interface.
- To understand the usage of API's to create web applications using Express JS.
- To store and model data in a no sql database.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Write JavaScript code for arrays, strings, and object manipulation.
CO2	Build interactive web pages using DOM events and dynamic styling.
CO3	Develop React components managing state, props, and lifecycle hooks.
CO4	Create RESTful APIs with Express handling CRUD operations efficiently.
CO5	Connect Node.js apps to MongoDB for database management tasks.

List of Experiment(s)

1. a) Write a script that Logs "Hello, World!" to the console. Create a script that calculates the sum of two numbers and displays the result in an alert box.
 b) Create an array of 5 cities and perform the following operations: Log the total number of cities. Add a new city at the end. Remove the first city. Find and log the index of a specific city.
2. Read a string from the user, Find its length. Extract the word "JavaScript" using substring() or slice(). Replace one word with another word and log the new string. Write a function isPalindrome(str) that checks if a given string is a palindrome (reads the same backward).
3. Create an object student with properties: name (string), grade (number), subjects (array), displayInfo() (method to log the student's details) Write a script to dynamically add a passed property to the student object, with a value of true or false based on their grade. Create a loop to log all keys and values of the student object.
4. Create a button in your HTML with the text "Click Me". Add an event listener to log "Button clicked!" to the console when the button is clicked. Select an image and add a mouseover event listener to change its border color. Add an event listener to the document that logs the key pressed by the user.
5. Build a React application to track issues. Display a list of issues (use static data). Each issue should have a title, description, and status (e.g., Open/Closed). Render the list using a functional component.
6. Create a component Counter with A state variable count initialized to 0. Create Buttons to increment and decrement the count. Simulate fetching initial data for the Counter component using use Effect (functional component) or component Did Mount

(class component). Extend the Counter component to Double the count value when a button is clicked. Reset the count to 0 using another button.

7. Install Express (npm install express). Set up a basic server that responds with "Hello, Express!" at the root endpoint (GET /). Create a REST API. Implement endpoints for a Product resource: GET : Returns a list of products. POST: Adds a new product. GET /:id: Returns details of a specific product. PUT /:id: Updates an existing product. DELETE /:id: Deletes a product. Add middleware to log requests to the console. Use express.json() to parse incoming JSON payloads.
8. Install the MongoDB driver for Node.js. Create a Node.js script to connect to the shop database. Implement insert, find, update, and delete operations using the Node.js MongoDB driver. Define a product schema using Mongoose. Insert data into the products collection using Mongoose. Create an Express API with a /products endpoint to fetch all products. Use fetch in React to call the /products endpoint and display the list of products. Add a POST /products endpoint in Express to insert a new product. Update the Product List, After adding a product, update the list of products displayed in React.

Reference(s)

1. JavaScript & Web Fundamentals, "Eloquent JavaScript" by Marijn Haverbeke.
2. React, "Learning React: Functional Web Development with React and Redux" by Alex Banks and Eve Porcello.

Web Resource(s)

1. https://www.reddit.com/r/learnjavascript/comments/1ho7sb3/free_fullstack_web_service_development_guide_from/
2. https://www.researchgate.net/publication/372345794_Full_Stack_Web_Development_with_Hands-On_Lab
3. <https://www.scribd.com/document/639682674/Untitled>

Regulation GE24	GIET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC307	MACHINE LEARNING WITH PYTHON LAB	L	T	P	C
Prerequisites	Nil	0	0	4	2

Course Objectives

- Make use of Data sets in implementing the machine learning algorithms
- Implement the machine learning concepts and algorithms in any suitable language of choice.
- Design Python programs for various Learning algorithms.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Apply basic learning algorithms (Find-S, Candidate Elimination, ID3) to datasets and derive hypotheses.
CO2	Develop and test Artificial Neural Networks using the Backpropagation algorithm for predictive tasks.
CO3	Apply regression algorithms (e.g., Locally Weighted Regression) for curve fitting and prediction.
CO4	Implement and evaluate classification algorithms such as k-Nearest Neighbor, Naïve Bayes, and Decision Trees on real-world datasets.
CO5	Construct and utilize Bayesian Networks for probabilistic reasoning and diagnosis in medical or other domains.
CO6	Analyze and interpret accuracy, precision, recall, and error measures for different machine learning models.

List of Experiment(s)

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .csv file.
2. For a given set of training data examples stored in a .csv file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.
3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
4. Write a Python program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions.
5. Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.
6. Write a program to implement the naive Bayesian classifier for a sample training data set stored as a .csv file. Compute the accuracy of the classifier, considering few test data sets.

7. Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.
8. Assuming a set of documents that need to be classified, use the naive Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision and recall for your data set.
9. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering using Python Programming.
10. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Reference(s)

1. Tom M. Mitchell – Machine Learning, McGraw Hill, 1997.
2. Ethem Alpaydin – Introduction to Machine Learning, MIT Press, 4th Edition, 2020.

Web reference(s)

1. https://www.amrita.edu/course/machine-learning-lab-with-python/?utm_source=chatgpt.com
2. https://www.machinelearningmastery.com/machine-learning-in-python-step-by-step/?utm_source=chatgpt.com
3. https://arxiv.org/abs/1201.0490?utm_source=chatgpt.com

Regulation GE24	GJET Engineering College (Autonomous)	II-I MCA			
Course Code 24MC308	BIG DATA TECHNOLOGIES LAB	L	T	P	C
Prerequisites	Nil	0	0	3	1.5

Course Objectives

The objectives of this course are to

- To implement Map Reduce programs for processing big data.
- To realize storage and processing of big data using MongoDB, Pig, Hive and Spark.
- To analyze big data using machine learning techniques.

Course Outcomes

After completion of this course, the learners will be able to

CO1	Install, configure, and perform file management operations in Hadoop Distributed File System (HDFS).
CO2	Develop and execute MapReduce programs for solving computational and analytical problems (e.g., matrix multiplication, weather data analysis, movie tag mining).
CO3	Apply NoSQL operations in MongoDB and scripting using Pig Latin for data manipulation and analysis.
CO4	Use Hive and Spark to create, manage, and query large datasets for structured and unstructured data processing.
CO5	Analyze and generate reports using CDH and HUE, and evaluate the effectiveness of big data tools in real-world applications.

List of Experiment(s)

1. Install Hadoop and Implement the following file management tasks in Hadoop: Adding files and directories Retrieving files Deleting files and directories. Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
2. Develop a Map Reduce program to implement Matrix Multiplication.
3. Develop a Map Reduce program that mines weather data and displays appropriate messages indicating the weather conditions of the day.
4. Develop a Map Reduce program to find the tags associated with each movie by analyzing movie lens data.
5. Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB
6. Write Pig Latin scripts to sort, group, join, project, and filter the data.
7. Use Hive to create, alter, and drop databases, tables, views, functions, and indexes.
8. Implement a word count program in Hadoop and Spark.
9. Use CDH (Cloudera Distribution for Hadoop) and HUE (Hadoop User Interface) to analyze data and generate reports for sample datasets

Reference(s)

1. Tom White – Hadoop: The Definitive Guide O'Reilly Media, 4th Edition, 2015.
2. Chuck Lam – Hadoop in *Action* Manning Publications, 2011.
3. Jure Leskovec, Anand Rajaraman, Jeffrey Ullman – Mining of Massive Datasets Cambridge University Press, 3rd Edition, 2020.

Web referencess(s)

1. https://hadoop.apache.org/docs/?utm_source=chatgpt.com
2. <https://hadoop.apache.org/docs/stable/hadoop-project-dist/hadoop-hdfs/HdfsUserGuide.html>
3. <https://pig.apache.org/docs/r0.17.0/>

MCA COURSE STRUCTURE – GE24

(Applicable from the Academic Year 2024-25 onwards)

MCA II Year I Semester

S.No	Course Code	Category	Title	L	T	P	Credits
1	24MC301	PC	Machine Learning using Python	3	0	0	3
2	24MC302	PC	Full Stack Development	3	0	0	3
3	24MC303	PC	Big Data Technologies	3	0	0	3
4	24MC304	PE	Program Elective-2 A. Cloud Computing B. Image Processing C. Internet of Things D. MOOCS-2(NPTEL /SWAYAM) Recommended 12 week course with 3 credits.	3	0	0	3
5	24MC305	BS&H	Human Resource Management	3	0	0	3
6	24MC306	PC	Full Stack Development Lab	0	0	3	1.5
7	24MC307	PC	Machine Learning with Python Lab	0	0	4	2
8	24MC308	PC	Big Data Technologies Lab	0	0	3	1.5
9	24MC309	AC	Employability Skills–2 [§]	1	0	0	0
10	24MC310	MC	Internship/Industry Oriented Mini Project [#]	0	0	0	2
Total				16	0	10	22

[§]Internal Evaluation

[#]This can be done during semester break and evaluated at the end of 3rd Sem.

MCA II Year II Semester

S.No	Course Code	Category	Title	L/D	T	P	Credits
1.	24MC401	PE	Program Elective-3 A. Unified Modeling Language B. Blockchain Technologies C. Advanced UNIX Programming D. MOOCS-3(NPTEL /SWAYAM) Recommended 12 week course with 3 credits.	3	0	0	3
2.	24MC402	PE	Program Elective-4 A. Mobile Adhoc Networks B. Quantum Computing C. Agile Methodologies D. MOOCS-3(NPTEL /SWAYAM) Recommended 12 week course with 3 credits.	3	0	0	3
3.	24MC403		Project Work/Dissertation	0	0	0	10
Total				6	0	0	16

*Students going for Industrial Project/ Thesis will complete these courses through MOOCs (or even in earlier semester

Regulation GE24	GIET Engineering College (Autonomous)	II-II MCA			
Course Code 24MC401A	UNIFIED MODELING LANGUAGE	L	T	P	C
Prerequisites	Nil	3	0	0	3

Course Objectives

The objectives of the course are to

1. To understand the Object-based view of Systems.
2. To develop robust object-based models for Systems.
3. To explain necessary skills to handle complexity in software design.

Course Outcomes

At the end of the course, learners will be able to

CO1	Explain the concept of object oriented modeling and UML Modeling.
CO2	Identify the requirements and document.
CO3	Apply the UML and Object oriented modeling.
CO4	Analyze about Design Patterns.
CO5	Apply structural patterns to solve design problems.

Unit-1:

CO1 10L

Introduction to UML

The meaning of Object-Orientation, object identity, encapsulation, information hiding, polymorphism, importance of modeling, principles of modeling, object oriented modeling, conceptual model of the UML, Architecture.

Unit-2:

CO2 10L

Basic Structural Modeling

Classes, relationships, common mechanisms, diagrams.

Structural Modeling

Advanced relationships, interfaces, types & roles, packages, instances.

Class & Object diagrams

Terms, concepts, examples, modeling techniques, class & Object diagrams.

Unit-3:

CO3 12L

Collaboration diagrams:

Terms, Concepts, depicting a message, polymorphism in collaboration diagrams, iterated messages, use of self in messages.

Sequence diagrams:

Terms, concepts, differences between collaboration and sequence diagrams, depicting synchronous messages with/without priority call back mechanism broadcast message.

Unit-4:**CO5 12L****Behavioral Modeling:**

Interactions, use cases, use case diagrams, activity diagrams.

Advanced Behavioral Modeling:

Events and signals, state machines, processes & threads, time and space, state chart diagrams.

Unit-5:**CO5 10L****Architectural Modeling:**

Terms, concepts, examples, modeling techniques for component diagrams and deployment diagrams.

Textbook(s)

1. The Unified Modeling Language User Guide, 2nd Edition, Grady Booch, Rumbaugh, Ivar Jacobson, PEA, 2005.
2. Fundamentals of Object Oriented Design in UML, 1st Edition, Meilir Page Jones, Addison Wesley, 2000.

Reference book(s)

1. Head First Object Oriented Analysis & Design, 1st Edition, Mclaughlin, SPD O'Reilly, 2006.
2. Object oriented Analysis & Design Using UML, 1st Edition, Mahesh, PHI, 2008.
3. The Unified Modeling Language Reference Manual, 2nd Edition, Rumbaugh, Grady Booch, etc., PEA, 2004.

Web reference(s)

1. https://sourcemaking.com/design_patterns
2. <https://ui-patterns.com/patterns>

Regulation GE24	GIET Engineering College (Autonomous)	II-II MCA			
Course Code 24MC401B	BLOCK CHAIN TECHNOLOGIES	L	T	P	C
Prerequisites	Data Structures and Algorithms, Object-Oriented Programming, Database Management System and Operating Systems	3	0	0	3

Course Objectives

The objective of the course are to

- Learn the fundamentals of Block Chain and various types of block chain and consensus mechanism.
- Understand public block chain system, Private block chain system and consortium block chain.
- Know the security issues of blockchain technology.

Course Outcomes

At the end of the course, learners will be able to

CO1	Describe the basic concepts and technology used for blockchain.
CO2	Describe the primitives of the distributed computing and cryptography related to blockchain.
CO3	Illustrate the concepts of Bitcoin and their usage, Implement Ethereum block chain contract.
CO4	Apply security features in blockchain technologies.
CO5	Use smart contract in real world applications.

Unit-1:

CO1 12L

Fundamentals of Blockchain:

Introduction, Origin of Blockchain, Blockchain Solution, Components of Blockchain, Block in a Blockchain, The Technology and the Future.

Blockchain Types and Consensus Mechanism:

Introduction, Decentralization and Distribution, Types of Blockchain, Consensus Protocol. Cryptocurrency: Bitcoin, Altcoin and Token: Introduction, Bitcoin and the Cryptocurrency, Cryptocurrency Basics, Types of Cryptocurrencies, Cryptocurrency Usage.

Unit-2:

CO2 10L

Public Blockchain System:

Introduction, Public Blockchain, Popular Public Blockchains, The Bitcoin Blockchain, Ethereum Blockchain.

Smart Contracts:

Introduction, Smart Contract, Characteristics of a Smart Contract, Types of Smart Contracts, Types of Oracles, Smart Contracts in Ethereum, Smart Contracts in Industry.

Unit-3:**CO3 15L****Private Blockchain System:**

Introduction, Key Characteristics of Private Blockchain, Private Blockchain, Private Blockchain Examples, Private Blockchain and Open Source, E-commerce Site Example, Various Commands (Instructions) in E-commerce Blockchain, Smart Contract in Private Environment, State Machine, Different Algorithms of Permissioned Blockchain, Byzantine Fault, Multichain.

Consortium Blockchain:

Introduction, Key Characteristics of Consortium Blockchain, Need of Consortium Hyperledger Platform, Overview of Ripple, Overview of Corda.

Initial Coin Offering:

Introduction, Blockchain Fundraising Methods, Launching an ICO, Investing in an ICO, Pros and Cons of Initial Coin Offering, Successful Initial Coin Offerings, Evolution of ICO, ICO Platforms.

Unit-4:**CO4 12L****Security in Blockchain:**

Introduction, Security Aspects in Bitcoin, Security and Privacy Challenges of Blockchain in General, Performance and Scalability, Identity Management and Authentication, Regulatory Compliance and Assurance, Safeguarding Blockchain Smart Contract (DApp), Security Aspects in Hyperledger Fabric.

Applications of Blockchain:

Introduction, Blockchain in Banking and Finance, Blockchain in Education, Blockchain in Energy, Blockchain in Healthcare, Blockchain in Real-estate, Blockchain in Supply Chain, The Blockchain and IoT. Limitations and Challenges of Blockchain.

Unit-5:**CO5 10L****Blockchain Case Studies:**

Case Study 1 – Retail,
Case Study 2 – Banking and Financial Services,
Case Study 3 – Healthcare,
Case Study 4 – Energy and Utilities.

Blockchain Platform using Python: Introduction, Learn How to Use Python Online Editor, Basic Programming Using Python, Python Packages for Blockchain.

Blockchain platform using Hyperledger Fabric: Introduction, Components of Hyperledger Fabric Network, Chain codes from Developer.ibm.com, Blockchain Application Using Fabric Java SDK.

Textbook(s)

1. "Blockchain Technology", Chandramouli Subramanian, Asha A.George, Abhilasj K A, MeenaKarthikeyan , Universities Press.

Reference book(s)

1. Blockchain Blue print for Economy, Melanie Swan, SPDOreilly.
2. Blockchain for Business, Jai Singh Arun, Jerry Cuomo, Nitin Gauar, Pearson Addition Wesley

Web reference(s)

1. https://onlinecourses.swayam2.ac.in/aic21_ge01/preview
2. <https://course.cutm.ac.in/courses/skill-block-chain-technology/>
3. <https://www.coursera.org/courses?query=blockchain>

Regulation GE24	GIET Engineering College (Autonomous)	II-II MCA			
Course Code 24MC401C	ADVANCED UNIX PROGRAMING	L	T	P	C
Prerequisites	Basic Programming Knowledge, Operating System Fundamentals.	3	0	0	3

Course Objectives

The objective of the course are to

- To understand the fundamental design of the unix Programming.
- To become fluent with the systems calls provided in the unix environment.
- To be able to design and build an application/service over the unix operating system.

Course Outcomes

At the end of the course students will be able to

CO1	Demonstrate the use of basic Unix commands, utilities, and shell programming constructs for efficient file, process, and text handling.
CO2	Explain the Unix file structure and implement low-level file operations and directory management using system calls and library functions.
CO3	Illustrate the concepts of process management and signal handling, and apply system calls to manage processes and signals in Unix.
CO4	Develop inter-process communication mechanisms using pipes, FIFOs, message queues, and semaphores for client-server interaction.
CO5	Implement shared memory and socket programming to enable communication between processes on the same or different systems using TCP and UDP protocols.

Unit-1:

CO1 12L

Overview of Unix Utilities and Shell Programming:

File handling utilities, security by file permissions, process utilities, disk utilities, networking commands, backup utilities, text processing utilities.

Shell Programming:

shell, shell responsibilities, pipes and input redirection, output redirection, here documents, the shell as a programming language, shell meta characters, shell variables, shell commands, the environment, control structures, shell script examples.

Unit-2:

CO2 12L

Unix Files:

Unix file structure, directories, files and devices, System calls, library functions, low level file access, usage of open, create, read, write, close, lseek, stat, fstat, octl, umask, dup, dup2, Differences between system call and library functions. File and directory maintenance: chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd.

Directory handling system calls:

opendir, readdir, closedir, rewinddir, seekdir, telldir.

Unit-3:**CO3 12L****Unix Process:**

Threads and Signals: process, process structure, starting new process, waiting for a process, zombie process, orphan process, process control, process identifiers, system call interface for process management, -fork, vfork, exit, wait, waitpid, exec, system.

Signals:

Signal functions, unreliable signals, interrupted system calls, kill and raise functions, alarm, pause functions, abort, sleep functions.

Unit-4:**CO4 15L****Inter process Communication:**

Introduction to IPC, IPC between processes on a single computer system, IPC between processes on different systems, pipes, FIFOs, message queues, semaphores and shared memory. Differences between pipes and FIFOs. Implementing client server program using pipes and FIFOs.

Message Queues:

IPC, permission issues, Access permission modes, message structure, working with message queues, client/server example.

Semaphores:

Creating semaphore sets, Unix kernel support for semaphores, Unix APIs for semaphores, file locking using semaphores.

Unit-5:**CO5 10L****Shared Memory:**

Working with a shared memory segments, Unix kernel support for shared memory, client/server example.

Sockets:

Berkeley sockets, socket structure, socket system calls for connection oriented protocol and connectionless protocol, implementing client server programs using TCP and UDP sockets.

Textbook(s)

1. Advanced programming in the unix environment, w- Richard Stevens 2nd Edition Pearson education.
2. Unix Concepts and Applications, 3/e, Sumitabha Das, TMH

Reference book(s)

1. Unix and shell Programming, Sumitabha Das, TMH.
2. A Beginner's Guide to Unix, N.P.Gopalan, B.Sivaselva, PHI.
3. Unix Shell Programming, Stephen G.Kochan, Patrick Wood, 3/e, Pearson.
4. Unix Shell Programming, Lowell Jay Arthus & Ted Burns, 3/e, GalGotia

Web reference(s)

1. <http://www.cs.fsu.edu/~asriniva/courses/aup02/lectures.html>.
2. <http://www.ietf.org/rfc.html>.
3. https://man7.org/tlpi/?utm_source=chatgpt.com.
4. https://www.geeksforgeeks.org/socket-programming-cc/?utm_source=chatgpt.com

Regulation GE24	GIET Engineering College (Autonomous)	II-II MCA			
Course Code 24MC402A	MOBILE ADHOC NETWORKS	L	T	P	C
Prerequisites	Basic Computer Networks Knowledge, Programming Fundamentals, Introduction to Operating Systems.	3	0	0	3

Course Objectives

The objective of the course are to

- Architect sensor networks for various application setups.
- Devise appropriate data dissemination protocols and model links cost.
- Understanding of the fundamental concepts of wireless sensor networks and has a basic
- knowledge of the various protocols at various layers. Evaluate the performance of sensor networks and identify bottlenecks.

Course Outcomes

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

CO1	Describe the characteristics, challenges, and MAC protocol design issues in Mobile Ad hoc Networks (MANETs).
CO2	Classify and compare routing and transport layer protocols designed for Ad hoc wireless networks and analyze their design challenges.
CO3	Explain the security issues in MANETs, including threats, key management, secure routing, and intrusion detection mechanisms.
CO4	Understand the architecture, design issues, and protocol stack of Wireless Sensor Networks (WSNs), including clustering and data retrieval methods.
CO5	Analyze the security mechanisms and operating system support in WSNs, including secure data aggregation and sensor node hardware/software platforms.

Unit-1:

CO1 10L

Introduction to Ad Hoc Wireless Networks:

Cellular and Ad Hoc Wireless Networks, Characteristics of MANETs, Applications of MANETs, Issues and Challenges of MANETs, Ad Hoc Wireless Internet, MAC protocols for Ad hoc Wireless Networks-Issues, Design Goals and Classifications of the MAC Protocols.

Unit-2:

CO2 10L

Routing Protocols for Ad Hoc Wireless Networks:

Issues in Designing a Routing Protocol, Classifications of Routing Protocols, Topology-based versus Position-based Approaches, Issues and design goals of a Transport layer protocol, Classification of Transport layer solutions, TCP over Ad hoc Wireless Networks, Solutions for TCP over Ad Hoc Wireless Networks, Other Transport layer protocols.

Unit-3:**CO3 10L****Security protocols for Ad hoc Wireless Networks:**

Security in Ad hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management, Secure Routing in Ad hoc Wireless Networks, Cooperation in MANETs, Intrusion Detection Systems.

Unit-4:**CO4 12L****Basics of Wireless Sensors and Applications:**

The Mica Mote, Sensing and Communication Range, Design Issues, Energy Consumption, Clustering of Sensors, Applications, Data Retrieval in Sensor Networks-Classification of WSNs, MAC layer, Routing layer, Transport layer, High-level application layer support, Adapting to the inherent dynamic nature of WSNs.

Unit-5:**CO5 12L****Security in WSNs:**

Security in WSNs, Key Management in WSNs, Secure Data Aggregation in WSNs, Sensor Network Hardware-Components of Sensor Mote, Sensor Network Operating Systems– TinyOS, LA-TinyOS, SOS, RETOS, Imperative Language-nesC, Dataflow.

Style Language:

TinyGALS, Node-Level Simulators, NS-2 and its sensor network extension, TOSSIM.

Textbook(s)

1. Ad Hoc Wireless Networks – Architectures and Protocols, 1st edition, C. Siva Ram Murthy, B. S. Murthy, Pearson Education, 2004
2. Wireless Sensor Networks - A Modern approach, Garimella Rama Murthy, 1st edition, Universities Publishers, 2025
3. Ad Hoc and Sensor Networks – Theory and Applications, 2nd edition Carlos Corderio Dharma P. Aggarwal, World Scientific Publications / Cambridge University Press, 2006

Reference book(s)

1. Wireless Sensor Networks: An Information Processing Approach, 1st edition, Feng Zhao, Leonidas Guibas, Elsevier Science imprint, Morgan Kauffman Publishers, 2005, rp2009
2. Wireless Ad hoc Mobile Wireless Networks – Principles, Protocols and Applications, 1st edition, Subir Kumar Sarkar, et al., Auerbach Publications, Taylor & Francis Group, 2008
3. Ad hoc Networking, 1st edition, Charles E. Perkins, Pearson Education, 2001
4. Wireless Ad hoc Networking, 1st edition, Shih-Lin Wu, Yu-Chee Tseng, Auerbach Publications, Taylor & Francis Group, 2007
5. Wireless Sensor Networks – Principles and Practice, 1st edition, Fei Hu, Xiaojun Cao, An Auerbach book, CRC Press, Taylor & Francis Group, 2010

Web reference(s)

1. https://www.tutorialspoint.com/ad_hoc_network/index.htm?utm_source=chatgpt.com
2. https://datatracker.ietf.org/wg/manet/about/?utm_source=chatgpt.com
3. https://link.springer.com/article/10.1007/s11276-005-0484-7?utm_source=chatgpt.com
4. https://www.geeksforgeeks.org/protocol-stack-in-wireless-sensor-networks-wsn/?utm_source=chatgpt.com
5. https://link.springer.com/chapter/10.1007/978-3-642-03841-9_12?utm_source=chatgpt.com

Regulation GE24	GIET Engineering College (Autonomous)	II-II MCA			
Course Code 24MC402B	QUANTUM COMPUTING	L	T	P	C
Prerequisites	Linear Algebra, Probability Theory, Basic Modern Physics / Quantum Mechanics, Classical Computing Fundamentals.	3	0	0	3

Course Objectives

The objective of the course are to

- To introduce the fundamentals of quantum computing, the problem-solving approach using finite dimensional mathematics

Course Outcomes

After completion of this course, the learners will be able to

CO1	Explain the evolution of quantum computing and differentiate between classical and quantum computational models.
CO2	Demonstrate the foundational mathematical, physical, and biological concepts required for understanding quantum computation.
CO3	Describe the nature of qubits, physical implementations, and design simple quantum circuits using basic gates.
CO4	Apply fundamental quantum algorithms like Deutsch, Deutsch-Jozsa, Shor's, and Grover's algorithms for computational problems.
CO5	Analyze quantum noise, error correction methods, and explain the principles of quantum cryptography and information theory.

Unit-1:

CO1 8L

History of Quantum Computing:

Importance of Mathematics, Physics and Biology.

Introduction to Quantum Computing:

Bits Vs Qubits, Classical Vs Quantum logical operations

Unit-2:

CO2 12L

Background Mathematics:

Basics of Linear Algebra, Hilbert space, Probabilities and measurements.

Background Physics:

Paul's exclusion Principle, Superposition, Entanglement and super symmetry, density operators and correlation, basics of quantum mechanics, Measurements in bases other than computational basis.

Background Biology:

Basic concepts of Genomics and Proteomics (Central Dogma).

Unit-3:**CO3 10L****Qubit:**

Physical implementations of Qubit. Qubit as a quantum unit of information. The Bloch sphere.

Quantum Circuits:

single qubit gates, multiple qubit gates, designing the quantum circuits. Bell states.

Unit-4:**CO4 10L****Quantum Algorithms:**

Classical computation on quantum computers. Relationship between quantum and classical complexity classes. Deutsch's algorithm, Deutsch's-Jozsa algorithm, Shor's factorization algorithm, Grover's search algorithm.

Unit-5:**CO5 12L****Noise and error correction:**

Graph states and codes, Quantum error correction, fault-tolerant computation.

Quantum Information and Cryptography:

Comparison between classical and quantum information theory. Quantum Cryptography, Quantum teleportation.

Textbook(s)

1. Quantum Computation and Quantum Information, Nielsen M. A., Cambridge
2. Programming Quantum Computers, Essential Algorithms and Code Samples, Eric R Johnson, NicHarrigan, Mercedes Ginemo, Segovia, Oreilly

Reference book(s)

1. Quantum Computing for Computer Scientists, Noson S. Yanofsk, Mirco A. Mannucci
2. Principles of Quantum Computation and Information, Benenti G., Casati G. and Strini G., Vol.I: Basic Concepts, Vol II
3. Basic Tools and Special Topics, World Scientific. Pittenger A. O., An Introduction to Quantum Computing Algorithms

Web reference(s)

1. https://quantum-computing.ibm.com/?utm_source=chatgpt.com
2. https://ocw.mit.edu/courses/mathematics/18-06-linear-algebra-spring-2010/?utm_source=chatgpt.com
3. https://qiskit.org/textbook/ch-states/representing-qubit-states.html?utm_source=chatgpt.com
4. https://qiskit.org/textbook/ch-algorithms/index.html?utm_source=chatgpt.com
5. http://theory.caltech.edu/~preskill/ph229/notes/chap7.pdf?utm_source=chatgpt.com

Regulation GE24	GIET Engineering College (Autonomous)	II-II MCA			
Course Code 24MC402C	AGILE METHODOLOGIES	L	T	P	C
Prerequisites	Basic Software Development Knowledge, Familiarity with Project Management Concepts, Basic Programming Skills.	3	0	0	3

Course Objectives

The objective of the course are to

- Introduce the important concepts of Agile software development Process.
- Emphasize the role of stand-up meetings in software collaboration.
- Impart the knowledge on values and principles in understanding agility

Course Outcomes

After completion of this course, the learners will be able to

CO1	Understand the core concepts, values, and principles of Agile methodologies.
CO2	Apply Agile principles effectively to software project delivery and team collaboration.
CO3	Explain and implement Scrum framework practices, including sprint cycles and team organization.
CO4	Utilize Extreme Programming (XP) techniques and embrace change in software development.
CO5	Employ Lean and Kanban principles to improve software process flow and apply Agile coaching strategies.

Unit-1:

CO1 10L

Learning Agile:

Agile, Getting Agile into your brain, Understanding Agile values, No Silver Bullet, Agile to the Rescue. A fractured perspective, The Agile Manifesto, Understanding the Elephant, Where to Start with a New Methodology.

Unit-2:

CO2 10L

The Agile Principles:

The 12 Principles of Agile Software, The Customer Is Always Right, Delivering the Project, Better Project Delivery for the Ebook Reader Project. Communicating and Working Together, Project Execution—Moving the Project Along, Constantly Improving the Project and the Team. The Agile Project: Bringing All the Principles Together

Unit-3:

CO3 12L

SCRUM and Self-Organizing Teams:

The Rules of Scrum, Act I: I Can Haz Scrum, Everyone on a Scrum Team owns the Project, Status Updates Are for Social Networks!, The Whole Team Uses the Daily Scrum, Feedback and the Visibility-Inspection-Adaptation Cycle, The Last Responsible Moment, Sprinting into a Wall, Sprints, Planning, and Retrospectives.

Scrum Planning And Collective Commitment:

Not Quite Expecting the Unexpected, User Stories, Velocity, and Generally Accepted Scrum Practices, Victory Lap, Scrum Values Revisited.

Unit-4:**CO4 12L****XP And Embracing Change:**

Going into Overtime, The Primary Practices of XP, The Game Plan Changed, but We're Still Losing, The XP Values Help the Team Change Their Mindset, An Effective Mindset Starts with the XP Values, The Momentum Shifts, Understanding the XP Principles Helps You Embrace Change.

XP, Simplicity, and Incremental Design:

Code and Design, Make Code and Design Decisions at the Last Responsible Moment, Final Score.

Unit-5:**CO5 8L****Lean, Eliminating Waste, and Seeing the whole:**

Lean Thinking, Creating Heroes and Magical Thinking. Eliminate Waste, Gain a Deeper Understanding of the Product, Deliver As Fast As Possible.

Kanban, Flow, and Constantly Improving:

The Principles of Kanban, Improving Your Process with Kanban, Measure and Manage Flow, Emergent Behavior with Kanban.

The Agile Coach:

Coaches Understand Why People Don't Always Want to Change. The Principles of Coaching.

Textbook(s)

1. Andrew Stellman, Jill Alison Hart, Learning Agile, O'Reilly, 2015. Reference Books: 1. Andrew Stellman, Jennifer Green, Head first Agile, O'Reilly, 2017.
2. Rubin K , Essential Scrum : A Practical Guide To The Most Popular Agile Process, Addison-Wesley, 2013

Reference book(s)

1. "Agile Software Development: Principles, Patterns, and Practices" Robert C. Martin, Micah Martin, Prentice Hall, 2006.
2. "Agile Project Management with Scrum", Ken Schwaber, Microsoft Press, 2004.

Web reference(s)

1. https://www.agilealliance.org/agile101/?utm_source=chatgpt.com
2. https://www.mountaingoatsoftware.com/agile/agile-principles?utm_source=chatgpt.com
3. https://www.atlassian.com/agile/scrum?utm_source=chatgpt.com
4. https://martinfowler.com/articles/on-xp.html?utm_source=chatgpt.com
5. https://agilecoachinginstitute.com/agile-coaching/?utm_source=chatgpt.com