

MOHAN BABU UNIVERSITY

Sree Sainath Nagar, Tirupati – 517 102



Centre for Distance and Online Education

Bachelor of Computer Applications (B.C.A)

CURRICULUM AND SYLLABUS *(From AY: 2025-26)*



MBU
MOHAN BABU
UNIVERSITY

MOHAN BABU UNIVERSITY

Vision

To be a globally respected institution with an innovative and entrepreneurial culture that offers transformative education to advance sustainability and societal good.

Mission

- ❖ Develop industry-focused professionals with a global perspective.
- ❖ Offer academic programs that provide transformative learning experience founded on the spirit of curiosity, innovation, and integrity.
- ❖ Create confluence of research, innovation, and ideation to bring about sustainable and socially relevant enterprises.
- ❖ Uphold high standards of professional ethics leading to harmonious relationship with environment and society.

SCHOOL OF COMPUTING

Vision

To lead the advancement of computer science research and education that has real-world impact and to push the frontiers of innovation in the field.

Mission

- ❖ Instil within our students fundamental computing knowledge, a broad set of skills, and an inquisitive attitude to create innovative solutions to serve industry and community.
- ❖ Provide an experience par excellence with our state-of-the-art research, innovation, and incubation ecosystem to realise our learners' fullest potential.
- ❖ Impart continued education and research support to working professionals in the computing domain to enhance their expertise in the cutting-edge technologies.
- ❖ Inculcate among the computing engineers of tomorrow with a spirit to solve societal challenges.

DEPARTMENT OF COMPUTER APPLICATIONS

Vision

To become a center of excellence in the field of computer science and applications.

Mission

- Imparting knowledge and skills through contemporary curriculum to the diverse group of students.
- Creating a talent pool of faculty in diverse domains of computer applications through continuous training.
- Domain and transferable skill development for the holistic personality of students to inculcate values and ethics for effective professional practice and as an entrepreneur.

BACHELOR OF COMPUTER APPLICATIONS (BCA)

PROGRAM EDUCATIONAL OBJECTIVES

After few years of graduation, the graduates of BCA Program will be able to:

- PEO1.** Pursue higher education in the core and allied areas of computer science and applications.
- PEO2.** Become professionals in industry or academia with an ability to adapt to evolving technologies in cultivating skills for thriving career.
- PEO3.** Become successful entrepreneurs and be engaged in technology innovation and deployment.
- PEO4.** Exhibit professionalism, and uplifting health, safety, legal, environmental, ethical, and cultural diversity issues for serving the society and communicating with local and national peers, bound within regulations and leading to lifelong learning.

PROGRAM OUTCOMES

On successful completion of the Program, the graduates of BCA Program will be able to:

- P01. Computational Knowledge:** Apply knowledge of mathematics and computing fundamental and domain concepts to find solutions for defined problems.
- P02. Problem Analysis:** Adapt basic principles of Mathematics and Computing sciences to identify and formulate problems to provide solutions for complex problems.
- P03. Design/Development of Solutions:** Design, analyze and develop solutions and evaluate system components or processes to meet a specific need for local, regional and global public health, societal, cultural, and environmental systems.
- P04. Conduct Investigations of Complex Computing Problems:** Use research-based knowledge and methods with the ability to perform analysis and development to reach valid conclusions.
- P05. Modern Tool Usage:** Design, analyze and develop solutions using modern tools by considering the limitations.

- PO6. Professional Ethics:** Commit to ethics and cyber regulations, responsibilities, and norms in computing practices.
- PO7. Life-long Learning:** Enhance understanding and building research, strategies in independent learning for continual development as computer applications professional.
- PO8. Project Management and Finance:** Establishing strategies for developing and implementing ideas in multi-disciplinary environments using computing and management skills as a member or leader in a team.
- PO9. Communication Efficacy:** Contribute to progressive community and society in comprehending computing activities by writing effective reports, designing documentation, making an effective presentation, and understanding instructions.
- PO10. Societal and Environmental Concern:** Apply mathematics and computing knowledge to access and solve issues relating to health, safety, societal, environmental, legal, and cultural issues within local, regional and global contexts.
- PO11. Individual and Teamwork:** Self and continuous learning to improve knowledge and competence as a member or leader of a team.
- PO12. Innovation and Entrepreneurship:** Identify a timely opportunity and use innovation to pursue that opportunity to create value and wealth for the betterment of the individual and society at large.

PROGRAM SPECIFIC OUTCOMES

On successful completion of the Program, the graduates of BCA Program will be able to:

- PSO1.** Design, develop, test, and deploy computing applications of specified requirements using programming skills.
- PSO2.** Apply tools and techniques to create database and adapt managerial and domain Skills of Information Management for storage and decision making.
- PSO3.** Apply suitable techniques and algorithms to integrate Operating System Services, Network devices, Security mechanisms and Infrastructure to meet the requirements for the deployment of an application on networks.

BACHELOR OF COMPUTER APPLICATIONS (BCA)

Course Structure

T: Theory; **T+P:** Theory with Practical; **P:** Practical; **T+PBL:** Theory with Project Based Learning

T+P+PBL: Theory with Practical and Project Based Learning

I-Semester

S. No	Course Code	Course Title	Course Type	Credits
1.	22LG102405L	GENERAL ENGLISH	T+P	3
2.	22MM101401L	MATRIX THEORY AND LINEAR ALGEBRA	T	3
3.	22CA101001L	COMPUTER FUNDAMENTALS AND ORGANIZATION	T	3
4.	22CA102002L	DATABASE MANAGEMENT SYSTEMS	T+P	4
5.	22CA102001L	PROGRAMMING FOR PROBLEM SOLVING	T+P	4
6.	22CM101403L	INNOVATION AND DESIGN THINKING	T	2
Total Credits				19

II-Semester

S. No	Course Code	Course Title	Course Type	Credits
1.	22MM101409L	NUMERICAL ANALYSIS, PROBABILITY AND STATISTICS	T	3
2.	22CA105001L	COMPUTER HARDWARE AND SYSTEM ESSENTIALS	P	2
3.	22CA101004L	COMPUTER COMMUNICATION	T	3
4.	22CA102004L	DATA STRUCTURES	T+P	4
5.	22CA102005L	PYTHON PROGRAMMING	T+P	4
6.	22CM101401L	PRINCIPLES OF ACCOUNTING	T	3
7.	22CA101003L	BASICS OF VIRTUALIZATION AND CLOUD TECHNOLOGY	T	3
8.	22ME101702L	HUMAN RESOURCE MANAGEMENT	T	3
Total Credits				25

III - Semester

S. No	Course Code	Course Title	Course Type	Credits
1.	22CA101006L	SOFTWARE ENGINEERING	T	3
2.	22CA101015L	CLOUD COMPUTING	T	3
3.	22CA101009L	ADVANCED DATABASES	T	3
4.	22CA102006L	JAVA PROGRAMMING	T+P	4
5.	22CA101010L	INTERNET OF THINGS	T	3
6.	22CA102007L	COMPUTER GRAPHICS	T+P	4
7.	22CA101012L	COMPUTER NETWORKS	T	3
Total Credits				23

IV - Semester

S. No	Course Code	Course Title	Course Type	Credits
1.	22CA102003L	DATA WAREHOUSING AND DATA MINING	T+P	4
2.	22CA101005L	FUNDAMENTALS OF DATA SCIENCE	T	2
3.	22CA101019L	ARTIFICIAL INTELLIGENCE	T	3
4.	22CA102014L	UNIX SHELL PROGRAMMING	T+P	3
5.	22CA101023L	INTRODUCTION TO VIRTUAL REALITY	T	3
6.	22CA101024L	INTRODUCTION TO AUGMENTED REALITY	T	3
7.	22CA101025L	INTRODUCTION TO DIGITAL ARTS AND TECHNOLOGY	T	3
Total Credits				21

V - Semester

S. No	Course Code	Course Title	Course Type	Credits
1.	22CA111001L	INTERNSHIP	-	2
2.	22MM101410L	DISCRETE MATHEMATICS FOR COMPUTER SCIENCE	T	3
3.	22CA104003L	ADVANCED COMPUTER GRAPHICS	T+P+PBL	4
4.	22CA102008L	DATA ANALYTICS	T+P	4
5.	22CA101007L	USER EXPERIENCE/ INTERFACE (UX/UI) DESIGN	T	2
6.	22CA101014L	MACHINE LEARNING	T	3
7.	22CA102020L	SOFTWARE TESTING AND AUTOMATION	T+P	3
8.	22LG201701L	PERSONALITY DEVELOPMENT	T	3
Total Credits				24

VI - Semester

S. No	Course Code	Course Title	Course Type	Credits
1.	22CM108001L	CAPSTONE PROJECT	-	8
Total Credits				8

Total Credits for the award of the Degree: 120

Course Code

Course Title

22LG102405L

GENERAL ENGLISH

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course deals with selected literary works of eminent writers, exercises on speaking, reading comprehensions for skimming and scanning, vocabulary, grammar, pronunciation, and conversation practice.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate knowledge of literary works of various pieces of eminent writers.

CO2. Adapt general and technical vocabulary in communication.

CO3. Apply grammatically correct English in writing.

CO4. Analyze texts using reading techniques.

CO5. Apply different communication styles in various situations.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	2	-	-	-	-	-
CO2	2	2	-	-	-	-	2	-	3	-	-	-
CO3	2	2	-	-	3	-	2	-	3	-	-	-
CO4	2	3	2	-	2	-	2	-	3	-	-	-
CO5	2	2	-	-	3	-	2	-	3	-	-	-
Course Correlation Mapping	2	2	2	-	3	-	2	-	3	-	-	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: 'A SNAKE IN THE GRASS' SHORT STORY BY R.K. NARAYAN.

A Snake in the Grass–A Short Story, Reading Comprehension, Grammar, Vocabulary, Pronunciation, and Conversation Practice.

Module 2: 'ON SAYING PLEASE' SHORT ESSAY BY A. G. GARDINER

On Saying Please–A Short Essay, Reading Comprehension, Grammar Vocabulary, Pronunciation, and Conversation Practice.

Module 3: 'IF YOU FORGET ME' POEMBY PABLO NERUDA

If you Forget Me - A Poem, Reading Comprehension, Grammar, Pronunciation, and Conversation Practice.

Module 4: 'AFTER THE SUNSET'SHORT STORY BY BHOOPAL

After the Sunset–A Short Story, Reading Comprehension, Grammar, Pronunciation, and Conversation Practice.

Module 5: 'MAN'S PERIL' ESSAYBY BERTRAND RUSSEL

Man's Peril - An Essay, Reading Comprehension, Vocabulary, Grammar, Pronunciation, and Conversation Practice.

EXPERIENTIAL LEARNING

1. In rainy seasons a lot of snakes are found crawling around. Prepare a write-up on the reactions of people when they found snakes.
2. India is now for entrepreneurs and the government announced a lot of startup programmes for that. Prepare a presentation on recent entrepreneurs.
3. Small courtesies play a major role in creating an impression on other people. List out a few examples.
4. Prepare a PowerPoint presentation on the present scenario in higher education and jobs in India.
5. Being a shopkeeper and persuading a customer to buy a product which is introduced newly in the market. Prepare a conversation.
6. The English language has a rich vocabulary. List out the homophones and homonyms and write down the pronunciation and meaning of those words.

7. Describe a situation in your college where teamwork is needed and explain the strategies to manage the team effectively.
8. India is a country of unity in diversity. List out the existence of different racial and religious people and bring out reasons for the harmonious relationship among the people.
9. Forget and forgive are the most important quality of any human being. Prepare a write-up on any two experiences which come across in your life where you forgive or forget to maintain good relationships with friends or relatives.
10. Make a case study on the problems of second language learners of English and suggest solutions to overcome them.
11. How do you feel that the role of science and technology in nation-building?

RESOURCES

TEXTBOOKS:

- 1 G. Damodar "*English Language for Undergraduate Students*", Cambridge University-2019.

REFERENCE BOOKS:

1. https://www.researchgate.net/publication/331773456_RK_Narayan's_A_Snake_in_the_Grass_and_Stephen_Leacock's_With_the_Photographer_-_A_Comparative_Study
2. <https://smartenglishnotes.com/2020/07/17/on-saying-please-summary-analysis-and-questions-and-answers/>

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=WnOOKO0CdaM>
2. <https://www.youtube.com/watch?v=H6Nlz8qmcFc>
3. <https://www.youtube.com/watch?v=-ITliZO85YM>
4. <https://www.youtube.com/watch?v=048YjXwgHWE>
5. <https://www.youtube.com/watch?v=XLLQm7Grmcc>

WEB RESOURCES:

1. https://www.researchgate.net/publication/331773456_RK_Narayan's_A_Snake_in_the_Grass_and_Stephen_Leacock's_With_the_Photographer_-_A_Comparative_Study
2. <https://smartenglishnotes.com/2020/07/17/on-saying-please-summary-analysis-and-questions-and-answers/>
3. http://www.emcp.com/product_catalog/school/litLink/Grade09/U09-04forgetme/
4. <https://englishlanguage-lit.blogspot.com/2021/05/after-sunset-short-story-by-bhoopal.html>
5. <https://www.taylorfrancis.com/chapters/mono/10.4324/9781003090359-31/man-peril-bertrand-russell?context=ubx&refId=1d767e2d-ceb1-4537-9de5-6417eab47d1e>

Course Code	Course Title
22MM101401L	MATRIX THEORY AND LINEAR ALGEBRA

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a discussion on matrix factorizations, linear systems, Eigenvalues and Eigenvectors, vector spaces, linear transformations, and orthogonality.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Demonstrate the concepts of matrix factorizations and solutions of the linear system.
- CO2.** Determine the Eigenvalues and Eigenvectors of the matrix and implement the concept of Eigen values and decompositions of a matrix in intelligent systems.
- CO3.** Apply the concepts of vector spaces and linear transformation on problems of computational systems.
- CO4.** Use the inner product spaces for the study of orthogonality and to construct orthonormal basis.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	2	-	-	-	-	-	-	-
CO2	2	3	-	2	2	-	-	-	-	-	-	-
CO3	3	3	-	2	1	-	-	-	-	-	-	-
CO4	2	3	-	3	2	-	-	-	-	-	-	-
Course Correlation Mapping	3	3	-	3	2	-	-	-	-	-	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: MATRICES AND LINEAR SYSTEM OF EQUATIONS

Elementary Row-operations, Elementary Matrices, Echelon form, Rank of a matrix by row-reduction, Solutions of system of linear equations by row reduction, Matrix Factorization, LU factorization, LDU factorization.

Module 2: EIGEN VALUES, EIGEN VECTORS AND DIAGONALIZATION

Characteristic equation of a matrix, Eigenvalues and Eigenvectors of matrices, Similarity of matrices, Diagonalization by using Eigenvalues, Cayley-Hamilton Theorem (Without Proof), Evaluation of matrix powers.

Module 3: VECTOR SPACES

Vector spaces, Sub-spaces, Four fundamental subspaces of a matrix, Span, Linearly independent and dependent, Basis, construction of Basis, dimensions, Finite dimensional vector space.

Module 4: LINEAR TRANSFORMATION

Linear transformation, Kernel and range of linear transformation, Basic properties, Invertible linear transformation, Matrix of linear transformation.

Module 5: INNER PRODUCT SPACES

Inner product, Norm, Distance, Inner product space, Orthogonal and orthonormal basis, Gram-Schmidt orthogonalization, Singular Value Decomposition for square matrices.

EXPERIENTIAL LEARNING

1. Explain the role of Eigen values and Eigen vectors in image processing.
2. Explain how the matrix theory is used in robotics and automachines.

RESOURCES

TEXT BOOKS:

1. Peter Selinger, "*Matrix theory and linear algebra*", 1st Edition, creative commons license, 2018.
2. Stephen H. Friedberg, Arnold J. Insel and Lawrence E. Spence, "*Linear Algebra*," Pearson

Education, 5th Edition, 2022.

REFERENCE BOOKS:

1. Kuladeep Sing, "*Linear Algebra step by step*," 1st edition, Oxford University press, 2014.
2. David Poole, "*Linear Algebra: A Modern Introduction*," Brooks/Cole, 2nd edition, 2005.
3. Edgar G. Goodaire, "*Linear Algebra*," Cambridge University Press, 1st Edition, 2014.
4. M. Thamban Nair and Arindama Singh, "*Linear Algebra*," Springer, 1st Edition, 2019.
5. Hans Schneider and George Phillip Barker, "*Matrices and Linear Algebra*," Dover Publications, 2nd Edition, 1989.
6. Jim DeFranza, Daniel Gagliardi, "*Introduction to Linear algebra with applications*," Mc GrawHill, 2009.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/111106051>
2. <https://nptel.ac.in/courses/111106135>

WEB RESOURCES:

1. <https://catalogimages.wiley.com/images/db/pdf/9781119570271.excerpt.pdf>
2. https://web.northeastern.edu/dummit/docs/linalgprac_5_eigenvalues_and_diagonalization.pdf
3. <https://web.auburn.edu/holmerr/2660/Textbook/vectorspace-print.pdf>
4. <https://textbooks.math.gatech.edu/ila/linear-transformations.html>
5. <https://linear.axler.net/InnerProduct.pdf>

Course Code**Course Title****22CA101001L****COMPUTER FUNDAMENTALS AND ORGANIZATION****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This course deals with fundamentals of computers, Data Representations, input and output units, primary and secondary storage devices, programming languages, Binary Arithmetic and Logic circuits. Understand Computer architecture and organization working scenario in addition to Reduced Instruction Set Computer (RISC) platform.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- C01.** Demonstrate fundamentals of computer and computer organization concepts to design of modern processors, memories and I/Os.
- C02.** Analyze the performance of commercially available computers.
- C03.** Develop to use the computer organization techniques in digital systems.
- C04.** Identify, formulates, and solve hardware and software computer engineering problems using sound computer engineering principles.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	3	3	3	-	-	-	-	-	-	-	-	-	-	3
C02	2	3	3	-	-	-	-	-	-	-	-	-	-	-	3
C03	2	3	3	-	-	-	-	-	-	-	-	-	-	-	3
C04	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	3	3	3	3	-	-	-	-	-	-	-	-	-	-	3

Correlation Levels:**3: High;****2: Medium; 1: Low**

COURSE CONTENT

Module 1: INTRODUCTION TO COMPUTERS

Computer basics: Algorithms, simple model of a computer, characteristics of computer, problem solving using computers: flow chart, Program, working of a computer, stored program concept.

Data Representation: Representation of characters in Computers, integers, fractions, Hexadecimal representation of numbers, decimal to binary conversion, error detecting codes.

Input units: Traditional computer Input/ Output units: Keyboard, Display unit, computer mouse, other input technologies: touch pad, touch screen, magnetic Ink Character recognition (MICR), Optical Mark Reading and Recognition (OMR), Flatbed Scanner and barcode.

Module 2: OUTPUT UNITS AND COMPUTER MEMORY

Computer Output Devices: Flat panel display technology, E-ink display, printers, inkjet printers, dot matrix printers, line printers, plotters, choosing printer.

Computer Memory: Memory cell, Memory Organization, Read Only Memory, Serial Access Memory, Physical Devices used to Construct Memories, magnetic hard disk, Compact disk read only memory, Magnetic tape drive and memory hierarchy.

Processor: Structure of Instructions, Description of Processor, Machine Language Program, Algorithm to Simulate the Hypothetical Computer, Enhancing Hypcom.

Module 3: BINARY ARITHMETIC AND LOGIC CIRCUIT

Binary Arithmetic: Binary addition, subtraction, Signed Numbers, Two's complement representations of Numbers, additions/subtractions of Numbers in 2's complement Notation, binary multiplications, Binary division, floating point representation of numbers.

Logic circuit: Switching Circuit, AND/OR Operations, NOT Operation, Boolean functions, Postulates, duality Principle, theorems, Precedence operators, canonical Forms for Boolean Functions, Logic circuits, Parallel and Serial adders and Physical devices used to construct gates.

Module 4: COMPUTER ORGANIZATION AND CENTRAL PROCESSING UNIT ORGANIZATION

Computer Organization and Design: Instruction codes, Computer Registers, Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions, Input-Output and interrupt. Central processing unit: Stack organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC), CISC vs. RISC.

Central Processing Unit organization: General Register Organization, Stack organization, Instruction formats, Addressing modes, Data Transfer and Manipulation, Program Control, CISC and RISC processors.

Module 5: MEMORY ORGANIZATION AND INPUT/OUTPUT ORGANIZATION

Memory Organization: Semiconductor Memory Technologies, Memory hierarchy, Interleaving, Main Memory-RAM and ROM chips, Address map, Associative memory-Hardware organization. Match logic. Cache memory-size vs. block size, Mapping functions-Associate, Direct, Set Associative mapping. Replacement algorithms, write policies, Auxiliary memoryMagnetic.

EXPERIENTIAL LEARNING:

- a) Understand the Role of Binary arithmetic in digital computers and perform the following operations.
 - i. Binary Addition
 - ii. Binary Subtraction
 - iii. Binary Multiplication
 - iv. Binary Division
- b) How to represent the following expression into Logic gates and Truth table?

Boolean Expression

$$Q = \overline{(A.B)} . \overline{(A+B)} . C$$

- c) Illustrate the organization of i5 Processors.

RESOURCES:

TEXT BOOKS:

1. V. Rajaraman, NeeharikaAdabala, "Fundamentals of Computers", PHI Learning Private Ltd, 6th Edition, 2015.
2. M. Moris Mano, "Computer System Architecture", 3rd edition, Pearson/PHI, India, 2006.

REFERENCE BOOKS:

1. Priti Sinha, Pradeep K., Sinha"Computer Fundamentals: Concepts, Systems & Applications", 8th Edition, BPB Publications.
2. William Stallings, "Computer Organization and Architecture- designing for performance", 8th edition, Prentice Hall, New Jersey, 2010.

VIDEO LECTURES:

1. https://onlinecourses.swayam2.ac.in/cec19_cs06/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs61/preview

WEB RESOURCES:

1. <https://www.electrical4u.com/binary-arithmetic/>
2. <https://www.youtube.com/watch?v=JQBRzsPhw2w>
- 3.

Course Code**Course Title****22CA102002L DATABASE MANAGEMENT SYSTEMS****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This Course provides theoretical concepts and hands-on experience on Database systems, Database design, Relational model, Relational algebra, SQL queries, Constraints and triggers, PL/SQL, Schema refinement and normal forms, Transaction management, Concurrency control, Overview of storage and indexing.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Analyze and apply the concepts of ER-modelling and normalization to design viable data models for a given problem.
- CO2.** Formulate relational database schemas, apply suitable integrity constraints, for querying databases.
- CO3.** Use SQL to store, query, and manipulate data in relational databases.
- CO4.** Develop PL/SQL blocks to centralize database applications for maintainability and reusability.
- CO5.** Analyze transaction processing, concurrency control and storage methods for database management.
- CO6.** Work Independently and Communicate Effectively in Oral and Written forms.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	2	3	-
CO6	-	-	-	-	-	-	-	-	3	3	-	-	-	-	-
Course Correlation Mapping	2	3	3	2	3	2	-	-	3	3	-	-	2	3	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO DATABASE SYSTEMS AND DATABASE DESIGN

Introduction to Database Systems: Database system applications, Purpose of database systems, View of data - Data abstraction, Instances and schemas, Data models; Database languages - Data Definition Language, Data Manipulation Language; Database architecture, Database users and administrators.

Introduction to Database Design: Database design and ER diagrams, Entities, attributes and entity sets, Relationships and relationship sets, Additional features of ER model, Conceptual Design with ER model.

Module 2: RELATIONAL MODEL AND RELATIONAL ALGEBRA

Relational Model: Creating and modifying relations, Integrity constraints over relations, Enforcing integrity constraints, Querying relational data, Logical database design, Introduction to views, Destroying/altering tables and views.

Relational Algebra: Preliminaries, Relational Algebra operators.

Module 3: SQL AND PL/SQL

SQL: Form of basic SQL query, Nested queries, Aggregate operators, Null values, Complex integrity constraints in SQL, Triggers and active databases.

PL/SQL: Generic PL/SQL block, PL/SQL data types, Control structure, Procedures and functions, Cursors, Database triggers.

Module 4: SCHEMA REFINEMENT AND TRANSACTIONS

Schema Refinement: Problems caused by redundancy, Decompositions, Problems related to decomposition, Functional dependencies, Reasoning about FDs, First normal form, Second normal form, Third normal form, Boyce-Codd normal form, Multivalued dependencies, Fourth normal form, Join dependencies, Fifth normal form.

Transactions: Transaction concept, Transaction atomicity and durability, Concurrent Executions – Serializability, Recoverability, Implementation of isolation, Testing for serializability.

Module 5: CONCURRENCY CONTROL, STORAGE AND INDEXING

Concurrency Control: Lock Based Protocols, Timestamp Based Protocols, Validation Based Protocols, Multiple Granularity, Deadlock Handling.

Storage and Indexing: Data on external storage, File organizations and indexing – Clustered indexes, Primary and secondary indexes; Index data structures – Hash based indexing, Tree based indexing; Comparison of file organizations.

EXPERIENTIAL LEARNING

- 1) Design and analyze an ER-Model for the following use case.

Roadway Travels is in business since 1977 with several buses connecting different places in India. Its main office is in Hyderabad. The company wants to computerize its operations in the following areas:

- a) Reservations
- b) Ticketing
- c) Cancellations

Reservations:

Reservations are directly handled by booking office. Reservations can be made 60 days in advance in either cash or credit. In case the ticket is not available, a wait-listed ticket is issued to the customer. This ticket is confirmed against the cancellation.

Cancellation and Modification:

Cancellations are also directly handled at the booking office. Cancellation charges will be charged. Wait-listed tickets that do not get confirmed are fully refunded.

- 2) a) Implement Single Row functions-Character, Numeric and Date functions.
- b) Implement Data Definition Language commands-Create, Alter, Drop, Truncate, and Rename.
- c) Implement Data Manipulation Language commands-Insert, Select, Update, and Delete.
- 3) Implement various types of integrity constraints-NOT NULL constraint, DEFAULT constraint, UNIQUE constraint, PRIMARY key, FOREIGN key, CHECK constraint.
- 4) a) Implement group functions with different operators such as aggregate operators, group by, having and order by.
- b) Implement nested and correlated nested queries using set operators and set comparison operators.
- 5) a) Creation of views, synonyms, sequence, indexes and save point
- b) Implement various types of joins-outer join and inner join.

Basic PL/SQL:

- 6) Construct PL/SQ block for the following:
- a) To determine whether a number is palindrome
 - b) To determine whether a number is an Armstrong number
 - c) To find greatest of three numbers
 - d) To display Fibonacci series

Control Structures:

- 7) a) Write a programming PL/SQL to update the salary of a specific employee by 8% if the salary exceeds the mid-range of the salary against this job and update up to mid-range if the salary is less than the mid-range of the salary, and display a suitable message.
- b) Write a PL/SQL program to display the description against a student's grade using CASE statement.

Exception Handling:

- 8) a) Develop a PL/SQL program that displays the name and address of a student whose ID is given. If there is no student with the given student ID in the database, the program should raise a run-time exception NO_DATA_FOUND, which should be captured in the EXCEPTION block.
- b) Construct the user-defined exceptions to get the salary of an employee and check it with the job's salary range. If the salary is below the range, raise an exception BELOW_SALARY_RANGE. If the salary is above the range, raise the exception ABOVE_SALARY_RANGE.

Functions:

- 9) a) Write a function that accepts two numbers A and B and performs the following operations.
- Addition
 - Subtraction
 - Multiplication
 - Division
- b) Write a PL/SQL block that updates salary of an employee in Employee table by using in cr function which takes employee number as argument and calculates increment and returns increment based on the following criteria.
- If salary ≤ 3000, increment = 30% of salary
 - If salary > 3000 and ≤ 6000, increment = 20% of salary
 - Else increment = 10% of salary

Procedures:

- 10) a) Write a procedure that accepts two numbers and displays their sum
- b) Write procedures to demonstrate IN, IN OUT and OUT parameters

Cursors:

- 11) a) Write a block in PL/SQL to create a Cursor that displays the employee name and number of jobs he/she has done in the past.
- b) Write a program in PL/SQL to create a cursor to display the name and salary of each employee in the EMPLOYEES table whose salary is less than that specified by a passed-in parameter value.

Triggers:

- 12) Develop a suitable student database application by considering appropriate attributes. Couple of attributes to be maintained is the attendance of a student in each subject for which he/she has enrolled and internal assessment Using TRIGGERS for the following:
 - a) Whenever the attendance is updated, check if the attendance is less than 85%; if so, notify the concerned head of the department.
 - b) Whenever, the marks in an internal assessment test are entered, check if the marks are less than 40%; if so, notify the concerned head of the department.

RESOURCES

TEXT BOOKS:

1. Raghu Ramakrishnan, Johannes Gehrke, *"Database Management Systems,"* McGrawHill, 3rd Edition, 2014.
2. Abraham Silberschatz, Henry. F. Korth, S. Sudarshan, *"Database System Concepts,"* McGrawHill, 7th edition, 2019.

REFERENCE BOOKS:

1. Ivan Bayross, *SQL, PL/SQL: "The Programming Language of Oracle,"* BPB publications, 4th Edition, 2017.
2. Ramez Elmasri, Shamkant B. Navathe, *"Fundamentals of Database Systems",* 7th Edition, Pearson, 2015.
3. Thomas Connolly, Carolyn Begg, *"Database Systems,"* Pearson, 6th edition, 2019.
4. S.K. Singh, *"Database System Concepts, Design and Applications,"* 1st Edition, Pearson Education, 2006.
5. Satish Ansani, *"Oracle Database 11g: Hands-on SQL and PL/SQL,"* PHI, 2010.
6. Dr. Rajiv Chopra, *"Database Management Systems,"* Sultan Chand, 2016.
7. Pranab Kumar Das Gupta, P. Radha Krishna, *"Database Management System Oracle SQL and PL/SQL,"* PHI, 2nd Edition, 2009.

VIDEO LECTURES:

1. https://swayam.gov.in/nd1_noc19_cs46/preview
2. <https://nptel.ac.in/courses/106105175>
3. https://onlinecourses.nptel.ac.in/noc21_cs04/preview
4. <https://www.youtube.com/watch?v=MDQxqYVXiVU>
5. <https://www.youtube.com/watch?v=c5HAWKX-suM>

WEB RESOURCES:

1. <https://www.classcentral.com/course/swayam-introduction-to-database-systems-17660>
2. <https://www.scaler.com/topics/dbms/>
3. https://www.academia.edu/27988617/Database_Management_System_DBMS_Tutorial

4. <https://nptel.ac.in/courses/106104135>
5. <https://downloads.mysql.com/docs/mysql-tutorial-excerpt-5.7-en.pdf>
6. https://docs.oracle.com/cd/E11882_01/server.112/e40540/intro.htm#CNCPT88786

Course Code	Course Title
22CA102001L	PROGRAMMING FOR PROBLEM SOLVING

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on C Programming concepts, Operators and Expressions, Input and Output Functions, Control Structures, Problem Solving Aspects, Arrays and Strings, Functions, Pointers, Structures and Unions and File Handling.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Design algorithms using problem-solving techniques for given problems.
- CO2.** Apply functions and Arrays to enhance reusability and data manipulation.
- CO3.** Develop programs using pointers for efficient memory management.
- CO4.** Apply structures, unions and file handling concepts to develop societal applications.
- CO5.** Work independently or in team to solve problems with effective communications.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	3	-	-	-	-	-	-	-	3	-	-
CO2	3	2	3	2	3	-	-	-	-	-	-	-	3	-	-
CO3	3	2	3	-	3	-	-	-	-	-	-	-	3	-	-
CO4	3	2	3	-	3	-	-	-	-	-	-	-	3	-	-
CO5	3	3	3	2	3	3	-	-	-	-	-	-	3	-	-
Course Correlation Mapping	3	2	3	2	3	3	-	-	-	-	-	-	3	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO C PROGRAMMING

Basics of C Programming: Introduction, Structure of a C program, Concept of a variable,

Data types in C, Program statement, Declaration, Storing the data in memory, Tokens, Operators and expressions, Lvalues and Rvalues, Type conversion in C.

Input and Output: Basic screen and keyboard I/O in C, Non-formatted input and output, formatted input and output functions.

Module 2: CONTROL STATEMENTS AND INTRODUCTION TO PROBLEM SOLVING

Control Statements: Specifying test condition for selection and iteration, Writing test expression, Conditional execution and selection, Iteration and repetitive execution, goto statement, Special control statements, Nested loops.

Introduction to Problem Solving: Algorithms, Flowcharts, Problem solving aspect, Top-down design, Implementation of algorithms, program verification and efficiency of algorithms.

Module 3: ARRAYS & STRINGS AND FUNCTIONS

Arrays and Strings: One-dimensional array – Declaration, Initialization, Accessing elements, operations; Multi-dimensional arrays – Declaration, Initialization, Working with 2D arrays; Strings – Declaration, Initialization, Printing strings, String input, Character manipulation, String manipulation; Arrays of strings – Initialization, manipulating string arrays.

Functions: Concept of function, Using functions, Call by value mechanism, working with functions, passing arrays to functions, Scope and extent, Storage classes, Recursion.

Module 4: POINTERS

Introduction to Pointers: Understanding memory addresses, Address operator (&), Pointer – declaration, Initialization, Indirection operator and dereferencing, Void and Null pointers, Use of pointers, Arrays and pointers, Pointers and strings, Pointer arithmetic, Pointers to pointers, Array of pointers, Pointers to an array, Two-dimensional arrays and pointers, Pointers to functions, Dynamic memory allocation.

Module 5: USER-DEFINED DATA TYPES AND FILES

User-Defined Data Types: Structures - Declaration, Accessing the members, Initialization, typedef and its use, Arrays of structures, Arrays within structure, Structures and pointers, Structures and functions; Unions, Enumeration types, Bitfields.

Files: Using files in C, Working with text and binary files, Direct File Input and Output, Files of records, Random access to files of records.

EXPERIENTIAL LEARNING

1.
 - a) Write a C program to perform the arithmetic operations on two integer numbers.
 - b) Write a program to evaluate the following expressions by reading the necessary values from the keyboard.
 - i. $(ax + b)/(ax - b)$
 - ii. $2.5 \log x + \cos 32^\circ + |x^2 + y^2|$
 - iii. $ax^5 + bx^3 + c$
 - iv. ae^{kt}
2.
 - a) Write a C program to find the roots of a quadratic equation.
 - b) In a town, the percentage of men is 52. The percentage of total literacy is 48 and the total percentage of literate men is 35 of the total population. Write a C program to find the total number of illiterate men and women if the population of the town is 7000.

3.
 - a) Write a C Program to compute an electricity bill based on the following slab rates.

Consumption units	Rate (in Rupees/unit)
0-100	4.0
101-150	4.6
151-200	5.2
201-300	6.3
Above 300	8.0

(**Hint:** Take current and old meter readings from the user to get consumption units)

- b) An insurance company computes the premium amount based on the following;
 - i. If a person's health is excellent and the person is between 25 and 35 years of age and lives in a city, and is a male then the premium is Rs.4 per thousand and the policy amount cannot exceed Rs.2 lakhs.
 - ii. If a person satisfies all the above conditions and is female then the premium is Rs.3 per thousand and the policy amount cannot exceed Rs.1 lakh.
 - iii. If a person's health is poor and the person is between 25 and 35 years of age and lives in a village and is a male then premium is Rs.6 per thousand and the policy cannot exceed Rs. 10000.
 - iv. In all other cases the person is not insured.

Write a C program to determine whether the person should be insured or not, his/her premium rate and maximum amount for which he/she can be insured.

- c) Write a C Program to find the grade for a student using a Switch case. The user needs to enter a subject score (varies from 0 to 100) and then display the grade as described below.

Score	Grade	Score	Grade
> = 90	O	>=50 to< 60	D
>=80 to< 90	A	>=40 to< 50	E
>=70 to< 80	B	< 40	Fail
>=60 to< 70	C		

4. a) A Fibonacci sequence is defined as follows:

The first and second terms in the sequence are 0 and 1. Sub-sequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.

- b) Write a C program to find the sum of individual digits of a positive integer.
- c) Write a C program to read two numbers x and n , and then compute the sum of the geometric progression: $1+x+x^2+x^3+\dots+x^n$. Show appropriate error message for $n<0$. (Example: if n is 3 and x is 5, then the sum is: $1+5+25+125$)
- d) Write a C program to print the following pattern.

```

                1
              1  2  1
            1  2  3  2  1
          1  2  3  4  3  2  1
        1  2  3  4  5  4  3  2  1

```

5. a) Write a C program to find both the largest and smallest numbers in a list of integers.
- b) Write a C program that uses function to perform the following:
- i) Addition of Two Matrices ii) Multiplication of Two Matrices
6. a) Write a C program to insert a sub-string in to a main string at a given position.
- b) Write a C program to count the lines, words and characters in a given text.
7. a) Write a C program to generate all the prime numbers between 1 and n , where n is a value entered by the user. Define a separate function to generate prime numbers.
- b) Write C program that uses recursive function to find the following.
- i) Factorial of a given integer ii) GCD of two given integers
8. a) Write a C program to print the elements of an array in reverse order using pointers.
- b) Write a C program to count the number of vowels and consonants in a string using pointers.

- c) Write a C program to store n elements in an array and print the elements in sorted order using pointers.
9. a) Write a C program that performs the following operations:
 - i. Reading a complex number ii. Writing a complex number
 - iii. Addition of two complex numbers iv. Multiplication of two complex numbers

(**Note:** Represent complex number using a structure.)
- b) Define a structure to store employee details include *Employee-Number*, *Employee-Name*, *Basic-pay*, *Date-of-Joining*. Write a C program for the following.
 - i. A function to store 10 employee details.
 - ii. A function to implement the following rules while revising the basic pay.

If $\text{Basic-pay} \leq \text{Rs.}5000$ then increase it by 15%.

If $\text{Basic-pay} > \text{Rs.}5000$ and $\leq \text{Rs.}25000$ then it increase by 10%.

If $\text{Basic-pay} > \text{Rs.}25000$ then there is no change in Basic-pay.
 - iii. A function to print the details of employees who have completed 20 years of service from the Date-of-Joining.
- 10 a) Write a C program to reverse the first n characters of a given text file.
- b) Write a C program to merge two files into a new file.
- 11 Develop a phone book application to save users contact information include name, mobile number and email id as well as to edit and delete contact details.

RESOURCES

TEXT BOOKS:

1. Pradip Dey and Manas Ghosh, "*Programming in C*," Oxford University Press, New Delhi, 2nd Edition, 2013.
2. R. G. Dromey, "*How to Solve it by Computer*," Pearson Education, 1st Edition, 2013.

REFERENCE BOOKS:

1. Byron S Gottfried and Jitender Kumar Chhabra, "*Programming with C*," 4th Edition, McGraw Hill Education, 2019.
2. Yashavant Kanetkar, "*Let Us C*," 5th Edition, BPB Publications, 2017.
3. E. Balagurusamy, "*Programming in C*," McGraw Hill Education Pvt, Ltd, New Delhi, 7th Edition, 2017.
4. Behrouz A. Forouzan and Richard F. Gilberg, "*Computer Science: A Structured Programming Approach Using C*," Cengage Learning, 3rd Edition, 2008.

SOFTWARE/TOOLS:

1. Software: Turbo C++/Dev C++

VIDEO LECTURES:

1. <https://www.digimat.in/nptel/courses/video/106105171/L03.html>
2. <https://nptel.ac.in/courses/106104128>

WEB RESOURCES:

1. Learn C Programming - <https://www.programiz.com/c-programming>
2. Learn C Programming - <https://www.tutorialspoint.com/cprogramming/index.htm>
3. C Programming Exercises, Practice, Solution - <https://www.w3resource.com/c-programming-exercises/>
4. Basic programming exercises and solutions in C - <https://codeforwin.org/2015/05/basic-programming-practice-problems.html>
5. C Programming Exercises, Practice, Solution - <https://www.w3resource.com/c-programming-exercises/>
6. Basic programming exercises and solutions in C - <https://codeforwin.org/2015/05/basic-programming-practice-problems.html>

Course Code

COURSE TITLE

22CM101403L INNOVATION AND DESIGN THINKING

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course introduces design thinking in product innovation. This course is intended to familiarize product design process, introduce the basics of design thinking, to bring awareness on idea generation, to familiarize the role of design thinking in services design.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Demonstrate fundamental knowledge of Design thinking.

CO2. Analyze characteristics of successful product development

CO3. Demonstrate knowledge on Idea generation techniques

CO4. Analyze the process of design thinking for services.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	2	1	-	-	-	-	-	-	-	-	-	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO DESIGN

Introduction to design, characteristics of successful product development, product development process, identification of opportunities, product planning, Innovation in product development.

Module 2: DESIGNING THINKING

Design Thinking: Introduction, Principles, the process, Innovation in Design Thinking, benefits of Design thinking, design thinking and innovation, case studies.

Module 3 IDEA GENERATION

Idea generation: Introduction, techniques, Conventional methods, Intuitive methods, Brainstorming, Gallery method, Delphi method, Synectics etc., case studies

Module 4 DESIGN THINKING IN INFORMATION TECHNOLOGY

Design Thinking in Business process model, Design Thinking for agile software development, virtual collaboration, multi user and multi account interaction, need for communication, TILES toolkit, Cloud implementation.

Module 5 DESIGN THINKING FOR SERVICE DESIGN

How to design a service, Principles of service design, Benefits of service design, Service blueprint, Design strategy, organization, principles for information design.

EXPERIENTIAL LEARNING

1. What data-driven insights can help us evolve our product?
2. How can we gather ongoing feedback to drive future enhancements?

RESOURCES

TEXT BOOKS:

1. Lagerfeld Kilian., "Design Thinking for Beginners", 1st Edition, Personal Growth Hackers, 2020.
2. PavanSoni, "Design Your Thinking: The Mindsets, Toolsets and Skill Sets for Creative Problem-Solving", 2nd Edition, Penguin Random House India Private Limited, 2020.
3. Marc stickdorn and Jacob Schneider, This is Service Design Thinking, Wiely, 2011

REFERENCE BOOKS:

1. Walter Brenner and Falk Uebernickel, "*Design Thinking for Innovation Research*", 1stEdition, Springer, 2016.
2. GK Van Patter and Garry K. VanPatte, "*Rethinking Design Thinking: Making Sense of the Future*", 1stEdition, Humantific Publishing, 2020.

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=4nTh3AP6knM>
2. <https://www.youtube.com/watch?v=NRQLlnGIKk>

WEB RESOURCES

1. <https://web.stanford.edu/~mshanks/MichaelShanks/files/509554.pdf>
2. https://www.tutorialspoint.com/hi/design_thinking/design_thinking_tutorial.pdf
3. <http://www.algarytm.com/it-executives-guide-to-design-thinking:e-book>

Course Code**Course Title****22MM101409L****NUMERICAL ANALYSIS, PROBABILITY AND STATISTICS****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This course aims to provide an understanding the numerical solutions of linear and nonlinear equations, Numerical techniques of interpolation in various intervals, Numerical techniques of differentiation and Integration. The course also provides an introduction to probability and statistics, random variables, mathematical expectations, distributions, correlation and regression.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Solve equations, derivatives and integrals through numerical methods for the given data.
- CO2.** Identify the types of random variables and determine their mathematical expectation & probabilities.
- CO3.** Apply the concept of probability distributions to solve computing problems.
- CO4.** Apply the concepts of Correlation and Regression in result analysis and Business forecasting.

CO-PO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	3	1	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	3	3	-	3	1	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	2	1	-	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	3	3	-	3	1	-	-	-	-	-	-	-	-	-	-

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

Module 1: NUMERICAL SOLUTIONS OF EQUATIONS

Solutions of Algebraic and Transcendental Equations: Bisection Method, Regula-falsi method, Newton-Raphson Method.

Systems of linear algebraic equations: Gauss elimination method, Gauss-Seidel methods, Gauss-Iteration methods.

Module 2: INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION

Interpolation: Finite differences: Forward and backward differences, Newton's forward and backward interpolation formula, Divided difference: Newton's divided difference formula, Lagrange's interpolation formula.

Numerical differentiation, Integration: Numerical differentiation using forward and backward interpolation formula, Numerical integration using Trapezoidal and Simpson's rules.

Module 3: RANDOM VARIABLES

Introduction to Probability, Random variables, Discrete and continuous random variables, Distribution function of random variables, Properties, Probability mass function, Probability density function, Mathematical expectation, Properties of mathematical expectation, Mean and Variance.

Module 4: PROBABILITY DISTRIBUTIONS

Binomial Distribution, Poisson distribution, Normal distribution - Mean, Variance, Standard deviation.

Module 5: CORRELATION AND REGRESSION

Introduction to simple correlation, Covariance, Correlation between two variables, Scatter diagram and its utility, Karl Pearson's coefficient of correlation Computation, Spearman's rank correlation coefficient, Estimation of regression lines.

EXPERIENTIAL LEARNING

1. Solve the following the system of equations by Gauss- Jordan iterative method correct to three decimal places.
$$X + Y + 5Z = 110; 27X + 6Y - Z = ; 6X + 15Y + 2Z = 72.$$
2. If X is a normally distributed with mean 70 and standard deviation 16, find
 $P(38 \leq X \leq 46)$ (ii) $P(82 \leq X \leq 94)$ (iii) $P(62 \leq X \leq 86)$.

RESOURCES

TEXT BOOKS:

1. B. S. Grewal, *Higher Engineering Mathematics*, Khanna publishers, 44th edition, 2017.
2. J. Ravichandran, *Probability and Statistics for Engineers*, Wiley India, 1st Edition, 2019.

REFERENCE BOOKS:

1. Richard A Johnson, Miller and Freund's *Probability and Statistics for Engineers*, Prentice Hall of India, 8th Edition, 2011.
2. M. K. Jain, S.R.K Iyengar, R. K. Jain, *Numerical Methods for Scientific & Engineering Computation*, New Age International Publishers, 6th Edition, 2012.
3. G. Shankar Rao, *Numerical Analysis*, New Age International Publishers, 5th Edition, 2018.
4. S.S. Sastry, *Introductory Methods of Numerical Analysis*, Prentice Hall of India, 5th Edition 2012.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/127106019>
2. <https://nptel.ac.in/courses/111106112>
3. <https://nptel.ac.in/courses/111105041>
4. <https://nptel.ac.in/courses/111106112>

WEB RESOURCES:

1. <https://www.pdfdrive.com/introductory-methods-of-numerical-analysis-by-ss-sastry-d148704487.html>
2. https://faculty.ksu.edu.sa/sites/default/files/probability_and_statistics_for_engineering_and_the_sciences.pdf
3. <http://brharnetc.edu.in/br/wp-content/uploads/2018/11/21.pdf>
4. <http://www.mi.sanu.ac.rs/~gvm/Teze/Numerical%20methods%20In%20Computational%20Engineering.pdf>

Course Code	Course Title
22CA105001L	COMPUTER HARDWARE AND SYSTEM ESSENTIALS

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on internal components of a computer, assemble a computer system, install an operating system, and troubleshoot using system tools and diagnostic software. Students will also be able to understand various network cables, connectors and TCP/IP networks, and work group.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1** Identify different hardware components on personal computer and peripheral devices.
- CO2** Create network architecture using TCP and UDP protocols for data transmission.
- CO3** Devise the solutions for the problems occurred in personal computer in Operating Systems.
- CO4** Implement the functionalities of different peripheral devices and networks by configuring multi-functional devices.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	1	1	-	-	-	-	-	-	-	-	-	3
CO2	3	-	3	-	1	-	-	-	-	-	-	-	-	-	3
CO3	3	-	3	1	2	-	-	-	-	-	-	-	-	-	3
CO4	3	2	3	1	-	-	-	-	-	-	-	-	-	-	3
Course Correlation Mapping	3	3	3	1	1	-	-	-	-	-	-	-	-	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

EXPERIENTIAL LEARNING

HARDWARE CONFIGURATION

1. Peripherals of the computer
2. Implement the following activities:
 - a) Configure settings using BIOS/UEFI tools on a PC.
 - b) Identify different components of mother board
 - c) Analyze various RAM types, PC extensions cards and storage devices
3. Implement the following activities:
 - a) Identify various CPU's, cooling methods and PC connection interfaces
 - b) Identification of various power supply, display devices and common PC Connectors
 - c) Install and configure common peripheral devices and SOHO multi-function device

PC Networking using Packet Tracer

Network Types and Components, Topologies, Wired and Wireless Transmission, Protocols.

4.
 - a) Identify various types of network cables and connectors and characteristics
 - b) Implement the following characteristics of TCP/IP
 - i) IPv4 and IPv6
 - ii) Client side DNS Settings
5.
 - a) Identify following TCP and UDP Ports
 - i) 21-FTP
 - ii) 443-HTTPS
 - iii) 80-HTTP
 - iv) Telnet
 - b) Analyze the following TCP and UDP protocols
 - i) SMD
 - ii) SNMP
 - iii) DHCP
6.
 - a) Configure the following network types
 - i) LAN
 - ii) WAN
 - iii) WLAN
 - b) Configure network architecture using the following
 - i) HUB
 - ii) Switch
 - iii) Router

OPERATING SYSTEMS

Introduction to Operating System, Characteristics of Operating System, Types of Operating System and its components

7. Installation of Windows Operating System
8. Installation of Application and Device Drivers management

TROUBLESHOOTING

Introduction to trouble shooting, Hardware and Software Trouble shooting

9.
 - a) Study the common problems related to the following
 - i) Mother Board
 - ii) RAM
 - iii) CPU
 - iv) Power
 - b) Troubleshoot the following failures
 - i) Read/Write Failure
 - ii) Slow Performance
 - iii) Failure to boot
10. Trouble Shoot the following symptoms of Video, projector and display issues
 - i) VGA Mode
 - ii) No Image of Screen
 - iii) Dead Pixels
 - iv) Color patterns
11. Trouble shoot the following issues of wired, wireless and mobile devices
 - i) No Connectivity
 - ii) IP conflict
 - iii) Ghost Cursor
 - iv) Sticking Keys

RESOURCES

REFERENCES:

1. David Anfinson, Allan Johnson and Kathleen Czurda, *IT Essentials v7 Companion Guide*, CISCO Press, 2020
2. Brian W. Kernighan, *Understanding the Digital World: What You Need to Know about Computers, the Internet, Privacy, and Security*, Second Edition, Princeton University Press, 2021
3. Kavin Wilson, *Exploring Computer Systems: The Illustrated Guide to Understanding Computer Systems, Hardware & Networks*, Elluminent Press, 2019

SOFTWARE/TOOLS:

1. Windows 8/10 operating systems
2. Cisco Packet Tracer

VIDEO LECTURES:

1. <https://www.edx.org/course/computer-hardware-and-operating-systems>
2. <https://www.coursera.org/learn/computer-hardware-software>

WEB RESOURCES:

1. <https://www.cisco.com/c/en/us/td/docs/ios-xml/ios/interface/configuration/15-s/ir-15-s-book.pdf>
2. <https://www.certexams.com/comptia/a+/cert-notes-aplus-networking.htm>
3. <https://www.rcboe.org/cms/lib/GA01903614/Centricity/Domain/4399/Network%20n10-007.pdf>
4. <https://www.tutorialsworld.com/CertNotes/CompTIA-cert/A+/aplu-prac-10.htm>

Course Code**Course Title****22CA101004L****COMPUTER COMMUNICATION****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This course covers basic concepts of data communications, data and signals in Computer communication. Layered Tasks, The OSI Model, TCP/IP Protocol Suite and addressing are used for network modelling. Analog and Digital Signals are used for transmitting of data without attenuation, Distortion and Noise. Multiplexing and Spread spectrum for reliable bandwidth utilization along with IEEE standards and protocols.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Demonstrate concepts of data communications, data and signals, network models and protocols & standards in Computer communication.
- CO2.** Apply digital-to-digital conversion, analog-to-digital conversion, digital-to-analog conversion, analog-to-analog conversion for reliable data communication.
- CO3.** Analyze network models, analog and digital signals, periodic analog signals, digital signals, digital transmission, transmission modes and analog transmission for transmitting the data over Communication channel.
- CO4.** Use multiplexing for bandwidth utilization, protocols & standards and Wired LANs(Ethernet) IEEE standards in Computer communication in compliance with communication standards

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO2	3	2	3	-	3	-	-	-	-	-	-	-	-	-	3
CO3	3	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO4	3	2	2	-	3	3	-	-	-	-	-	-	-	-	3
Course Correlation Mapping	3	3	3	-	3	3	-	-	-	-	-	-	-	-	3

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

Module 1: DATA COMMUNICATIONS AND PROTOCOLS & STANDARDS

Concepts of Data Communications: Components, Data Representation, Dataflow

Networks: Distributed Processing, Network Criteria, Physical Structures, Network Models, Categories of Networks, Interconnection of Networks.

PROTOCOLS AND STANDARDS: Protocols, Standards, Standards Organizations, Internet Standards.

Module 2: NETWORK MODELS

Layered Tasks: Sender, Receiver, Carrier, Hierarchy.

The OSI Model: Layered Architecture, Peer-to-Peer Processes, Encapsulation.

TCP/IP Protocol Suite: Physical and Data Link Layers, Network Layer, Transport Layer, Application Layer.

Addressing: Physical Addresses, Logical Addresses, Port Addresses, Specific Addresses.

Module 3: DATA AND SIGNALS

Analog and Digital: Analog and Digital Data, Analog and Digital Signals, Periodic and Non-periodic Signals.

Periodic Analog Signals: Sine Wave, Phase, Wavelength, Time and Frequency Domains, Composite Signals, Bandwidth.

Digital Signals: Bit Rate, Bit Length, Digital Signal as a Composite Analog Signal, Transmission of Digital Signals.

Transmission Impairment: Attenuation, Distortion, Noise.

Module 4: DIGITAL TRANSMISSION

Digital-To-Digital Conversion: Line Coding, Line Coding Schemes, Block Coding, Scrambling.

Analog-To-Digital Conversion: Pulse Code Modulation (PCM), Delta Modulation(DM).

Transmission Modes: Parallel Transmission, Serial Transmission, Analog Transmission.

Digital-To-Analog Conversion: Aspects of Digital-to-Analog Conversion, Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Quadrature Amplitude Modulation.

Analog-To-Analog Conversion: Amplitude Modulation, Frequency Modulation, Phase Modulation.

Module 5: BANDWIDTH UTILIZATION: MULTIPLEXING AND SPREADING

Multiplexing: Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Time-Division Multiplexing

Wired LANs(Ethernet):IEEE STANDARDS :Data Link Layer, Physical Layer; STANDARD ETHERNET : MAC Sublayer , Physical Layer; Changes in the standard :Bridged Ethernet , Switched Ethernet , Full-Duplex Ethernet

EXPERIENTIAL LEARNING

1. Configure Peer - to - peer network with at least three hosts.
2. Create desired standard network cable including Cross cable and test it by using cable tester.
3. Establishing Connection of Computers Using Wireless Media

RESOURCES

TEXT BOOK:

1. Behrouz A. Forouzan, "*Data Communications and Networking*", 5th Edition, Tata McGraw-Hill, 2013.

REFERENCE BOOKS:

1. William Stallings, "*Data and Computer Communications*", 10th Edition, Prentice-Hall, 2013.
2. Alberto Leon-Garcia and Indra Widjaja, "*Communication Networks - Fundamental Concepts and Key architectures*", 2nd Edition, Tata McGraw-Hill, 2004.
3. William Stallings, "*Data and Computer Communication*", 8th Edition, Pearson Education, 2007.
4. Larry L. Peterson and Bruce S. Davie, "*Computer Networks – A Systems Approach*", 4th Edition, Elsevier, 2007.
5. Nader F. Mir, "*Computer and Communication Networks*", Pearson Education, 2007.

SOFTWARE/TOOLS:

1. UTP/STP cable.
2. Connector (Mainly RJ45 connector)
3. Networks toolkit (Mainly Crimping tool.)
4. Line tester or cable tester.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106105082> : Layered Architectures
2. <https://www.digimat.in/nptel/courses/video/106105082/L35.html>
3. <https://nptel.ac.in/courses/106105082> : Data and Signals
4. <https://nptel.ac.in/courses/106105082> : Digital Signal
5. <https://nptel.ac.in/courses/106105082> : Analog Signals
6. <https://www.digimat.in/nptel/courses/video/106105082/L28.html>

WEB RESOURCES:

1. <https://ncert.nic.in/textbook/pdf/lecs111.pdf>
2. <http://eti2506.elimu.net/Introduction/Books/Data%20Communications%20and%20Networking%20By%20Behrouz%20A.Forouzan.pdf>

Course Code	Course Title
22CA102004L	DATA STRUCTURES
Pre-Requisite	-
Anti-Requisite	-
Co-Requisite	-

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on data structure concepts like arrays, stack, queues, trees, graphs and real-time applications of data structures. This course also examines algorithms for sorting, searching graphs, hashing.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Analyze and develop solutions using linear data structures such as arrays, linked lists for efficient data organization and manipulation.
- CO2.** Analyze, implement and conduct investigations on data structures such as trees, graphs, hash tables for efficient search and retrieval of data.
- CO3.** Select and apply appropriate techniques for searching and sorting problems.
- CO4.** Apply knowledge to select appropriate data structures for modelling information in data.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: LINKED LISTS

Overview of data structures and algorithms, Linear and non-linear data structures, Big O notation, Linked lists Definition, Operations; Single linked lists, Circular linked lists, Doubly linked lists, Sorted lists, Linked lists efficiency, Applications of linked lists.

Module 2: STACKS AND QUEUES

Stacks: Definition, Operations, Implementation using arrays and linked lists, Applications Reversing a word, Delimiter matching, Parsing arithmetic expressions.

Queues: Definition, Operations, Applications, Implementation using arrays and linked lists, Circular queue, Double-ended queues, Priority queues.

Module 3: BINARY TREES AND SEARCH TREES

Tree terminology, Binary trees, Trees represented as arrays, Binary search trees - Concepts, Advantages, Operations, Finding maximum and minimum values, Efficiency; Balanced and unbalanced trees, AVL search trees Concepts, Operations; Red-Black trees Concepts, Rotations, Inserting a node, Efficiency.

Module 4: SEARCHING AND SORTING

Searching: Linear search, Binary search.

Sorting: Bubble sort, Selection sort, Insertion sort, Sorting objects, Shell sort, Partitioning, Quick sort, Merge sort, Heap sort, radix sort, count sort, enumeration sort.

Module 5: GRAPHS AND HASHING

Graphs: Concepts, Representation, Operations, Depth-first search, Breadth-first search, Minimum spanning trees.

Hashing: Introduction, Open addressing, Separate chaining, Characteristics of good hash functions - Quick computation, Random and Non-random keys, Folding; Hashing efficiency.

EXPERIENTIAL LEARNING

1. A college has N number of students and the following details of all the students are maintained – register number, name, branch, phone number. Write a program to store the details of the students using a singly linked list. Develop functions to perform the following operations on the data.
 - a) Insert new student's details
 - b) Display the details of the students
 - c) Display the total number of students

- d) Delete a given student's information
2. Department of CSE has readers club named 'Aalochana'. Students can be granted membership in readers club on their request. Similarly, one may cancel their membership of the club. Members of the club can rent books from the club. Write a program to create data structure to maintain readers club members information (Hall ticket number, name) using singly linked list. In singly linked list, the header node should store details of head of readers club and last node should store details of in-charge of readers club. Develop functions to perform the following operations on the data.
 - a) Store details of head and in-charge of the readers club
 - b) Grant and cancel memberships of students
 - c) Display total number of members
 - d) Display the details of the members
 - e) Display the sorted list of details of the members (sort based on their names in alphabetical order)
3. A company has N number of employees and it maintains the following details of each of its employees: ID, department, salary, phone number. Develop a menu driven program using doubly linked list to store the employees' data. Develop functions to perform the following operations on the data.
 - a) Add and delete employees
 - b) Display total number of employees
 - c) Display details of employees with salary more than Rs. 50,000
 - d) Display the phone number of the employee given the ID
4. a) Alexa has two stacks of non-negative integers, stack and stack where index denotes the top of the stack. Alexa challenges Nick to play the following game:
 - i. In each move, Nick can remove one integer from the top of either stack.
 - ii. Nick keeps a running sum of the integers he removes from the two stacks.
 - iii. Nick is disqualified from the game if, at any point, his running sum becomes greater than some integer max_sum given at the beginning of the game.
 - iv. Nick's final score is the total number of integers he has removed from the two stacks.
 - b) Write a program to check whether a string is palindrome or not using stack data structure.
 - c) Mostly syntax errors in a computer program arise due to unbalanced braces (such as (), {}, []). Write a program using stack to check whether a given expression has balanced braces or not.
5. a) Develop a menu driven program to perform the following operations on a queue of characters (Array and linked list implementations of queue with maximum size MAX)
 - i) Insert an element
 - ii) Delete an element
 - iii) Display the status
 - iv) Demonstrate overflow and underflow situations (in array implementation)
 - b) A restaurant based on its human resources can accept a maximum of N number of food orders. The food orders are served in first come first serve basis. The food orders once placed cannot be cancelled. Write a program to simulate the food ordering and

serving system in the restaurant using circular queue.

6. Write a program to perform the following operations on the binary search tree.
 - a) Construct binary search tree by inserting the values {6, 9, 5, 2, 8, 15, 24, 14, 7, 8, 5, 2} in the given order.
 - b) Display the nodes of the tree using inorder, preorder and postorder traversal techniques.
 - c) Display the smallest number stored in the tree.
 - d) Search the tree for a given number.
7. There are train paths between cities. If there is a train between city A and city B then there is a route between the cities. The cost of the route is the distance between city A and city B. Represent the train travel route information as a graph. The node can be represented by the name of the city. Write a program to perform the following operations.
 - a) Store the details of train travel route information using adjacency list or adjacency matrix representation.
 - b) Traverse the graph and display the details of all trains between the cities along with the cost using breadth-first method.
 - c) Traverse the graph and display the details of all trains between the cities along with the cost using depth-first method.
8. Store register numbers of students who attended placement training program in a random order in an array. Write a function to search whether a student has attended placement training program or not using
 - a) Linear search
 - b) Binary search
9. A list of customer names could be sorted into alphabetical order by surname, or a list of people could be put into numerical order by age. Sorting a list of items can take a long time, especially if it is a large list. A computer program can be created to do this, making sorting a list of data much easier. Apply proper sorting mechanisms like quick and shell to sort the data.
10.
 - a) Write a program to sort a given set of integers using merge sort.
 - b) Write a program to read the marks obtained by students in a mathematics examination and store the data using a heap data structure. Find out the maximum and minimum marks obtained by the students.
11. Apply suitable data structure concepts (like hashing) for mapping large chunks of data into small tables.
 - a) Separate Chaining Method
 - b) Open Addressing Method
12. Consider an online movie ticket booking system through which customers can book tickets to watch movies at theatres. The database stores the details of each transaction of ticket booking with the details - ID, customer name, customer phone number, movie name, theatre name, date of show, time of show, number of tickets booked, starting seat number, total amount. Write a menu driven program to perform create the database and given an ID, display a client's phone number. Use a hash table implementation to quickly search through the database.

RESOURCES

TEXT BOOKS:

1. Robert Lafore, "*Data Structures & Algorithms in Java*," 2nd Edition, Pearson, 2007.
2. Goodrich, Tamassia, Goldwasser, "*Data structures & Algorithms in Java*," 6th Edition, Wiley, 2014.

REFERENCE BOOKS:

1. John R. Hubbard, "*Programming with Java*," McGraw Hill, 2nd Edition, 2009.
2. Debasis Samanta, "*Classic Data Structures*," Prentice Hall, 2nd Edition, 2009.

SOFTWARE/TOOLS:

1. Software: J2SDK 1.7
 - **Eclipse or Net beans**
2. Java compatible web browser

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106105175>
2. <https://www.edx.org/course/introduction-to-data-structures>
3. <https://github.com/suhassrivats/Udacity-Data-Structures-and-Algorithms>
4. <https://www.linkedin.com/learning/programming-foundations-algorithms>

WEB RESOURCES:

1. <https://www.javatpoint.com/data-structure-tutorial>
2. <https://medium.com/javarevisited/10-data-structure-and-algorithms-articles-programmer-should-read-this-week-585404a9403b>
3. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_algorithms_pdf_version.html
4. <https://www.w3schools.in/data-structures/intro>
5. https://www.tutorialspoint.com/data_structures_algorithms/data_structures_algorithms_tutorial.pdf
6. <https://lecturenotes.in/subject/81/data-structure-using-c-ds>
7. <https://code.tutsplus.com/series/data-structures-succinctly-part-1--cms-551>
8. <https://www.geeksforgeeks.org/data-structures/>
9. <https://visualgo.net/en>

Course Code	Course Title
22CA102005L	PYTHON PROGRAMMING
Pre-Requisite	PROGRAMMING FOR PROBLEM SOLVING
Anti-Requisite	-
Co-Requisite	-

COURSE DESCRIPTION: This course provides a detailed discussion and hands-on experience on Basics of Python programming, Control structures, Sequences, Sets, Dictionaries, Regular expressions, Functions, File handling, Object-oriented programming, Exception handling.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Demonstrate knowledge on Python constructs, sequences, sets and dictionaries to solve basic computational problems.
- CO2.** Apply the concepts of regular expressions for searching patterns in strings.
- CO3.** Develop and use Python modules to provide solutions to problems.
- CO4.** Apply the knowledge of file operations in Python for file processing.
- CO5.** Design applications using object-oriented programming features – encapsulation, inheritance, polymorphism and exception handling.
- CO6.** Work independently to solve problems with effective communication.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	3	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	3	-	-	-	-	-	-	-	3	-	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO4	3	2	2	2	3	-	-	-	-	-	-	-	3	-	-
CO5	3	3	3	3	3	-	-	-	-	-	-	-	3	-	-
CO6	-	-	-	-	-	-	-	3	3	-	-	-		-	-
Course Correlation Mapping	3	3	3	3	3	-	-	3	3	-	-	-	3	-	-

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO PYTHON PROGRAMMING

Introduction to Python, Tokens, Variables, Literals, Identifiers, Keywords, Special symbols, Operators, Fundamental datatypes, Expressions, Type conversions, Handling Input and output in Python.

Module 2: CONTROL STRUCTURES

Selection Statements: if statement, if-else statement, if-elif-else statement, nested-if statement.

Iterative Statements: while loop, for loop, break statement, continue statement, pass and else statements used with loops.

Module 3 SEQUENCES, SETS, DICTIONARIES AND REGULAR EXPRESSIONS

Sequences: Lists and operations – Creating, Inserting elements, Updating elements, Deleting elements, Searching and sorting, List comprehensions, Nested lists; Tuples – Creating, Searching and sorting, Nested tuples; Strings – Initializing a string and string operations, String handling methods, String formatting.

Sets: Set creation, Set operations.

Dictionaries: Operations on dictionaries, Dictionary methods, Sorting elements using lambdas.

Regular Expressions: Regular expressions, Sequence characters in regular expressions, Quantifiers in regular expressions, Special characters in regular expressions.

Module 4 FUNCTIONS AND FILE HANDLING

Functions: Need for functions, Function definition, Function call, Variable scope and lifetime, Return statement, Positional arguments, Keyword arguments, Default arguments and variable length arguments, Recursive functions, Lambda functions, Generators.

File Handling: Types of files, Opening and closing files, Reading and writing data.

Module 5 OBJECT ORIENTED PROGRAMMING AND EXCEPTION HANDLING

Object Oriented Programming: Introduction to object-oriented programming, Classes and objects, Inheritance and polymorphism, Abstract Classes and interfaces.

Exception Handling: Errors in a python program, Exceptions, Exception handling, Types of exceptions, Except block, Assert statement, User defined exceptions.

EXPERIENTIAL LEARNING

1. Design a python script to perform the various computations for the amount payable by the customer for Challenger Computers Store. A customer buying two numbers of SSD device, one SSD device cost is Rs. 3575/-. The stores offer 15% of the total cost. The customer has to pay 9% CGST, and 9% SGST. Prepare the Net Amount to be payable by the customer.
2. Design a python script to compute and generate the electricity bill as per the following slab rates. Collect the meter reading inputs, such as current unit and previous unit.

Consumption Units	Rate (in Rupees/Unit)
0-200	3.0
201-250	4.5
251-300	5.2
301-400	6.5
Above 400	7.0

3. Design a python script to display the sum of numbers divisible by 4. The code must allow the user to accept a number and add it to the sum if it is divisible by 4. It should repeatedly accepting numbers as long as the user wants to provide an input using an appropriate iterative statement and should display the final sum.
4. Food Corner home delivers vegetarian and non-vegetarian combos to its customer based on order. A vegetarian combo costs Rs.120 per plate and a non-vegetarian combo costs Rs.150 per plate. Their non-veg combo is really famous that they get more orders for their non-vegetarian combo than the vegetarian combo. Apart from the cost per plate of food, customers are also charged for home delivery based on the distance in kms from the restaurant to the delivery point. The delivery charges are as mentioned below:

Distance in kms	Delivery charge in Rs per km
For first 3kms	0
For next 3kms	3
For the remaining	6

Given the type of food, quantity (no. of plates) and the distance in kms from the restaurant to the delivery point, write a python program to calculate the final bill amount to be paid by a customer. The below information must be used to check the validity of the data provided by the customer.

- Type of food must be 'V' for vegetarian and 'N' for non-vegetarian.
- Distance in kms must be greater than 0.
- Quantity ordered should be minimum 1.
- If any of the input is invalid, bill amount should be considered as -1.

5.
 - a) A list has the AP City Names [Tirupati, Kurnool, Kadapa]. Design a python script and perform the operations like, add 3 more AP City names Chittoor, Nellore, Guntur, insert Hyderabad in 3rd position, delete any two city names, update all city names as in Uppercase. Displays the list data, whenever an operation completes.
 - b) Design a python script for given an integer tuple, for each element in the tuple, check whether there exists a smaller element on the next immediate position of the tuple. If it exists print the smaller element. If there is no smaller element on the immediate next to the element then print -1.

Example: Input: 4 2 1 5 3 Output: 2 1 -1 3 -1

6.
 - a) Sets n1 has the data {1, 3, 5, 7, 9}, n2 has the data {9, 5, 6, 8},
 wd1=set(["Mon", "Tue", "Wed", "Thu", "Fri", "Sat", "Sun"]),
 wd2=set(["Mon", "Tue", "Wed"]).

Design a python script to perform intersection, difference, and symmetric difference operations on the sets n1 and n2, and to perform superset, and subset operations on the sets wd1, and wd2.

- b) The dictionary city_pin has the data {'Tirupati': 517101, 'Hyderabad': 500002, 'Chittoor': 517001, 'Nellore': 524001}. Design a python script using lambda function to sort the dictionary on city name and produce the output and sort the dictionary on pincode and produce the output.
 - c) The string has the data, Wel_str = "Welcome to AI ML DS". Design a python script to search the pattern "AI" using regular expression search and display the three location numbers of the pattern. First shows the pattern starts location, second shows the pattern end location, and the last shows pattern span locations.
7.
 - a) Design a python script for the mathematical puzzle, Towers of Hanoi. The puzzle has three rods and n disks. To move the entire stack to another rod, obeying the three rules (i) Only one disk can be moved at a time, (ii) Each move consists of taking the upper disk from one of the stacks and placing it on top of another stack i.e., a disk can only be moved if it is the uppermost disk on a stack, (iii) No disk may be placed on top of a smaller disk.
 - b) Design a python script to display the numbers that do not appear in the Fibonacci series of n numbers where n is given by the user. (If n is 8 then up to 8 Fibonacci numbers has to be printed Ex: 1 1 2 3 5 8 13 21 and in this series missing numbers should be traced and printed, Ex: missing numbers are: 4 6 7 9 10 11 12 14 15 16 17 18 19.
8.
 - a) Design a function Learner_Age_Days with two formal parameters name, age and it computes Learner's age in days, then displays learners name and age in days.
 - (i) Design a driver code to call the function using positional arguments, keyword arguments
 - (ii) Apply the necessary changes in Learner_Age_Days function, and design a driver code to call the function using default arguments.
 - b) Design a python script using lambda and filter functions to construct an odd numbers list from numbers 1 to 10, and construct a negative numbers list from range of numbers -7 to 7 and to find the biggest number from a numbers list.
9.
 - a) Design a python script to create a new file Collect_Literals_Phython.txt, collect the data from the keyboard about the contents of collection literals list, tuple, sets, dictionaries details, then write all the data into that file, and then close that file. Afterwards Open the Collect_Literals_Phython.txt file in read mode, read the entire contents of the file

- Collect_Literals_Python.txt, then display all the contents of that file in monitor.
- b) The file feat_python1.txt has the contents of features of the Python programming language. Design a python script to open that file feat_python1.txt in read mode, open the new file in feat_python2.txt in write mode, then read entire contents of the file feat_python1.txt, then copy all the contents of that file into the new file feat_python2.txt
10. a) Construct a Python script to implement the below requirements. Create a base class Basic_Info with data members name, rollno, gender and two member functions getdata() and display(). Derive a class Physical_Fit from Basic_Info which has data members height and weight and member functions getdata() and display(). Display all the information using object of derived class.
- b) Design a Python script to implement the below specifications, compute, and produce required output. Define a class REPORT with the following specification

Private members

Admno : 4-digit admission number

Name : 20 characters

Marks : A list of 5 floating point values

Average : average marks obtained

GETAVG() a function to compute the average obtained in five subjects.

Public members

READINFO() function to accept values for Adno, Name, Marks. Invoke the function GETAVG ().

DISPLAYINFO() function to display all data members of report on the screen. You should give function definitions. Write driver code to demonstrate all the functions.

11. 1. The below scenarios will create Logical Error/Exception, and it will forcibly stop the execution in middle of the program. Design a Python Script to handle these operations exceptions effectively, and avoid to stop the script execution in the middle.
- The variable num has the data 100, the value of num dividing by the value 0.
 - To importing a library file matheqn, this library file not available in Python.
 - A num_List has the values[10,20,30].To print the fifth value of num_List[5]
 - A dictionary has the data, Dict_Univ = {'1':"MBU", '2':"Tirupathi", '3':"CSE"}. to print the fifth key value Dict_Univ[5]
2. Design a python script to collect the 10 students Python course mark. Check that entered mark is negative, then throw a user defined exception called Negative, otherwise store into the mark in the List Python_mark[].

RESOURCES

TEXT BOOKS:

- R. Nageswara Rao, *Core Python Programming*, 3rd Edition, Dreamtech Press, 2021.
- Paul J. Deitel, Harvey Deitel, *Python for Programmers with Big Data and Artificial Intelligence Case Studies*, Pearson, 2019.

REFERENCE BOOKS:

1. Charles Dierbach, *Introduction to Computer Science using Python: A Computational Problem Solving Focus*, Wiley India, 2016.
2. Christian Hil, *Learning Scientific Programming with Python*, 2nd Edition, Cambridge University Press, 2020.

SOFTWARE/TOOLS:

1. Python 3.10
2. Jupyter Notebook/JupyterLab/IDLE/Google CoLab

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc19_cs41/preview
2. <https://www.coursera.org/specializations/python>
3. <https://www.coursera.org/learn/python-for-applied-data-science-ai>
4. <https://www.youtube.com/watch?v=WGJJlItfnfk>
5. https://www.youtube.com/watch?v=_uQrJ0TkZlc
6. <https://www.udemy.com/topic/python/>
7. <https://freevideolectures.com/course/2512/python-programming>

WEB RESOURCES:

1. <https://www.w3schools.com/python/>
2. <https://www.programiz.com/python-programming>
3. <https://www.geeksforgeeks.org/python-programming-language/>
4. <https://www.javatpoint.com/python-lists>
5. <https://www.learnpython.org/>

Course Code**Course Title****22CM101401L****PRINCIPLES OF ACCOUNTING****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -**COURSE DESCRIPTION:**

The course is designed so that the students can understand the scientific preparation of accounting books with relevant interpretation. The course also provides students with knowledge of preparation of final accounts.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Demonstrate knowledge of basic concepts of financial accounting.
- CO2.** Analyze Cash book and reconciliation statements and acquaint oneself with preparation of statements.
- CO3.** Demonstrate knowledge on preparation of Bank Reconciliation statements.
- CO4.** Analyze and prepare financial statements for the sole proprietorship of business.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-

Correlation Levels:**3: High;****2: Medium;****1: Low****COURSE CONTENT****Module 1: INTRODUCTION TO ACCOUNTING**

Meaning – Definition – Objectives of Accounting – Scope of accounting – Accounting principles – Branches of accounting – Classification of accounts – Double Entry System – Book Keeping – Users of Accounting Information – Advantages and limitations of accounting

Module 2: PROCESS OF ACCOUNTING

Meaning and Definition of Journal – Importance of Journal Entry – Proforma of Journal Entries – Journalising – Posting – Problems on Journal Entries – Ledger – Problems on Ledger accounts – Balancing of Ledger accounts

Module 3: SUBSIDIARY BOOKS

Introduction to Subsidiary Books- Purchase Book, sales Book, Purchase Returns, Sales Returns, Bills Receivable, Bills Payable, Journal Paper-Preparation of Subsidiary Books- Cash Books, Three Column Cash Book– Trial Balance (Simple problems)

Module 4: BANK RECONCILIATION STATEMENT

Meaning – Need – Reasons for differences between cash book and pass book balances – Favorable and over draft balances – Ascertainment of correct cash book balance (Amended Cash Book) – Preparation of Bank Reconciliation Statement. (Including problems)

Module 5: PREPARATION OF FINAL ACCOUNTS

Introduction to Final Accounts – Trading account – Profit and Loss account – Balance Sheet with simple adjustments (Simple problems)

EXPERIENTIAL LEARNING

1. Observation of Recording Business Transactions in an Audit firm.
2. Visiting a Business and knowing entire process of maintenance of Books of Accounts.

RESOURCES

TEXT BOOKS:

1. Maheswari S.N. & Maheswari S. K., "*Introduction to Financial Accountancy*," Vikas Publications, 2020.
2. Grewal. T.S., "*Fundamentals of Accounting*," Sultan Chand & Sons Pvt Ltd New Delhi, 2019.

REFERENCE BOOKS:

1. Jawahar Lal, Financial Accounting, Wheeler Publishing, New Delhi, 2021.
2. Chawla & Jain- Financial Accounting, Kalyani Publishers, New Delhi, 2008.

VIDEO LECTURES:

1. https://www.youtube.com/watch?v=tIDFXs6_Tjc
2. <https://www.youtube.com/watch?v=xWKfKcNqQAE>

WEB RESOURCES:

1. <https://icmai.in/upload/Students/Syllabus2016/Inter/Paper-5New.pdf>
2. https://ebooks.lpude.in/management/bba/term_2/DMGT104_FINANCIAL_ACCOUNTING.pdf

Course Code**Course Title**

22CA101003L BASICS OF VIRTUALIZATION AND CLOUD TECHNOLOGY

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course gives students an insight into the basics of cloud computing along with virtualization. It will provide the students basic understanding about cloud and virtualization.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Demonstrate basic concepts of Virtualization and Cloud Technology of Cloud Computing.
- CO2.** Analyze desktop virtualization, providers with traditional IT service providers, Roots of cloud computing, hardware virtualization and Regularity issues for cloud technology.
- CO3.** Use Microsoft's Virtualization solutions for cloud virtualization
- CO4.** Adapt architectural influences using High-performance computing, Utility and Enterprise grid computing for the performance in Cloud environment.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	-	-	-	-	-	3
CO2	3	3	3	2	-	-	-	-	-	-	-	-	-	-	3
CO3	3	2	3	2	3	-	-	-	-	3	-	-	-	-	3
CO4	3	3	3	-	3	-	-	-	-	-	-	-	-	-	3
Course Correlation Level	3	3	3	3	3	2	-	-	-	3	-	-	-	-	3

Correlation Levels: 3: High 2: Medium; 1: Low

COURSE CONTENT

Module 1: BASICS OF VIRTUALIZATION

Virtualization and cloud computing: Need of virtualization, cost, administration, fast deployment, reduce infrastructure cost, limitations.

Types of hardware virtualization: Full virtualization, partial virtualization, para virtualization

Desktop virtualization: Software virtualization, Memory virtualization, Storage virtualization, Data virtualization, Network virtualization

Module 2: HYPERVISORS AND VIRTUAL MACHINES

Server Virtualization: Understanding Server Virtualization, types of server virtualization, Virtual machine basics, types of virtual machines, hypervisor concepts and types.

Module 3: VIRTUALIZATION SOLUTIONS

Understanding Microsoft's Virtualization solutions: Microsoft's Infrastructure Optimization Model, Virtualization and the Infrastructure Optimization Model, Benefits of Virtualization, Achieving the Benefits of Datacenter Virtualization, Achieving the Benefits of Client Virtualization, Achieving the Benefits of Cloud Virtualization.

Module 4: BASICS OF CLOUD COMPUTING

Origins of Cloud computing, Cloud components, Essential characteristics, On-demand self-service, Broad network access, Location independent resource pooling, Rapid elasticity, Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

Module 5: CLOUD INSIGHTS

Architectural influences: High-performance computing, Utility and Enterprise grid computing; Cloud scenarios, Benefits: scalability, simplicity, vendors, security, Limitations, Sensitive information, Application development, security level of third party, security benefits, Regularity issues: Government policies.

EXPERIENTIAL LEARNING:

1. Creating Virtualized Environment using VM ware.
2. Deploying an WebApp/MobileApp in Public Cloud.
3. Invoke an operating System in an Virtualized environment.

RESOURCES

TEXT BOOKS:

1. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center," Auerbach.
2. Anthony T.Velte, Toby J. Velte Robert Elsenpeter "Cloud computing a practical approach", TATA McGraw- Hill, 2010.

REFERENCE BOOKS:

1. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate," 2008.
2. Rajkumar Buyya, James Broberg, Andrzej Goscinski, "Cloud Computing (Principles and Paradigms)", John Wiley & Sons, Inc. 2011
3. Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, "Cloud computing for Dummies", Wiley Publishing Inc., 2010

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=Jph3H1wZTKM>
2. <https://www.digimat.in/nptel/courses/video/106105167/L07.html>

WEB RESOURCES:

1. <https://www.knowledgehut.com/blog/cloud-computing/virtualization-in-cloud-computing>
2. <https://www.analyticssteps.com/blogs/what-virtualization-cloud-computing-characteristics-benefits>
3. <https://www.javatpoint.com/virtualization-in-cloud-computing>

Course Code**Course Title****22ME101702L****HUMAN RESOURCE MANAGEMENT****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -**COURSE DESCRIPTION:**

Concepts of HRM; Environmental Scanning; Human Resource Planning; Job analysis; Job design; Job evaluation; Recruitment; Selection; Placement; Orientation; Training and Development; Performance appraisal; Merit rating; Compensation; Industrial relations; Trade unions; Industrial disputes; Ethical issues; Employee safety.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1** Demonstrate the knowledge on the principles, processes and practices of human resource management.
- CO2** Analyze the key issues related to administering the human elements such as motivation, recruitment, training and development, compensation, appraisal, and career development.
- CO3** Provide solutions to plan and manage human resource functions effectively within organization.
- CO4** Apply HRM concepts and techniques in strategic planning to improve organizational effectiveness.
- CO5** Evaluate HRM related social, cultural and safe responsibilities and issues in a global context.

CO-PO Mapping Table

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1	-	1	-	-	-	-	-	-
CO2	3	3	1	1	-	1	-	-	-	-	-	-
CO3	3	2	3	1	-	-	-	-	-	-	-	-
CO4	2	1	1	1	3	1	-	-	-	-	-	-
CO5	3	1	1	1	1	1	2	3	-	-	-	-
Course Correlation Mapping	3	2	1	1	2	2	2	3	-	-	-	-

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

Module 1: INTRODUCTION TO HRM & HRP

Introduction to Human Resource Management (HRM): Objectives, Scope and significance of HRM, Functions of HRM, Prospects in HRM, Environmental scanning.

Human Resource Planning (HRP): Introduction, Nature and importance of HRP, Factors affecting HRP, The planning process, Human resource planning and the Government, Requisites for successful HRP, Barriers to HRP.

Module 2: RECRUITMENT AND PLACEMENT

Job Analysis – Nature and process of job analysis, Methods of collecting job data, Potential problems with job analysis, Requisites for job analysis; Job Design - Factors, Job design approaches, Contemporary issues; Job evaluation - Process, Methods; Recruitment - Nature, Purposes and importance, Factors governing recruitment, Recruitment process, Evaluation and control; Selection – Nature, Process, Barriers to effective selection, Evaluation of selection process, Placement; Separation.

Module 3: HUMAN RESOURCE DEVELOPMENT AND COMPENSATION

Orientation - Orientation programme, Requisites of an effective programme, Evaluation of orientation programme, Problems of orientation; Training and development – Nature, Inputs, Training process, Methods, Impediments to effective training, Management development, Career development, Talent management; Performance Appraisal - Nature, Appraisal process, Challenges of performance appraisal; Merit rating; Compensation - Philosophy, Components, Theories, Factors influencing employee compensation, Challenges, Wage and salary administration.

Module 4: INDUSTRIAL RELATIONS AND TRADE UNIONS

Industrial Relations (IR): Nature of IR, Importance of Peaceful IR; Approaches to IR - Unitary Approach, Pluralistic approach, Marxist approach; Parties to IR; IR strategy; Industrial Disputes - Nature, Causes, and Settlement.

Trade unions: Nature of trade unions, Strategic choices before unions, Union tactics, Trade union movement in India, Trends in trade union movement, Managing unions; Indian Factories Act; Employee's compensation Act; Industrial disputes Act.

Module 5: ETHICAL ISSUES AND SAFETY ADMINISTRATION

Managing Ethical Issues in HRM: Nature of ethics, Sources of business ethics, Myths about ethics, Ethical dilemmas, HR ethical issues, Managing ethics, Improving ethical decision making.

Employee Safety: Safety, Need for safety, Types of accidents, Safety programme, ISO safety standards.

EXPERIENTIAL LEARNING

1. What are the challenges that are faced by HR in effective performance management including performance appraisal in MNCs? Discuss in detail in the contemporary of HRM.
2. Evaluate employee relations in a comparative perspective across few countries of your choice. Describe in brief by taking a case study.
3. Visit an organization or industry and Evaluate HRM related social, cultural, ethical and environmental responsibilities and issues in a global context.

(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)

RESOURCES

TEXT BOOKS:

1. Aswathappa K, *Human Resource Management*, Tata McGraw Hill Private Limited, 8th edition, 2017.
2. Garry Dessler and Biju Varkkey, *Human Resource Management*, Pearson India, 16th Edition, 2020.

REFERENCE BOOKS:

1. Raymond A. Noe, John R. Hollenbeck, *HRM: Gaining a Competitive Advantage*, TMH, 7th edition, 2010.
2. Bohlander George W, Snell Scott, *Principles of Human Resource Management*, Cengage Learning, 16th edition, 2016.
3. Edwin B. Flippo, *Personnel Management*, McGraw-Hill International editions, 6th edition, 1984.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/122105020>
2. https://onlinecourses.nptel.ac.in/noc20_mg15/preview
3. <https://www.digimat.in/nptel/courses/video/122105020/L01.html>

WEB RESOURCES:

1. <https://www.coursera.org/specializations/human-resource-management>
2. <https://www.techtarget.com/searchhrsoftware/definition/human-resource-management-HRM>

Course Code	Course Title
22CA101006L	SOFTWARE ENGINEERING
Pre-Requisite	-
Anti-Requisite	-
Co-Requisite	-

COURSE DESCRIPTION: This course provides a detailed discussion on concepts of Software Engineering, Software Process Models, Conventional and Agile Process Models, Software Requirements Engineering Process, System Analysis, Architectural Design, User Interface Design and Re-engineering, Software Testing, Risk and Quality Management

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- C01.** Demonstrate concepts of software engineering and analyze process models required to develop a software system.
- C02.** Analyze software requirements and model requirements for the given scenario.
- C03.** Apply design concepts and metrics for software development.
- C04.** Apply testing strategies and techniques for quality software.
- C05.** Analyze risks in software development life cycle and apply risk strategies to mitigate risks.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	2	3	3	-	-	-	-	-	-	-	-	-	3	-	-
C02	2	3	-	-	-	3	3	2	-	-	2	-	3	-	-
C03	2	3	3	2		2	2	-	-	-	3	-	3	-	-
C04	2	-	-	-	2	3	-	-	-	-	-	-	3	-	-
C05	2	3	-	-	2	3	-	-	-	-	-	-	3	-	-
Course Correlation Mapping	2	3	3	2	2	3	3	2	-	-	3	-	3	-	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

Module 1: SOFTWARE ENGINEERING AND SOFTWARE PROCESS

A Generic view of process: The Nature of Software, Software Engineering- Software Engineering Layers; The Software Process, Software Engineering Practice, Software myths.

Process models: A Generic Process Model, Prescriptive Process Models-The Waterfall Model, Incremental Process Models, Specialized Process Models; The Unified Process, Agile Development-Agility, Agile Process, Extreme Programming (XP), Scrum, Dynamic System Development Method, Agile Modeling (AM), Agile Unified Process (AUP).

Module 2: REQUIREMENTS ENGINEERING AND MODELING

Requirements Engineering: Functional and non-functional requirements, The software requirements document, Requirements specifications, Requirements engineering processes, Requirements elicitation and analysis, Requirements validation, Requirements management.

Requirements Modeling: Requirements Analysis, Data Modeling Concepts, Flow-Oriented Modeling, Scenario based Modeling, UML Models that supplement the Use Case, Case study on Requirements modeling for Web and Mobile Apps.

Module 3 DESIGN ENGINEERING AND METRICS

Design using UML: Class Diagram - Terms and concepts, Use case Diagram - Terms and concepts, Activity Diagrams - Terms and concepts, Interaction diagrams - Terms and concepts, State machine Diagram- Terms and concepts, Component Diagram- Terms and concepts, Deployment Diagram- Terms and concepts.

Process and Project Metrics: Metrics in the process and project domains, Software Measurement, Metrics for software quality.

Module 4 SOFTWARE TESTING STRATEGIES AND APPLICATIONS

Testing strategies: A strategic approach to software testing, Strategic issues, Test strategies for conventional software, Test strategies for object oriented software, Validation testing, System testing, The art of debugging.

Testing Conventional Applications: Software testing fundamentals, White box testing-Basis path testing, Control structure testing; Black box testing, Object oriented testing methods.

Module 5 RISK, QUALITY MANAGEMENT AND REENGINEERING

Risk and Quality Management: Reactive and Proactive risk strategies, Software risks, Risk Mitigation Monitoring and Management (RMMM), RMMM plan, Formal Technical Reviews (FTR), Software Quality Assurance (SQA)-Tasks, Goals and Metrics; Software reliability.

Reengineering: Introduction, Business Process Reengineering (BPR), Software Reengineering, Restructuring, Reverse engineering, Forward engineering.

EXPERIENTIAL LEARNING

1. Identify Functional and Non-Functional Requirements for:
 - a. Online Ticket Reservation for Railways
 - b. Recruitment Procedure for Software Industry

2. **Online Ticket Reservation for Railways**

Problem Statement: Computer plays an integral part of the day in today's life. It makes the entire job easier and faster, every job is computerized so as the ticket reservation we can book over the online ticket reservation system. During the booking of the ticket reservation passenger has to select origin, date of journey, destination, class of train etc. The reservation counter keeps track of passenger's information. Thus the system will have all the details about the trains and facilities provided by them. There are various trains with the different level of convenience for the passengers. The whole database will be maintained by database administrator. There are varieties of trains where the passengers can select the train according to the convenience for their destination journey. The journey could be within the state or across the India. Each train has the three types of classes i.e. Sleeper class, First class and the AC compartment. Design the application for the above problem description. Model using Visual modelling tools in different views i.e. component view, Deployment view.

3. **Recruitment Procedure for Software Industry**

Problem Statement: In the software industry the recruitment procedure is the basic thing that goes in the hand with the requirement as specified by the technical management team. HR first gives an advertisement in leading Newspapers, Journals, Weeklies and Websites. The job seekers can apply for it through by Post or by e-mail to the company. The technical skill and the experience of the candidates are reviewed and the short listed candidates are called for the interview. There may be different rounds for interview like the written test, technical interview, and HR interview. After the successful completion of all rounds of interview, the selected candidates' names are displayed. Meanwhile HR gives all the details about the salary, working hours, terms and conditions and the retirement benefit to the candidate. Model using Visual modelling tools in different views i.e. Use case view, logical view

RESOURCES

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering - A Practitioner's Approach," McGraw-Hill International Edition, 8th Edition, 2015.
2. Ian Sommerville, "Software Engineering," Pearson Education, 9th Edition, 2011.

REFERENCE BOOKS:

1. Grady Booch, James Rumbaugh and Ivar Jacobson, "The Unified Modeling Language User Guide," 2nd Edition, Pearson Education, 2009.

2. K. K. Aggarwal and Yogesh Singh, "Software Engineering, "New Age International Publishers, 3rdEdition, 2007.
3. ShelyCashman Rosenblatt, "Systems Analysis and Design," Thomson Publications, 6thEdition, 2006.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106105087/>
2. <https://nptel.ac.in/courses/106105182/>

WEB RESOURCES:

1. AgileModeling :<https://www.techtarget.com/searchsoftwarequality/definition/agile-software-development>
2. Functional and Non-Functional Requirements:
<https://www.linkedin.com/learning/software-design-developing-effective-requirements/functional-vs-non-functional>

Course Code**Course Title****22CA101015L****CLOUD COMPUTING****Pre-Requisite****Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: Virtualization, Cloud Computing Fundamentals, Deployment Models; Cloud Computing Architecture; Cloud Computing Mechanisms; Cloud Security; Working with Clouds; and Case Studies.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Understand the importance of virtualization and how this has enabled the development of Cloud Computing.
- CO2.** Analyze the cloud computing models, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- CO3.** Implement different types of Virtualization technologies and Service Oriented Architecture systems
- CO4.** Apply modern technologies & tools of Cloud Computing in solving resource sharing problems in industry.
- CO5.** Identify security and privacy issues in cloud computing.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	2	3	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	3	1	-	-	-	-	-	-	-	-	-	3	-	-
CO5	2	3	2	-	-	2	-	-	-	-	-	-	-	3	-	-
Course Correlation Mapping	2	3	2	1	-	2	-	-	-	-	-	-	-	3	-	-
Correlation Levels: 3: High; 2: Medium; 1: Low																

COURSE CONTENT

Module 1: INTRODUCTION TO VIRTUALIZATION

Virtualization: Introduction to Virtualization, objectives of virtualization, benefits of virtualized technology, Adding guest Operating system.

Virtualization Technologies: Ubuntu, VMware, Microsoft Hyper-V.

Module 2: DEFINING CLOUD COMPUTING

Defining Cloud Computing: Defining Cloud Computing, Cloud Types - The NIST model, The Cloud Cube Model, Deployment models, Service models, Benefits of cloud computing, Disadvantages of cloud computing, Assessing the Role of Open Standards.

Understanding Cloud Architecture: Exploring the Cloud Computing Stack, Compos ability, Infrastructure, Platforms, Connecting to the Cloud.

Module 3 UNDERSTANDING SERVICES AND APPLICATIONS

Understanding Services And Applications By Type : Defining Infrastructure as a Service (IaaS), IaaS workloads, Pods, aggregation, and silos, Defining Platform as a Service (PaaS), Defining Software as a Service (SaaS), SaaS characteristics.

Understanding Abstraction and Virtualization: Using Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, Virtual machine types, VMware vSphere.

Module 4 EXPLORING PLATFORM AS A SERVICE

Using Amazon Web Services: Understanding Amazon Web Services, Amazon Web Service Components and Services, Working with the Elastic Compute Cloud (EC2), Amazon Machine Images, Pricing models, System images and software, Creating an account and instance on EC2.

Managing the Cloud: Administrating the Clouds, Management responsibilities, Lifecycle management, Emerging Cloud Management Standards, DMTF cloud management standards, Cloud Commons and SMI.

Module 5 Understanding Cloud Security

Understanding Cloud Security: Securing the Cloud, The security boundary, Security service boundary, Security mapping, Securing Data, Brokered cloud storage access, Storage location and tenancy, Encryption, Auditing and compliance, Establishing Identity and Presence, Identity protocol standards, Windows Azure identity standards, Presence.

EXPERIENTIAL LEARNING

1. Compare Cloud Delivery Models.
2. Compare Cloud Deployment Models
3. Impact of cloud computing on real world environment.

RESOURCES

TEXT BOOKS:

1. Barrie Sosinsky, *"Cloud Computing Bible,"* Wiley India Pvt Ltd, 1st Edition, 2011.
2. Ivanka Menken Ivanka Menken, *"Cloud Computing Virtualization Specialist Complete Certification Kit - Study Guide Book",* Emereo Publishing, 2nd Edition, 2012.

REFERENCE BOOKS:

1. Anthony T. Velte, Toby J. Velte Robert Elsenpeter, *"Cloud Computing: A practical Approach",* Tata Mc Graw Hill, ISBN: 9780071626941, 1st Edition, 2010.
2. John W. Rittinghouse, James F. Ransome, *"Cloud Computing implementation, Management and Security",* CRC Press, ISBN: 9788120341609, Taylor & Francis group, 1st Edition 2010.
3. George Reese, *"Cloud Application Architectures",* Oreilly publishers, 1st Edition, 2010.
4. David S. Linthicum, *"Cloud Computing and SOA Convergence in your Enterprise",* Addison- Wesley, 1st Edition, 2010.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. <https://www.coursera.org/specializations/cloud-computing>
3. <https://www.udemy.com/course/introduction-to-cloud-computing-on-amazon-aws-for-beginners/>

WEB RESOURCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs14/preview
2. [https:// trailhead.salesforce.com/en/home](https://trailhead.salesforce.com/en/home)
3. <https://mkyong.com/tutorials/google-App- engine-tutorial/>
4. <https://www.awsacademy.com>

Course code**Course Title****22CA101009L****ADVANCED DATABASES****Pre-Requisite** Database Management Systems**Anti-Requisite** -**Co-Requisite** -**COURSE DESCRIPTION**

Parallel Databases; Object-Based Databases; Distributed Databases; XML; Emerging Database Technologies and Applications.

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

- CO1.** Understand the concepts of parallelism to design parallel systems on multicore processors.
- CO2.** Apply object oriented concepts to design object based databases.
- CO3.** Design distributed databases by analyzing various data fragmentations.
- CO4.** Create XML databases for web based applications.
- CO5.** Implement emerging database technologies for the development of applications.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	3	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	3	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	3	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	3	-	3
CO5	-	-	-	-	-	-	-	-	3	3	-	-	3	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	3	3	-	-	3	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: PARALLELDATABASES

Introduction, I/O Parallelism, Interquery Parallelism, Intraquery Parallelism, Intraoperation Parallelism, Interoperation Parallelism, Query Optimization, Design of Parallel Systems, Parallelism on Multicore Processors.

Module 2: OBJECT-BASEDDATABASES

Overview, Complex Data Types, Structured Types and Inheritance in SQL, Table Inheritance, Array and Multi set Types in SQL, Object-Identity and Reference Types in SQL, Implementing O-R Features, Persistent Programming Languages, Object-Relational Mapping, Object-Oriented versus Object-Relational.

Module 3: DISTRIBUTEDDATABASES

Features of Distributed versus Centralized Databases, Reference Architecture for Distributed Databases, Types of Data Fragmentation, Integrity Constraints in Distributed databases, Distributed Database Design.

Module 4: XML

Structure of XML data, XML Document Schema, Querying and Transformation, Application Program Interfaces to XML, Storage of XML Data, XML Applications. (graph database)

Module 5: EMERGINGDATABASETECHNOLOGIESANDAPPLICATION

Mobile Database, Geographic Information Systems, Genome Data Management, Multimedia Database; NoSQL-An Overview of NoSQL, Characteristics of NoSQL, NoSQL Storage Types.

EXPERIENTIAL LEARNING

1. Evaluate the security of a database system.
2. Plan and execute the migration of a database from one system to another
3. Design a distributed database system for a scenario involving multiple data centers.

RESOURCES

TEXT BOOKS:

1. A.Silberschatz, H.F.Korth and S.Sudarshan, "Database System Concepts," Tata McGraw Hill, 7th Edition, 2019.
2. Stefand Ceri and Giuseppe Pelagatti, "Distributed Databases Principles and Systems," McGraw Hill, 1st Edition, 2008.

REFERENCE BOOKS:

1. Ramea Elmasri and Shamkant B. Navathe, " Fundamentals of database Systems," Pearson Education, 5th Edition, 2007.

2. Gaurav Vaish, *"Getting Started with NoSQL,"* Packt Publishing, 1st Edition, 2013.

VIDEO LECTURES:

1. <https://youtu.be/7M0CdMfUEmQ>
2. <https://youtu.be/tFS0qiimHPY>
3. <https://youtu.be/yTZBtde3zoI>

WEB RESOURCES:

1. <https://www.geeksforgeeks.org/difference-between-centralized-database>
2. <https://www.geeksforgeeks.org/parallelism-in-query-in-dbms>
3. <https://www.geeksforgeeks.org/object-based-databases>

Course Title

JAVA PROGRAMMING

Object Oriented Programming with C++

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COURSE DESCRIPTION

Representation of Java Classes and methods; Inheritance and Polymorphism using Java, Creation of Packages and Interfaces; Implementation of Utility Classes and Input/output; Exception handling mechanism and multithreading; Event handling techniques and GUI applications by using AWT.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Understand the basic concepts of classes, objects, methods of JAVA Programming to build Java applications.
- CO2.** Analyze inheritance and polymorphism to solve real world problems.
- CO3.** Design and develop GUI Applications using AWT.
- CO4.** Apply utility classes, Java collections, exception handling and multithreading concepts to develop real time applications.
- CO5.** Work together to customize the real world applications. Communicate effectively about complex computing activities by writing documentation.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
C02	2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
C03	1	2	3	-	-	-	-	-	-	-	-	-	-	3	-
C04	1	2	2	3	3	-	-	-	-	-	2	-	-	-	3
C05	-	-	-	-	-	-	2	-	-	-	2	-	3	-	-
Course Correlation Mapping	3	3	2	2	2	-	-	-	-	-	2	-	2	2	2

Correlation Levels: **3: High; 2: Medium; 1: Low**

COURSE CONTENT

Module 1: INTRODUCTION TO JAVA PROGRAMMING

Introduction to Java Programming: History of Java, Java Buzzwords, Object-Oriented Programming, First Simple Program, Data Type, Variables, Operators, Control Statements, Arrays, Introducing Classes: Class Fundamentals, Declaring Objects, Introducing Methods, Constructors, this Keyword, Garbage Collection, finalize() Method; Overloading Methods, Access Control, static Keyword, final Keyword, Introducing Nested and Inner Classes, String Class.

Module 2: INHERITANCE AND POLYMORPHISM

Inheritance and Polymorphism: Inheritance Basics, Using super, Creating Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Abstract Classes, final with Inheritance, Object Class.

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces; Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces, Interfaces can be Extended.

Module 3 EXCEPTION HANDLING AND MULTITHREADING

Exception Handling: Fundamentals of Exception Handling, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating your own Exception Subclasses', Chained Exceptions.

Multithreading: Java Thread Model, Thread life Cycle, Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities, Synchronization, Interthread Communication, Suspending, Resuming and Stopping Threads.

Module 4 UTILITY CLASSES AND INPUT/OUTPUT

Utility Classes: Introduction to Java Collections, Overview of Java Collection Frame Work, Commonly Used Collection Interfaces: Set, List, Queue, Map; Commonly used Collection Classes: Hash Set, LinkedHashSet, Linked List, Stack, Array List, Vector, Hash table; Iteration over Collections: Iterator Interface, List Iterator Interface and Enumeration Interface; String Tokenizer, Date, Calendar.

Input/output: Stream Classes: Byte Streams, Character Streams, Console Class, Stream I/O, Serialization.

Module 5 EVENT HANDLING AND GUI PROGRAMMING WITH JAVA

Event Handling: Delegation Event Model, Event Classes, Sources of Events, Event Listener Interfaces.

GUI Programming with Java: Abstract Window Toolkit (AWT): AWT Classes, Windows Fundamentals, Working with Frame Windows, Graphics and Color, AWT Controls: Labels, Buttons, Check Boxes, Lists, Scroll Bars, Text Field, Text Area, Layout Managers; Applets: Applet Basics, Applet Architecture, Applet Skeleton, Applet Display Methods, Passing Parameters to Applets.

EXPERIENTIAL LEARNING

1. Write a Java program that prints all real solutions to the quadratic equation $ax^2 + bx + c = 0$. Read in a , b , c and use the quadratic formula. If the discriminant $b^2 - 4ac$ is negative, display a message stating that there are no real solutions.
2. Write a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer.
3. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util)
4. Write a Java program to illustrate method overloading.
5. Write a Java program to implement the matrix ADT using a class. The operations supported by this ADT are:
 - a) Reading a matrix.
 - b) Printing a matrix.
 - c) Addition of matrices.
 - d) Subtraction of matrices.
 - e) Multiplication of matrices.
6. Write a Java program that uses functions to perform the following operations:
 - a. Inserting a sub-string in to the given main string from a given position.
 - b. Deleting n characters from a given position in a given string.
7. Write a Java program that illustrates the following:
 - a) Creation of simple package.
 - b) Accessing a package.
8. Write a Java program that illustrates the following:
 - a) Handling predefined exceptions
 - b) Handling user defined exceptions
9. Write a Java program that correctly implements producer consumer problem using the concept of inter thread communication.
10. Write a java program to demonstrate various GUI components in java (AWT) with appropriate Event Handling.
11. Develop an applet in Java that displays a simple message.
12. 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.

RESOURCES

TEXT BOOK:

1. Herbert Schildt, "*The Complete Reference Java*", Tata McGraw-Hill, 7th Edition, 2007.

REFERENCE BOOKS:

1. B. Eswar Reddy, T. V. Suresh Kumar and P. Ragavan, "*Object Oriented Programming with Java*," Pearson Sanguine Publications, 2nd Edition, 2011.
2. H. M. Dietel and P. J. Dietel, "*Java How to Program*," Pearson Education/ PHI, 5th Edition, 2009.

VIDEO RESOURCE:

1. <https://nptel.ac.in/courses/106105191>
2. <https://www.udemy.com/course/java-tutorial/>
3. <https://www.udemy.com/course/java-the-complete-java-developer-course/>
4. <https://www.udemy.com/course/the-complete-java-development-bootcamp/>

WEB RESOURCE

1. https://www.tutorialspoint.com/java/java_tutorial.pdf
2. <https://www.iitk.ac.in/esc101/share/downloads/javanotes5.pdf>
3. <https://book.huihoo.com/goalkicker.com/JavaBook/JavaNotesForProfessionals.pdf>

Course Code
22CA101010L

Course Title
INTERNET OF THINGS

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION

Basic concepts of IoT, evolution, characteristics, advantages and disadvantages of IoT, ADC and DAC Principle, IoT sensors and actuators, working with arduino board, applications of IoT in different domains.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- C01.** Understand the basic concepts of IoT to work with IoT environment.
- C02.** Analyze the principles of ADCs and DACs to implement in the development of devices.
- C03.** Design IoT devices with sensors and actuator technologies for effective results.
- C04.** Make use of the Arduino board to develop IoT devices for different domains.
- C05.** Develop various IoT related used cases and applications to solve real world problems.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	3	3	3	-	-	-	-	-	3	-	-	3	3	-
C02	3	3	3	3	-	-	-	-	-	3	3	3	3	3	-
C03	3	3	2	3	-	-	-	-	-	3	-	-	3	3	-
C04	3	3	3	3	-	-	-	-	-	3	3	3	3	3	-
C05	3	3	3	3	-	-	-	-	-	3	3	3	3	3	3
Course Correlation Mapping	3	3	3	3	-	-	-	-	-	3	-	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: BASICS OF IOT

Definition of "Internet of Things", Technological trends which have led to IoT, impact of IoT on society, History of IOT, How IOT works, IOT Applications, Characteristics of IoT, Challenges of IoT, Advantages of IoT, Disadvantages IOT, evolution of IOT.

Module 2: ADCS AND DACS

DAC principle, weighted register DAC, R L1,L2,L3 -2R ladder DAC, performance characteristics of DAC, ADC principle, flash ADC, successive approximation ADC, counter type ADC, dual slope ADC, performance characteristics of ADC.

Module 3: IOT SENSORS AND ACTUATORS

Various IOT Sensors and actuators and technologies, Temperature sensors Moisture sensors, Light sensors, Acoustic and noise sensors, Water level sensors, Proximity sensors, motion sensors, Gyroscope, Chemical sensors, Image sensors.

Module 4: ARDUINO BOARD

Introduction to Arduino board, interfacing sensors and actuators to Arduino board.

Module 5: IOT USE CASES AND APPLICATIONS

Smart homes, wearables, smart city, smart grid, industrial internet, connected cars, connected health, smart retail, smart supply chain, smart farming.

EXPERIENTIAL LEARNING

1. Compare and contrast different communication protocols used in IoT.
2. Discuss how sensor data is collected, processed, and transmitted to a central hub.
3. Identify potential security risks in an IoT ecosystem and propose strategies to mitigate these risks.

RESOURCES

TEXT BOOKS:

1. Internet of Things: A Hands-on Approach Arshdeep Bahga and Vijay Madisetti Universities Press 2nd Edition.
2. Internet of Things: Architecture and Design Principles Rajkamal McGraw Hill Education 1st edition.

REFERENCE BOOKS:

1. IoT Fundamentals Networking Technologies, Protocols and Use Cases for Internet of Things David Hanes, Gonzalo Salgueiro Cisco Press Kindle Edition 2017
2. Designing the Internet of Things Adrian McEwen, Hakim Cassimally Paperback 1st edition

3. Analytics for the Internet of Things(IoT) Andrew Minter Kindle Edition 1st edition

VIDEO LECTURES :

1. [http://www.nptel.ac.in/\(https://youtu.be/WUYAjxnwjU4?list=PLaxu2gn9WXMf_In5pMvxjf043jzof4-i&t=13\)](http://www.nptel.ac.in/(https://youtu.be/WUYAjxnwjU4?list=PLaxu2gn9WXMf_In5pMvxjf043jzof4-i&t=13))
2. [http://www.iitk.ac.in/ \(https://youtu.be/p7kYStiASLo?list=PLbRMhDVUMngdcL\)](http://www.iitk.ac.in/(https://youtu.be/p7kYStiASLo?list=PLbRMhDVUMngdcL))

WEB RESOURCES:

1. [http://www.nptel.ac.in/ \(https://nptel.ac.in/courses/108108098/\)](http://www.nptel.ac.in/(https://nptel.ac.in/courses/108108098/))
2. [http://www.edureka.com/ \(https://youtu.be/LhmzVL5bm8?list=PL9ooVrP1hQOGccf\)](http://www.edureka.com/(https://youtu.be/LhmzVL5bm8?list=PL9ooVrP1hQOGccf))

Course Code**Course Title****22CA102007L****COMPUTER GRAPHICS****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -**COURSE DESCRIPTION**

Basics of Graphics; Graphical User Interfaces; Three Dimensional Viewing Devices; Virtual Reality systems; Raster-Scan Systems; Random-Scan System; 2-D transformations; 3-D transformations; Graphics Programming.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Understand the fundamentals of animation, graphic design and its related technologies to develop the applications.
- CO2.** Analyze the importance of viewing and projections to create user friendly applications.
- CO3.** Design and develop applications related to Computer Graphics using OpenGL.
- CO4.** Apply algorithms to scan, convert the basic geometrical primitives, transformations and clipping.
- CO5.** Work independently or in teams to solve problems with effective Communication.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	1	2	3	-	-	-	-	-	-	-	-	-	-	3	-
CO4	1	2	2	3	3	-	-	-	-	-	2	-	-	-	3
CO5	-	-	-	-	-	-	2	-	-	-	2	-	3	-	-
Course Correlation Mapping	3	3	2	2	2	-	-	-	-	-	2	-	2	2	2

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

Module 1: INTRODUCTION

Applications of Graphics: CAD, Presentation Graphics, Computer Art, Entertainment, Education and Training, Visualization, Image Processing.

Module 2: GRAPHICAL USER INTERFACE

Overview of Graphics Systems: CRT, Flat Panel Displays, Three-Dimensional Viewing Devices, Virtual Reality systems, Raster-Scan Systems, Random-Scan Systems.

Module 3: INTERACTIVE INPUT DEVICES AND COMPUTER GRAPHICS ALGORITHM

Input Devices: Keyboards, Mouse, Data Glove, Digitizers, Touch Panels; Hard Copy Devices: Printers, Plotters.

Output Primitives: Bresenham's Line Algorithm, Midpoint Circle Algorithm; Filled Area Primitives: Boundary-Fill Algorithm, Flood-Fill Algorithm; Character Generation; Homogeneous Coordinates.

Module 4: TWO DIMENSIONAL AND THREE-DIMENSIONAL TRANSFORMATIONS

Two Dimensional Geometric Transformations; Translation, Rotation, Scaling, Reflection, Shear;

Two-Dimensional Viewing: Cohen Sutherland Line Clipping Three Dimensional Geometric Transformations; Translation, Rotation, Scaling, Reflection, Shear;

Three-Dimensional Viewing: Projections, Parallel Projections, Perspective Projections, View Volumes and General Projection Transformations.

Module 5: GRAPHICS PROGRAMMING

Graphics Programming: OpenGL, Command Syntax, Drawing and filling images, patterns, Filling regular and irregular shapes, Outputting Text, Justifying Text, Animation. Drawing with mouse, Building mouse cursors, freehand drawing using mouse, menus using mouse.

EXPERIENTIAL LEARNING

1. Write a program for 2D line drawing as Raster Graphics Display.
2. Write a program for display basic 2D geometric primitives.
3. Write a program to display a filled square.
4. Write a program to display a series of concentric circle sofvaryingradius.
5. Write a program for line draw in gas Raster Graphics Display.
6. Write a program for circle drawing as Raster Graphics Display.
7. Write a program to draw a line using Bresenham line drawing algorithm

8. Write a program to draw a circle using Midpoint algorithm. Modify the same for drawing an arc and sector.
9. Write a program to rotate a point about origin.
10. Write a program to rotate a triangle about origin.

RESOURCES

TEXT BOOKS:

1. D.Hearn,M.P.Baker, "ComputerGraphics C Version," Pearson Education, 2nd Edition.
2. Donald Hearn & M. Pauline Baker, "Computer Graphics with OpenGL", Pearson Education, 4th Edition, 2018.
3. M.Woo, J.Neider, T.Davis, D.Shreiner, "OpenGL ProgrammingGuide," 3rd Edition, Pearson Education.

REFERENCE BOOKS:

1. Edward Angel – "Interactive Computer Graphics – A Top-down Approach using OpenGL", Pearson Education, 5th Edition, 2000
2. Foley, J. D., A. V. Dam, S. K. Feiner, J. F. Hughes, "Computer Graphics Principle and Practices," Addison Wesley Longman, Singapore Pvt. Ltd.,
3. Robert R & Snow D "Flash CS4 Professional Bible," Wiley Publishing.
4. A.V. Dan, F.H. Jones, J.D. Foley, S.K. Feiner, "Computer Graphics Principles & Practices in C", 2nd Edition, Pearson.
5. D. F. Rogers, "Procedural Elements for Computer Graphics", McGraw Hill.
6. D. F. Rogers, & J. A. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, McGraw Hill.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc20_cs90/preview
2. <https://digimat.in/nptel/courses/video/106106090/L01.html>
3. <https://www.youtube.com/watch?v=6LjVtIcSbK8>
4. http://www.cse.iitm.ac.in/~vplab/computer_graphics.html

WEB RESOURCES:

1. <https://www.geektonight.com/computer-graphics-notes/>
<https://www.dgp.toronto.edu/~hertzman/418notes.pdf>

Course code	Course Title
22CA101012L	COMPUTER NETWORKS
Pre-Requisite	Computer Communications
Anti-Requisite	-
Co-Requisite	-

COURSE DESCRIPTION

Concepts of Computer Networks, The Physical Layer, The Data Link Layer, The Network Layer, The Transport Layer, The Application Layer.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1** Understand the concepts of Networking, reference models, transmission media.
- CO2** Apply error and flow control techniques and implement congestion control mechanisms and transport protocols for reliable data communication.
- CO3** Analyze design issues of layers, techniques for quality of service, elements of transport and application Protocols ensuring the communication procedures.
- CO4** Examine the layered and e-mail architectures, networking protocols and e-mail message formats in compliance with communication standards.

Co-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO2	2	2	3	1	3	1	-	-	-	-	-	-	-	-	3
CO3	2	3	3	-	2	2	-	-	-	-	-	-	-	-	3
CO4	-	1	1	-	-	2	-	-	-	-	-	-	-	-	2
Course Correlation Mapping	2	2	3	1	3	2	-	-	-	-	-	-	-	-	3

Correlation Levels: 3: High; 2: Medium;1: Low

COURSE CONTENT

Module 1: NETWORK CONCEPTS AND PHYSICAL LAYER

Network Concepts: Uses of Computer Networks, Network Hardware, Network Software, Reference Models-OSI, TCP/IP.

The Physical Layer: Guided Transmission media-Magnetic Media, Twisted Pairs, Coaxial Cable, Fiber Optics. Wireless Transmission-The Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared Transmission and Light Transmission.

Module 2: THE DATA LINK LAYER

The Data Link Layer: Data Link layer design issues, Error Detection and Correction, Elementary Data Link Protocols - Unrestricted simplex protocol, Simplex stop-and-wait protocol, Simplex protocol for a noisy channel. Sliding Window protocols - One-bit sliding window protocol, Protocol using Go back N, Protocol using Selective Repeat.

Module 3: THE NETWORK LAYER

Network layer design issues, Routing Algorithms-Optimality principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing for Mobile Hosts, Routing in Ad Hoc Networks. Congestion Control Algorithms, Internetworking, The Network layer in the Internet-The IP Version 4 protocol, IP Addresses

Module 4: THE TRANSPORT LAYER

The Transport service, Elements of Transport protocols - Addressing, Connection Establishment, Connection Release, Error Control and Flow Control, Multiplexing and Crash recovery, The Internet Transport protocols - Introduction to UDP, Remote Procedure Call, Introduction to TCP, The TCP Service Model, TCP protocol and TCP Segment Header, TCP Connection Establishment, TCP Connection Release, TCP Sliding Window, TCP Timer Management, TCP Congestion Control.

Module 5: THE APPLICATION LAYER

DNS - The Domain name space, Resource records and Name servers; Electronic Mail-Architecture and services, the user agent, message formats, message transfer and Final Delivery.

EXPERIENTIAL LEARNING

1. Write a C program to implement the algorithm for parity method for error control.
2. Write a C program to implement the algorithm on hamming method for error correction (both single and block errors).
3. Write a C program to implement the algorithm for check sum computation

RESOURCES

TEXT BOOK:

1. Andrew S. Tanenbaum and David J. Wetherall, "*Computer Networks*," Pearson Education, 5th Edition, 2015.

REFERENCE BOOKS:

1. Behrouz A. Forouzan, "*Data Communications and Networking*," The McGraw-Hill, 4th Edition, 2011.
2. James F. Kurose and Keith W. Ross, "*Computer Networking: A Top-Down Approach*," Pearson Education, 6th Edition, 2017.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106/105/106105081/>
2. https://www.youtube.com/watch?v=6_PINy02_g0

WEB RESOURCES:

1. <https://www.cisco.com/c/en/us/solutions/small-business/resource-center/networking/networking-basics.html>
2. <https://memberfiles.freewebs.com/00/88/103568800/documents/Data.And.Computer.Communications.8e.WilliamStallings.pdf>
3. [https://www01.ibm.com/servers/resourcelink/svc0302a.nsf/pages/zVMV7R1sc246333/\\$file/kijl0_v7r1.pdf](https://www01.ibm.com/servers/resourcelink/svc0302a.nsf/pages/zVMV7R1sc246333/$file/kijl0_v7r1.pdf)
4. <http://ns2simulator.com/ns2-tcp-congestion-control/>

Course Code**Course Title****22CA102003****DATA WAREHOUSING AND DATA MINING****Pre-Requisite** Database Management Systems**Anti-Requisite** -**Co-Requisite** -**COURSE DESCRIPTION**

Data Mining Fundamentals; Data Preprocessing; Operational Database Systems and Data Warehouses; Mining Frequent Patterns; Classification and Prediction; Clustering; Data warehousing and Mining tools, New Trends and Research Frontiers.

COURSE OUTCOMES: After successful completion of this course, the student will be able to:

CO1. Understand the concepts of Data Warehousing architecture, Multidimensional models and OLAP operations.

CO2. Analyze data preprocessing techniques to produce refined data.

CO3. Apply Association rules and classification techniques for data categorization.

CO4. Make use of clustering techniques for grouping similar data items and identify outliers.

CO5. Design and develop applications using Data Mining trends.

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	-	-	-	-	-	-	-	-	3	3	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	3	3	-	-	2	-	3

Correlation Levels:**3: High;****2: Medium; 1: Low**

COURSE CONTENT

Module 1–DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING

Data Warehouse, Operational Database Systems versus Data Warehouses, A Multi tiered Architecture, A Multidimensional Data Model, Stars, Snowflakes and Fact Constellations: Schemas, Role of Concept hierarchies, Measures, OLAP Operations, from online Analytical processing to Multidimensional Data Mining, Indexing OLAP Data.

Module 2–DATA MINING AND DATA PREPROCESSING

Introduction to Data Mining, kinds of data, kinds of patterns, major issues in Data Mining, Data Pre-processing, Data Cleaning, Data Integration , Data Reduction, Data Transformation and Discretization.

Module 3–ASSOCIATIONS AND CLASSIFICATION

Basic Concepts, Frequent itemset Mining Methods, pattern evaluation methods- From Association Mining to Correlation Analysis, Classification, Decision Tree Introduction, Bayesian Classification Methods, Rule Based Classification, Prediction: Linear Regression.

Module 4- CLUSTER ANALYSIS

Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods-k-Means and K-Medoids, Hierarchical methods-Agglomerative and divisive method, Density-Based Method-DBSCAN, Grid-Based Method-STING, Outlier Analysis.

Module 5- DATA MINING TRENDS

Mining Complex Data Types: Mining sequence data, Mining other kinds of data: Spatial, Text, Multimedia and Web data.

Data Mining Trends: Mining Complex Data Types, Methodologies of Data Mining, Data Mining Applications, Data Mining and Society, Data Mining Trends.

EXPERIENTIAL LEARNING

1. Design and implement data acquisition process to perform Source Qualifier Transformation
2. Design and implement data acquisition process to perform Filter Transformation
3. Design and implement data acquisition process to perform Joiner Transformation
4. Design and implement data acquisition process to perform Aggregator Transformation
5. Design and implement data acquisition process to perform Sorter Transformation
6. Design and implement data acquisition process to perform Router Transformation
7. Design and implement data acquisition process to perform Union Transformation
8. Design and implement data acquisition process to perform Transaction control

Transformation

9. Design and implement data acquisition process to perform Rank Transformation
10. Design and implement data acquisition process to perform Normalizer Transformation
11. Implement the following Data mining techniques.

Data cleaning techniques

- a) smoothing by bin means
- b) smoothing by bin medians
- c) smoothing by bin boundaries

RESOURCES

TEXT BOOK:

Jiawei Han, Micheline Kamber and Jian Pei, "Data Mining: Concepts and Techniques," Elsevier, 3rd Edition, 2013.

REFERENCE BOOKS:

1. K.P. Soman, Shyam Diwakar and V. Ajay, Insight into Data mining Theory and Practice, Easter Economy Edition, Prentice Hall of India, 2006.
2. G. K. Gupta, Introduction to Data Mining with Case Studies, Easter Economy Edition, Prentice Hall of India, 2006.
3. Tan P.N, Steinbach M. and Kumar V., Introduction to Data Mining, Addison-Wesley, 2006.

SOFTWARE/TOOLS:

Python

Library : Sci kit Learn;

Computing platform : Jupyter Notebook

VIDEO LECTURES:

1. <http://nptel.ac.in/courses/106106093/35>
2. http://nptel.ac.in/syllabus/syllabus_pdf/106106105.pdf
3. <http://nptel.ac.in/video.php?subjectId=106106093>
4. <http://textofvideo.nptel.iitm.ac.in/video.php?courseId=106106093&p=4>

WEB RESOURCES:

1. <http://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/>
2. <https://myweb.sabanciuniv.edu/rdehkharghani/files/2016/02/The-Morgan-Kaufmann-eries-in-Data-Management-Systems-Jiawei-Han-Micheline-Kamber-Jian-Pei-Data-Mining.-Concepts-and-Techniques-3rd-Edition-Morgan-Kaufmann-2011.pdf>

<https://www.dei.unipd.it/~capri/SI/MATERIALE/DWDM0405.pdf>

Course Code**22CA101005****Course Title****FUNDAMENTALS OF DATA
SCIENCE****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: Basic Terminologies of data science, Computation using NumPy, Data exploration using Pandas, Data transformation, Data wrangling, Plotting and visualization using Matplotlib, Data aggregation, Time series analysis.

COURSE OUTCOMES: *After successful completion of this course, the students will be able to:*

- CO1.** Demonstrate knowledge on the concepts of data science to perform mathematical computations using efficient storage and data handling methods in NumPy.
- CO2.** Apply Data Preparation and Exploration methods using Pandas to perform data manipulation.
- CO3.** Create data visualization using charts, plots and histograms to identify trends, patterns and outliers in data using Matplotlib and Seaborn.
- CO4.** Develop methods to analyze and interpret time series data to extract meaningful statistics.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1	3	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	2	2	3	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	3	3	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	2	3	3	-	-	-	-	-	-	-	-	3	-	-
Course Correlation Mapping	3	3	2	2	3	-	-	-	-	-	-	-	-	3	-	-

Correlation Level: 3-High; 2-Medium; 1-Low

DETAILED SYLLABUS:

UNIT I– INTRODUCTION TO DATA SCIENCE

Basic terminologies of data science, Types of data, Five steps of data science, Arrays and vectorized computation using NumPy - The NumPy and array: A multidimensional array object, Universal functions: Fast element-wise Array functions, Array-oriented Programming with arrays, File input and output with arrays, Linear algebra, pseudorandom number generation.

UNIT II – DATA EXPLORATION WITH PANDAS

Process of exploring data, Pandas data structures – Series, Data frame, Index objects; Essential functionality, Summarizing and computing descriptive statistics - Correlation and covariance, Unique values, Value counts and membership; Data loading, Storage, and file formats - Reading and writing data in text format , Binary data formats , Interacting with web APIs, Interacting with databases.

UNIT III – DATA CLEANING, PREPARATION AND DATA WRANGLING

Handling missing data, Data transformation, String manipulation - String object methods, Regular expressions, Vectorized string functions in Pandas; Data wrangling: join, Combine and reshape - Hierarchical indexing, Combining and merging datasets, Reshaping and pivoting.

UNIT IV – DATA VISUALIZATION WITH MATPLOTLIB

Plotting and visualization- A brief matplotlib API primer, Plotting with Pandas and Seaborn, Other python visualization tools; Data aggregation and Group operations- Group By mechanics, Data aggregation, Apply: General split-apply-combine, Pivot tables and Cross-tabulation.

UNIT V – TIME SERIES ANALYSIS

Date and time data types and tools, Time series basics, Date ranges, Frequencies, and shifting. Time zone handling, Periods and period arithmetic, Resampling and frequency Conversion – Down sampling, up sampling and interpolation, Resampling with periods; Moving window functions.

EXPERIENTIAL LEARNING

1. An illustrative application of utilizing and array operations in the simulation of random walks
2. Explain about Integer Indexing and Panel Data using pandas

TEXT BOOKS:

1. Wes McKinney, Python for Data Analysis, O'Reilly, 2nd Edition, 2017.

REFERENCE BOOKS:

1. Sinan Ozdemir, Principles of Data Science, Packt Publishers, 2nd Edition, 2018.
2. Rachel Schutt, Cathy O'Neil, *Doing Data Science: Straight Talk from the Frontline*, O'Reilly, 2014.

VIDEO LECTURES:

1. <https://archive.nptel.ac.in/courses/106/106/106106212/>
2. https://onlinecourses.nptel.ac.in/noc22_cs32/preview

WEB RESOURCES:

1. https://swayam.gov.in/nd1_noc19_cs60/preview
2. <https://towardsdatascience.com/>
3. <https://www.w3schools.com/datascience/>
4. <https://github.com/jakevdp/PythonDataScienceHandbook>

Course Code**22CA101019****Course Title****ARTIFICIAL INTELLIGENCE****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: Introduction to artificial intelligence, Designing intelligent agents, Solving general purpose problems, Search in complex environments, Probabilistic reasoning, Represent knowledge and reason under uncertainty, Robotics, Ethics and safety in AI.

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

CO1 Architect intelligent agents using artificial intelligence techniques and principles.

CO2 Analyze and interpret the problem, identify suitable solutions using heuristic functions, optimization algorithms and search algorithms.

CO3 Select and apply appropriate knowledge representation to build Bayesian network models to reason under uncertainty.

CO4 Investigate robot hardware and frameworks for intelligent robotic perception.

CO5 Demonstrate knowledge on ethical implications of intelligent machines for providing privacy, trust, security and safety.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	1	-	-	-	-	-	-	-	-	-	-	-	-	3	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-	-	-	3	-
CO4	3	-	-	-	-	1	-	-	-	-	-	-	-	-	3	-
CO5	-	-	-	-	-	1	-	2	-	-	-	-	-	-	3	-
Course Correlation Mapping	3	2	2	-	-	1	-	2	-	-	-	-	-	-	3	-

Correlation Level: 3-High; 2-Medium; 1-Low

COURSE CONTENT:

Module 1: INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Foundations of artificial intelligence, History of artificial intelligence, State of the art, Risks and benefits of AI, Intelligent agents – Agents and environments, The concept of rationality, Structure of agents.

Module 2: PROBLEM SOLVING BY SEARCHING

Problem solving agents, Search algorithms, Uninformed search strategies, Informed search strategies – Greedy best-first search, A* search; Heuristic functions.

Module 3: SEARCH IN COMPLEX ENVIRONMENTS

Local search algorithms and optimization problems – Hill-climbing search, Simulated annealing, Local beam search, Evolutionary algorithms; Optimal decisions in games – The minimax search algorithm, Optimal decisions in multiplayer games, Alpha-Beta pruning, Move ordering; Monte Carlo tree search.

Module 4: PROBABILISTIC REASONING

Representing Knowledge in an uncertain domain, Semantics of Bayesian networks, Probabilistic reasoning over time – Time and uncertainty, Inference in temporal models, Hidden Markov models, Kalman Filter.

Module 5: ROBOTICS, ETHICS AND SAFETY IN AI

Robotics: Robots, Robot hardware, Robotic perception, Alternative robotic frameworks, Application domains.

Ethics and Safety in AI: Limits of AI, Ethics of AI – Surveillance, security and privacy, Fairness and bias, Trust and transparency, AI safety.

EXPERIENTIAL LEARNING:

1. Solve the travelling sales man problem using Hill Climbing search algorithm.
2. Design and implement solution for 8-puzzle problem using Greedy Best First Search.

RESOURCES

TEXT BOOK(S):

1. Stuart Russell, Peter Norvig, *Artificial Intelligence: A Modern Approach*, Prentice Hall, 4th Edition, 2020.

REFERENCE BOOKS:

1. Stephen Lucci , Danny Kopec, *Artificial Intelligence in the 21st Century*, Mercury Learning and Information, 3rd Edition, 2018.

2. Rich, Knight, Nair: Artificial intelligence, Tata McGraw Hill, Third Edition, 2009.
3. Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Education, 2017.
4. Saroj Kaushik, Artificial Intelligence, Cengage Learning, 2011.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc22_cs56/preview
2. <https://nptel.ac.in/courses/106105077>
3. <https://www.coursera.org/learn/introduction-to-ai>

WEB RESOURCES:

1. <https://searchenterpriseai.techtarget.com/definition/AI-Artificial-Intelligence>
2. <http://aima.cs.berkeley.edu/>
3. <https://ai.google/education/>
4. <https://www.coursera.org/courses?query=artificial%20intelligence>
<https://www.edureka.co/blog/artificial-intelligence-with-python/>

Course Code**Course Title****22CA102014****UNIX SHELL PROGRAMMING****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -**COURSE DESCRIPTION:**

This course provides a detailed discussion and hands-on experience on how to understand and make effective use of Unix utilities and Shell scripting language (bash) to solve Problems and to write Shell programming to automate the shell commands and to develop the skills necessary to write systems programs related to file system and managing process creation and to learn various powerful text editors in Unix/Linux.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Develop a deeper understanding of operating systems, their functions and services.
- CO2.** Understanding the basic set of commands and utilities in Linux/UNIX systems.
- CO3.** Learn the Linux/UNIX library functions and system calls.
- CO4.** Effectively use Text editors for shell programs and Shell Scripts.
- CO5.** Describe the work with UNIX utilities and to develop shell scripts.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	3	-	-	-	-	-	-	-	2	-	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO3	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
CO4	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
CO5	-	-	-	-	-	-	-	-	3	3	-	-	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	-	3	3	-	-	2	-	3

Correlation Levels:**3: High;****2: Medium; 1: Low**

COURSE CONTENT

Module 1: UNIX ENVIRONMENT

The operating system, The UNIX operating system, knowing your system , The UNIX Architecture, features of UNIX, locating commands, internal and external commands, command structure, understanding the man documentation.

Module 2: UNIX COMMANDS

Cal, date, echo, printf, bc, script, Email basics, mailx, passwd, who, uname, tty, sty. **The process:** Processbasics,**ps:**Processstatus,mechanismofprocesscreation,internalandexternal commands, running jobs in background, process states and Zombies, **nice**, killing processes with signals, job control, **cron**, **time**.

Module 3: FILESYSTEMANDITS ATTRIBUTES

Listing file attributes, directory attributes, file owner ship, file permissions, directory permissions, changingfileownership,filesystemandInodes,hardlinks,symboliclinks,locatingfiles, Modification and access time.

Module 4: THEVIEDITOR

VI Basics, Input mode-Entering and Replacing text, Saving and Quitting – The ex-mode, Navigation, Editing text, Undoing Last Editing Instructions, Repeating the last command, searching text in the editor, Substitution - search and replace.

Module 5: SHELL SCRIPT

Basic types of statements in a shell script, How do you execute a shell script, Examples of simplescripts,Workingwithscriptvariables,includingcommand-linearguments,Commandsubstitution, Expressions involving variables, Other forms of input to shell variables or commands in a script, Flow-of-control statements

EXPERIENTIAL LEARNING

1. Working with unix commands
2. Working with vi editor
3. Creating document in vi editor
4. Practicing–How to compile and run Cor C++programs
5. Shell programs Basics

6. Shell programs using decision statements, loops, positional variables
7. Shell programs using arrays and strings
8. Shell program applying UNIX commands
9. Shell program with functions
10. Shell program for file operations

RESOURCES

TEXT BOOKS:

1. Sumitabha Das, Your UNIX/LINUX: The Ultimate Guide , Edition 2012,Tata McGraw Hill.
2. Yashwanth Kanitkar, Unix Shell programming, BPB Publications, First Edition.

REFERENCE BOOKS:

1. Andrew Mallett-Mastering Linux Shell Scripting, 2015, PACKT Publisher.
2. Paul Love, Joe Merlino, Craig Zimmerman, Jeremy C. Reed, Paul Weinstein. Beginning Unix, 2015, Wiley Publisher.

SOFTWARE/TOOLS:

1. <https://learn.microsoft.com/en-us/windows/wsl/install>
2. <https://www.geeksforgeeks.org/essential-linuxunix-commands/>

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=k4Ww6gFeF0M>
2. <https://www.youtube.com/watch?v=vLPdBp9vv9Y>
3. <https://www.youtube.com/watch?v=lqYSCSgFefM&list=PL6UwySlcwEYIZGsbXnUxsojD0yeUA67lb>

WEB RESOURCES:

1. <https://www.unixtutorial.org/basic-unix-commands>
2. <https://www.udemy.com/course/bash-shell-scripting-crash-course-for-beginners>
3. <https://www.javatpoint.com/basic-unix-commands>
4. <https://www.geeksforgeeks.org/essential-linuxunix-commands>

Course Code**Course Title****22CA101023L INTRODUCTION TO VIRTUAL REALITY****Pre-Requisite** Computer Graphics**Anti-Requisite** -**Co-Requisite** -**COURSE DESCRIPTION:** This course provides a discussion on Introduction to Virtual Reality, 3D Graphic Basics, Computing Architectures for VR, modelling, Human Factors in VR.**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- CO1.** Demonstrate the concepts of Virtual Reality platforms and Applications.
- CO2.** Analyze the 3D graphics coordinate systems, transforms and matrices.
- CO3.** Design the Computing Architectures for virtual Reality using Graphics Benchmarks.
- CO4.** Applying the Geometric Modelling, Kinematics modelling, Physical modelling and Behavior modeling.
- CO5.** Implement the concepts of human factors for developing the Virtual Reality applications.

CO-PO- PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
CO5	3	3	-	-	-	-	-	-	-	-	-	-	2	3	-
Course Correlation Mapping	2	3	3	2	3	2	-	-	3	3	-	-	2	3	-

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

Module 1: INTRODUCTION TO VIRTUAL REALITY

Stereoscopic Displays - Motion Tracking Hardware - Input Devices - Computing Platforms - Virtual Reality Applications.

Module 2: 3D GRAPHICS BASICS

3D Coordinate Systems - Meshes, Polygons, and Vertices - Materials, Textures, and Lights - Transforms and Matrices - Cameras, Perspective, Viewports, and Projections - Stereoscopic Rendering.

Module 3: COMPUTING ARCHITECTURES FOR VR

The Rendering Pipeline - The Graphics Rendering Pipeline - The Haptics Rendering Pipeline - PC Graphics Architecture - PC Graphics Accelerators - Graphics Benchmarks

Module 4: MODELLING

Geometric Modelling - Virtual Object Shape - Object Visual Appearance - Kinematics Modelling - Physical Modelling - Behaviour Modelling

Module 5: HUMAN FACTORS IN VR

Usability Engineering Methodology - VR Health and Safety Issues - Direct Effects of VR Simulations on Users - Cyber sickness - Traditional VR Applications - Emerging Applications of VR

EXPERIENTIAL LEARNING:

1. A virtual Study Use Case- NICE, An Educational Experience
2. Study the use of Virtual Reality at NASA
3. Sweeping coverage of eye movements

RESOURCES

TEXT BOOKS:

1. Tony Parisi – Learning Virtual Reality, O'Reilly Media, Inc., 2015, ISBN-9781491922835

REFERENCE BOOKS:

1. Grigore C. Burdea, Philippe Coiffet - Virtual Reality Technology, 2nd Edition Wiley-IEEE Press, ISBN: 978-0-471-36089-6 July 2003

VIDEO LECTURES:

1. https://onlinecourses.swayam2.ac.in/nou23_ge34/preview
2. <https://archive.nptel.ac.in/courses/121/106/121106013/>
3. <https://www.udemy.com/course/virtual-reality-a-quick-introduction/>

WEB RESOURCES:

1. <https://www.geeksforgeeks.org/virtual-reality-introduction/>
2. <https://msl.cs.uiuc.edu/vr/vrch1.pdf>

Course Code

Course Title

22CA101024L

**INTRODUCTION TO AUGMENTED
REALITY**

Pre-Requisite Computer Graphics

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION: This course provides a discussion on Introduction to Virtual Reality, 3D Graphic Basics, Computing Architectures for VR, modelling, Human Factors in VR.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1. Gain Knowledge on the basic and advanced concepts of Augmented reality platforms and Applications.

CO2. Analyze the concepts of tracking.

CO3. Implement the concepts of computer vision for augmented reality which mapping

CO4. Apply the calibration and registration for augmented reality and visual coherence

CO-PO- PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	-	-	-	-	-	-	-	3	2	-
Course Correlation Mapping	2	3	3	2	3	-	-	-	3	3	-	-	2	3	-

Correlation Levels:

3: High;

2: Medium;

1: Low

COURSE CONTENT

MODULE 1: INTRODUCTION TO AUGMENTED REALITY

History – Multimodal Displays - Visual Perception - Requirements and Characteristics - Spatial Display Model - Visual Displays

MODULE 2: TRACKING

Tracking, Calibration, and Registration - Coordinate Systems - Characteristics of Tracking Technology - Stationary Tracking Systems - Mobile Sensors - Optical Tracking

MODULE 3: COMPUTER VISION FOR AUGMENTED REALITY

Marker Tracking - Multiple-Camera Infrared Tracking - Natural Feature Tracking by Detection - Incremental Tracking - Simultaneous Localization and Mapping.

MODULE 4: CALIBRATION AND REGISTRATION

Camera Calibration - Internal Camera Parameters - Correcting Lens Distortion - Display Calibration - Single Point Active Alignment Method - Head-Mounted Display Calibration Using a Pointing Device - Hand-Eye Calibration - Registration - Geometric Measurement Distortions - Error Propagation - Latency - Filtering and Prediction.

MODULE 5: VISUAL COHERENCE

Registration - Occlusion - Occlusion Refinement - Probabilistic Occlusion - Model-Free Occlusion - Photometric Registration - Image-Based Lighting - Light Probes - Offline Light Capturing

EXPERIENTIAL LEARNING

1. Investigate the historical evolution of augmented reality. How has it evolved over time, and what were the key milestones in its development?
2. Explore the spectrum between real and virtual worlds. Provide examples of technologies that fall within this spectrum and discuss their relationship with augmented reality.
3. Identify and discuss real-world applications of augmented reality. How is AR being used across various industries, and what impact does it have on user experiences?
4. Examine the various sensory displays in augmented reality hardware. How do audio displays, haptic displays, and visual displays contribute to enhancing the user's AR experience?
5. Delve into the role and architecture of processors in augmented reality hardware. How do processors contribute to the overall functionality of AR devices?
6. Explore the characteristics of tracking technology in augmented reality. How does tracking, calibration, and registration enhance the precision and accuracy of AR devices?
7. Conduct an experiment using marker tracking in augmented reality. Discuss the advantages

and limitations of marker-based tracking in various scenarios.

8. Analyze the major components of augmented reality software systems. How do these components work together to create a seamless AR experience?
9. Implement a markerless tracking approach in a real-world scenario. Discuss the challenges and benefits of markerless tracking, providing examples of successful implementations.
10. Investigate different types of markers used in augmented reality, such as template markers and 2D barcode markers. Compare their advantages and disadvantages in specific contexts.

RESOURCES

TEXT BOOKS:

1. Augmented Reality: Principles & Practice by Schmalstieg / Hollerer, Pearson Education India; First edition (12 October 2016), ISBN-10: 9332578494
2. Allan Fowler-AR Game Development, 1st Edition, A press Publications, 2018, ISBN 978-1484236178

REFERENCE BOOKS:

1. Sanni Siltanen- Theory and applications of marker-based augmented reality. Julkaisija – Utgivare Publisher. 2012. ISBN 978-951-38-7449-0

VIDEO LECTURES:

1. <https://www.coursera.org/learn/ar>
2. <https://www.coursera.org/courses?query=augmented%20reality>
3. https://www.udemy.com/course/develop-augmented-reality-book-ar-business-card-with-unity/?gad_source=1&gclid=EAIaIQobChMIv4yp

WEB RESOURCES:

1. <http://pire.fiu.edu/publications/Augmented.pdf>
2. <https://b-u.ac.in/sites/b-u.ac.in/files/latest-attachments/2.pdf>

Course Code**Course Title****22CA101025L****INTRODUCTION TO DIGITAL ARTS
AND TECHNOLOGY****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This course gives students an insight into the concepts and evolution of digital arts and related technologies, develop skills in digital design, editing, and multimedia creation, the principles of effective visual communication and design, engage in hands-on creative projects using digital tools, evaluate the impact of digital arts from ethical, legal, and social perspectives.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Demonstrate basic concepts of foundational concepts and the evolution of digital arts and technology.
- CO2.** Apply design principles and color theory in the creation of digital artwork.
- CO3.** Demonstrate proficiency in using digital media tools (graphic, audio, video).
- CO4.** Design multimedia content and digital storytelling projects.
- CO5.** Assess digital media in terms of ethics, aesthetics, and usability.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	-	-	-	-	-	3
CO2	3	3	3	2	-	-	-	-	-	-	-	-	-	-	3
CO3	3	2	3	2	3	-	-	-	-	3	-	-	-	-	3
CO4	3	3	3	-	3	-	-	-	-	-	-	-	-	-	3
CO5			3	-	3	-	-	-	-	-	-	-	-	-	3
Course Correlation Level	3	3	3	3	3	2	-	-	-	3	-	-	-	-	3

Correlation Levels: 3: High 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO DIGITAL ARTS

History and evolution, Types of digital art: 2D, 3D, generative, interactive, motion graphics, Technology in art: Digital devices, software, virtual environments, Emerging trends: AR/VR, AI in art, NFTs, Careers and applications in digital arts.

Module 2: ELEMENTS & PRINCIPLES OF DESIGN

Elements: Line, shape, form, texture, space, color, value; Principles: Balance, contrast, emphasis, unity, rhythm, movement, Introduction to color theory and typography, Composition and layout for screen-based design.

Module 3: TOOLS AND SOFTWARE FOR DIGITAL CREATION

Raster vs vector graphics, Graphic design tools: Adobe Photoshop, GIMP, Illustrator, Inkscape, Audio editing basics: Audacity, GarageBand, Video editing basics: Adobe Premiere, Shotcut, DaVinci Resolve, Image formats, resolution, compression techniques.

Module 4: MULTIMEDIA & DIGITAL STORYTELLING

Multimedia components: Text, image, video, audio, animation, Digital storytelling: Narrative structures and scripting, Introduction to UI/UX design basics and wireframes, Animation basics using tools like Adobe Animate or Blender.

Module 5: ETHICS, COPYRIGHT

Copyright and intellectual property in digital media, Plagiarism, fair use, and Creative Commons, Ethical use of AI and generative art, Social and cultural impact of digital technologies.

EXPERIENTIAL LEARNING:

4. Create a digital poster using Canva, Figma, or Photoshop.
5. Peer review of design work in small groups.
6. Hands-on practice sessions with image/audio/video editing tools.
7. Edit a photo and audio clip as mini projects.

RESOURCES

TEXT BOOKS:

1. **Fredricka K. Reisman** – *Teaching and Learning in the Digital Age*
2. **Jennifer George-Palilonis** – *The Multimedia Journalist: Storytelling for Today's Media Landscape*

REFERENCE BOOKS:

1. **Michael Freeman** – *The Photographer's Eye*
2. **Robin Landa** – *Graphic Design Solutions*

VIDEO LECTURES:

1. **Digital Art Tutorial for Beginners** – [YouTube](#)
2. **Color Theory in 5 Minutes** – [YouTube](#)
3. **What is Digital Storytelling?** – [YouTube](#)
4. **Free Photoshop Course** – [YouTube - GFXMentor](#)
5. **Audacity Beginner Tutorial** – [YouTube](#)

WEB RESOURCES:

1. [Adobe Creative Cloud Tutorials](#)
2. [Khan Academy – Pixar in a Box](#)
3. [Behance.net](#) – Explore projects by digital artists

Course Code**Course Title****22CA111001L****INTERNSHIP****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: Expose students to the industrial environment; Create competent professionals for the industry; sharpen the real time technical / managerial skills required at the job; Gain professional experience and understand engineer's responsibilities and ethics; Familiarize with latest equipment, materials and technologies; Gain exposure to technical report writing; Gain exposure to corporate working culture.

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

- CO1.** Analyze latest equipment, materials and technologies that are used in industry to solve complex engineering problems following relevant standards, codes, policies and regulations.
- CO2.** Analyze safety, health, societal, environmental, sustainability, economical and managerial factors considered in industry in solving complex engineering problems.
- CO3.** Perform individually or in a team besides communicating effectively in written, oral and graphical forms on practicing engineering.

CO-PO Mapping Table:

Course Outcome	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	3	-	-	3	-	-	-	3
CO2	-	3	-	-	-	3	3	-	-	-	3	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-
Course Correlation Mapping	3	3	-	3	3	3	3	3	3	3	3	3

Correlation Level: 3-High; 2-Medium; 1-Low

Course Code**Course Title****22MM101410L DISCRETE MATHEMATICS FOR COMPUTER SCIENCE****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This course will discuss fundamental concepts such as sets, proof techniques, functions, relations, counting principles, mathematical logics and graph theoretical approaches with applications to computer science.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Identify the mathematical logic through the algebraic skills of expressions, tables and normal forms.
- CO2.** Demonstrate the basic concepts of Mathematical systems to analyse the proof techniques in mathematical induction.
- CO3.** Apply the techniques of counting, permutations and combinations for solving various practical problems.
- CO4.** Apply the concepts of graph theory to solve structural and graphical designs.

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	-	1	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	2	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	2	-	-	-	-	-	-	-	-	-	-	-
Course Correlation Mapping	3	2	-	2	2	-	-	-	-	-	-	-	-	-	-

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

Module 1: MATHEMATICAL LOGIC

Propositions and Logical Operations, Truth Tables, Equivalence, Implications, Laws of Logic, Normal Forms: Conjunctive Normal Form, Disjunctive Normal Form, Principle Disjunctive Normal Form, Principle Conjunctive Normal Form.

Module 2: SET THEORY

Sets and Elements, Subsets, Venn Diagrams, Set Operations, Algebra of Sets, Finite Sets, Counting Principle, Classes of Sets, Power Sets, Partitions, Mathematical Induction.

Module 3: RELATIONS AND FUNCTIONS

Relations, Operations on Relations, Equivalence Relation, Partitions and Equivalence Classes, Functions, One-One and Onto Functions, Special Type of Functions, Invertible Functions, Compositions of Functions, Recursively Defined Functions.

Module 4: TECHNIQUES OF COUNTING

Basic Counting Principles, Permutations, Combinations, Generalized Permutations and Combinations, Pigeonhole Principle, Generalized Pigeonhole Principle, Inclusion Exclusion Principle.

Module 5: GRAPHS

Definition of a Graph, Graph Terminology and special Types of Graphs, Handshaking Theorem, Finite and Infinite graphs, Incidence and Degree, Null graph, Sub graphs, Walks, Paths and Circuits in a graph, Connected graphs.

EXPERIENTIAL LEARNING

1. Demonstrate that $R \wedge (P \vee Q)$ is a valid conclusion from the premises $(P \vee Q)$, $(Q \rightarrow R)$, $(P \rightarrow M)$ and $\neg M$.
2. Draw the Hasse diagram of the set $\{2,4,8,16\}$ under the partial ordering relation "divides" and indicate those which are totally ordered

RESOURCES

TEXT BOOKS:

1. Kenneth H. Rosen, "*Discrete Mathematics and its Applications*", Tata McGraw Hill, 8th Edition, 2019.
2. Jon Pierre Fortney, "*Discrete Mathematics for Computer Science*," CRC Press, Taylor & Francis Group, 1st Edition, 2021.

REFERENCE BOOKS:

1. Richard Johnsonbaugh, "*Discrete Mathematics*," Prentice Hall, 8th Edition, 2019.
2. Narasing Deo, "*Graph Theory with application to Engineering and Computer Science*," Prentice Hall India, 2016.
3. J.P. Trembly and R. Manohar, "*Discrete Mathematical Structures with Applications to Computer Science*," Tata McGraw Hill, 37th Edition, 2017.

VIDEO LECTURES:

1. <https://nptel.ac.in/courses/106106183>
2. <https://nptel.ac.in/courses/106106094>

WEB RESOURCES:

1. <https://www.coursera.org/learn/discrete-mathematics>
2. <https://people.cs.pitt.edu/~milos/courses/cs441/>
3. <https://web.stanford.edu/class/cs103x/cs103x-notes.pdf>

Course Code**Course Title****22CA104003L****ADVANCED COMPUTER GRAPHICS****Pre-Requisite** Introduction to 3D Computer Animation**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: To Introduce various Graphics Applications in real world scenario, familiar with image fundamentals and animations and learn more about 2D, 3D and Curve applications

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Compare various graphics algorithm used in 2D and 3D
- CO2.** Understand fundamentals of graphics used in various real life applications.
- CO3.** Understand and identify the performance characteristics of graphics algorithms.
- CO4.** Design basic graphics application programs, including animation
- CO5.** Acquire familiarity with the relevant mathematics of computer graphics
- CO6.** Design applications that display graphic images to given specifications

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	1	3	2	2	3	-	-	-	-	-	-	-	2	3	-
CO3	1	2	3	2	3	-	-	-	-	-	-	-	2	3	-
CO4	2	3	3	3	3	2	-	-	-	-	-	-	3	2	-
CO5	3	3	2	2	2	2	2	-	-	-	-	-	1	-	-
CO6	3	3	-	-	2	-	-	-	-	-	-	-	-	3	-
Course Correlation Mapping	2	3	3	2	3	2	-	-	-	-	-	-	2	3	-

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

MODULE 1: REVIEW OF 2D AND 3D GRAPHICS

Transformations, Windowing, Clipping, 3D geometry, primitives and transformations, Rotation about an arbitrary axis, Parallel and perspective projection, Viewing parameters, 3D clipping and viewing transformation.

MODULE 2: CURVES AND FRACTALS

Polygon Meshes, Parametric Cubic curves: B-spline, Bezier, Hermite. Parametric Bicubic Surfaces, Quadric surfaces, Fractals: fractal lines and surfaces Applications.

MODULE 3: ACHROMATIC AND COLORED LIGHT

Achromatic light, Gamma correction, Halftone, approximation, Chromatic Color, CIE chromaticity diagram, Color models for Raster Graphics. Using Color in Computer Graphics.

MODULE 4: ILLUMINATION AND SHADING

Surface detail, shadows and Transparency, Inter object Reflections, Illumination Models, Extended Light Sources, Recursive Ray Tracing.

MODULE 5: ANIMATION AND GRAPHICS HARDWARE

Introduction, morphing, character animation and facial animation, Special-purpose computer graphics processors and accelerators.

EXPERIENTIAL LEARNING

1. To perform open GL program for Bezier Curve.
2. To perform Bezier curve with c0 and c1 continuity.
3. To Draw cube with or without back face culling.
4. To perform Hermite Curve.
5. To perform program for diffuse illumination
6. To perform program for sphere with Back face culling.
7. To perform program for Ambient and diffuse light source.
8. To perform program for ambient & specular & diffuse light source.
9. To perform program for Diffuse only light source.
10. To perform Z buffer visible surface Algorithm

PROJECT BASED LEARNING

The students have to select the problems and solve using the concept of computer Graphics.

1. Ambient light simulation in 3D Object
2. Visualization of the digits of PI

3. Client Server Architecture Simulation
4. Super ellipse visualization
5. Mandelbrot set visualization
6. Visualization of A* Shortest Path finding Algorithm
7. Fibonacci Spiral (Golden Ratio) Visualisation

RESOURCES

TEXT BOOKS:

1. Computer Graphics: principals and practice Foley, vanDam, Feiner Hughes Addison Wesley
2. Mathematical Elements of Graphics Roges Tata McGrow Hill

REFERENCE BOOKS:

1. Computer Graphics Donald Hearn and M.Pauline Baker Prentice Hall India
2. Procedural Elements-Computer Graphics, David Rogers, TMH
3. Principals of Computer graphics, Shalini Govil-pal, springer

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc20_cs90/preview
2. <https://nptel.ac.in/courses/106106090>

WEB RESOURCES:

1. <https://www.coursera.org/learn/interactive-computer-graphics>
2. <https://www.coursera.org/learn/interactive-computer-graphics>

Course Code
22CA102008L

Course Title
DATA ANALYTICS

Pre-Requisite -

Anti-Requisite -

Co-Requisite -

COURSE DESCRIPTION:

This course provides a detailed discussion and understanding the need of Big Data Analytics, challenges and different analytical architectures, Installation and understanding of Hadoop Architecture and its ecosystems, Processing of Big Data with Advanced architectures.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

- CO1.** Ability to explain the foundations, definitions, and challenges of Big Data and various Analytical tools.
- CO2.** Access and Process Data on Hadoop Distributed File System
- CO3.** Manage Job Execution in Hadoop Environment
- CO4.** Ability to understand the importance of Big Data in Social Media and Mining
- CO5.** Analyze the value from the Data

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	3	-	-	-	-	-	-	-	-	3	3	3
CO2	3	2	3	3	3	-	-	-	-	-	3	3	3	3	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-	3	3	3
CO4	3	3	3	1	3	1	-	1	-	-	1	3	3	3	3
CO5	3	3	3	3	3	3	-	3	-	-	3	3	3	3	-
Course Correlation Mapping	3	3	3	3	3		-	3	-	-	-	3	3	3	3

Correlation Levels: 3: High; 2: Medium; 1: Low

COURSE CONTENT

Module 1: INTRODUCTION TO BIG DATA ANALYTICS

Overview of Big Data Analytics, Data Science, Big Data Characteristics, Architecture of Big Data Systems, Advantages of Big Data and Challenges faced by Big Data Systems.

Module 2: BIG DATA TECHNOLOGIES

Hadoop's Parallel World – Data discovery – Open source technology for Big Data Analytics – cloud and Big Data – Predictive Analytics – Mobile Business Intelligence and Big Data

Module 3: HADOOP

Big Data – Apache Hadoop & Hadoop Eco System – Moving Data in and out of Hadoop – Understanding inputs and outputs of MapReduce – Data Serialization.

Module 4: HADOOP ARCHITECTURE

Hadoop: RDBMS Vs Hadoop, Hadoop Overview, Hadoop distributors, HDFS, HDFS Daemons, Anatomy of File Write and Read., Name Node, Secondary Name Node, and Data Node

Module 5: HDFS and MAP REDUCE FRAMEWORK

HDFS Architecture, Hadoop Configuration, Map Reduce Framework

EXPERIENTIAL LEARNING

1. Perform setting up and Installing Hadoop in its standalone operating mode
2. Perform setting up and Installing Hadoop in its Pseudo and Fully Distributed operating mode
3. By Using web-based tools to monitor the Hadoop Setup.
4. Perform Hadoop Commands
5. Implement the File Management task by adding the files and directories in Hadoop
6. Implement the Retrieving file task in Hadoop
7. Implement the Removing file task in Hadoop.

RESOURCES

TEXT BOOKS:

1. Big Data Analytics by G Sudha Sadasivam and R. Thirumahal, Oxford Higher Edition.
2. Big Data Analytics, Seema Acharya, Subhasini Chellappan, Wiley 2015.
3. Hadoop: The Definitive Guide, Tom White, 3rd Edition, O'Reilly Media, 2012.

REFERENCE BOOKS:

1. Big Data Analytics: Disruptive Technologies for Changing the Game, Arvind Sathi, 1st Edition, IBM Corporation, 2012.

2. Big Data and Business Analytics, Jay Liebowitz, Auerbach Publications, CRC press (2013)

SOFTWARE/TOOLS:

1. Hadoop (<https://hadoop.apache.org/releases.html>)
2. Cassandra (<http://cassandra.apache.org/download/>)

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc20_cs92/preview
2. <https://www.upgrad.com/data-science/pg-programme>
3. <https://www.youtube.com/watch?v=CaqJ65CIoMw>

WEB RESOURCES:

1. Big Data Analytics Tutorial (tutorialspoint.com)
2. hackerrank-solutions · GitHub Topics · GitHub
3. What is Big Data - javatpoint
4. What is Big Data? - GeeksforGeeks

Course Code**Course Title****22CA101007L****USER EXPERIENCE / INTERFACE (UX/UI) DESIGN****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -**COURSE DESCRIPTION:** User experience (UX), usability and UI design.**COURSE OUTCOMES:** After successful completion of the course, students will be able to:

- C01.** Understand Importance and Characteristics of User interface design
- C02.** Create User Interface Design process AND Business functions
- C03.** Design System menus, navigation schemes
- C04.** Demonstrate screen-based controls and device-based controls
- C05.** Identify prototypes and test plans of user interface

CO-PO-PSO Mapping Table:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
C01	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
C02	3	3	3	3	3	-	-	-	-	-	-	-	2	-	3
C03	3	2	3	3	3	-	-	-	-	-	-	-	2	-	3
C04	3	3	3	3	3	-	-	3	-	-	-	-	2	-	3
C05	-	-	-	-	-	-	-	-	3	3	-	3	2	-	3
Course Correlation Mapping	3	3	3	3	3	-	-	3	3	3	-	3	2	-	3

Correlation Levels: 3: High; 2: Medium; 1: Low**COURSE CONTENT****Module 1: THE IMPORTANCE OF USER INTERFACE:**

Defining the User Interface, The Importance Of Good Design, The Benefits of Good Design, A Brief History of The Human-Computer Interface-Introduction of The Graphical User Interface, The Blossoming of The World Wide Web, A Brief History of Screen Design

CHARACTERISTICS OF GRAPHICAL AND WEB USER INTERFACES: The Graphical User Interface, The Web User Interface, Principles of User Interface Design.

Module 2: THE USER INTERFACE DESIGN PROCESS:

Obstacles and Pitfalls in the Development Path, Usability, The Design Team.

KNOW YOUR USER OR CLIENT: Understanding How People Interact with Computers, Important Human Characteristics in Design, Perception, Memory, Sensory Storage, Visual Acuity, Human Considerations in Design-The User's Knowledge and Experience.

Module 3: UNDERSTAND THE BUSINESS FUNCTION:

Business Definition and Requirements Analysis, Determining Basic Business Functions, Design Standards or Style Guides, System Training and Documentation Needs.

UNDERSTAND THE PRINCIPLES OF GOOD SCREEN DESIGN: Human Considerations In Screen Design, Interface Design Goals, Statistical Graphs

Module 4: DEVELOP SYSTEM MENUS AND NAVIGATION SCHEMES:

Structures of Menu, Functions Of Menus, Formatting And Phrasing Of Menus, Navigating Menus, Kinds Of Graphical Menus, Window Characteristics, Components Of A Window, Types Of Windows, Window Operations, Web Systems.

Module 5: SELECTING THE PROPER DEVICE-BASED CONTROLS:

Characteristics of Device-Based Controls, Presentation Controls, Write Clear Text and Messages, Provide Effective Feedback and Guidance and Assistance, Create Meaningful Graphics, Icons And Images.

EXPERIENTIAL LEARNING

1. Plan and conduct a usability test for a specific feature of a digital product.
2. Evaluate the accessibility of an existing website or application. Identify potential accessibility issues and propose design changes to enhance inclusivity.

RESOURCES

TEXT BOOKS:

1. The Essential Guide to User Interface Design, Second Edition, Wilbert O. Galitz, 2002.

REFERENCE BOOKS:

1. User Interface Design, A Software Engineering Perspective, Soren Lauesen.
2. User Interface Design and Evolution, Debbie Stone, Caroline Jarrett, Mark Woodroffe, Shailey Minocha, 2005

VIDEO LECTURES:

1. <https://www.coursera.org/learn/UXdesign>
2. <https://www.edx.org/course/UX-design>
3. <https://www.udemy.com/course/UX>

WEB RESOURCES:

1. <https://www.coursera.org/articles/ui-vs-ux-design>
2. <https://www.simplilearn.com/how-to-become-ui-ux-designer-article>
3. <https://intellipaat.com/blog/ui-ux-design-tutorial/>

Course Code**Course Title****22CA101014L****MACHINE LEARNING****Pre-Requisite** Data Warehousing and Data Mining**Anti-Requisite** -**Co-Requisite** -**COURSE DESCRIPTION:**

Concept learning, General to specific ordering, Decision tree learning, Support vector machine, Artificial neural networks, Multilayer neural networks, Bayesian learning, Instance based learning, reinforcement learning.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to

- CO1** Analyze the concept learning algorithms to automatically infer a general description for a given learning problem.
- CO2** Analyze the underlying mathematical models within machine learning algorithms and learning tasks.
- CO3** Evaluate and apply suitable machine learning algorithms for various types of learning tasks.
- CO4** Design efficient neural architectures to model patterns for a given learning problem.
- CO5** Select and apply machine learning algorithms to solve societal problems such as face recognition, text classification.

CO-PO-PSO Mapping Table:

Course Outcome	Program Outcomes												Program Specific Outcomes			
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3	PSO 4
CO1	3	2												3		
CO2	2	3												3		
CO3	2	3	2	1										3		
CO4	3	3	3	1										3		
CO5	2	3	2			2								3		

Correlation Levels:**3: High;****2: Medium; 1: Low**

COURSE CONTENT:

Module 1: CONCEPT LEARNING AND GENERAL-TO-SPECIFIC ORDERING

Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning, Concept learning task, Concept learning as search, FIND-S, Version spaces and candidate elimination algorithm, Inductive bias.

Module 2: DECISION TREE LEARNING AND KERNEL MACHINES

Decision Tree Learning: Decision tree representation, Problems for decision tree learning, Decision tree learning algorithm, Hypothesis space search, Inductive bias in decision tree learning, Issues in decision tree learning.

Kernel Machines: Support vector machines – SVMs for regression, SVMs for classification, Choosing C, A probabilistic interpretation of SVMs.

Module 3: ARTIFICIAL NEURAL NETWORKS

Neural network representations, Appropriate problems for neural network learning, Perceptron's, Multilayer networks and Back propagation algorithm, Convergence and local minima, Representational power of feed forward networks, Hypothesis space search and inductive bias, Hidden layer representations, Generalization, Over fitting, Stopping criterion, An Example - Face Recognition.

Module 4: BAYESIAN LEARNING

Bayes theorem and concept learning, Maximum likelihood and least-squared error hypothesis, Maximum likelihood hypotheses for predicting probabilities, Minimum Description Length principle, Bayes optimal classifier, Gibbs algorithm, Naive Bayes classifier, An Example – Learning to classify text; Bayesian belief networks, EM Algorithm.

Module 5: INSTANCE BASED LEARNING AND REINFORCEMENT LEARNING

Instance Based Learning: k-Nearest Neighbor learning, Locally weighted regression, Radial basis functions, Case-based reasoning.

Reinforcement Learning: The learning task, Q-learning, Nondeterministic rewards and actions, Temporal difference learning, Generalizing from examples, Relationship to dynamic programming.

EXPERIENTIAL LEARNING:

1. Implement Simple and Multiple Linear Regression Models
2. Implement Naïve Bayes Classification in Python
3. Write a python program to implement K-Means clustering Algorithm.

RESOURCES**TEXT BOOKS:**

1. Tom M. Mitchell, *Machine Learning*, McGraw Hill, 2013.
2. Kevin P. Murphy, *Machine Learning: A Probabilistic Perspective*, MIT Press, 2012.

REFERENCE BOOKS:

1. EthemAlpaydin, *Introduction to Machine Learning*, MIT Press, 4th Edition, 2020.
2. Shai Shalev Shwartz, Shai Ben David, *Understanding Machine Learning: From Theory to Algorithms*, Cambridge University Press, 2014.

VIDEO LECTURES:

1. https://swayam.gov.in/nd1_noc19_cs52/preview
2. <https://www.udemy.com/course/machinelearning/>

WEB RESOURCES:

1. <https://www.tensorflow.org/resources/learn-ml>
2. <https://sgfin.github.io/learning-resources/>

Course Code**Course Title****22CA102020L****SOFTWARE TESTING AND AUTOMATION****Pre-Requisite**

Software Engineering

Anti-Requisite

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Co-Requisite

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COURSE DESCRIPTION: Black-Box Testing and White-Box Testing; Software Testing Life Cycle; Software Testing Principles; Test Cases; Bug Reporting, Advanced Testing concepts; Automated Software Testing; Automate Testing of Web Applications; Selenium;

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1: Understand the basic concepts of software testing and the need for software testing

CO2: Design Test planning and different activities in involvedintest planning

CO3: Design effective test cases that can uncover critical defects in the application

CO4: Carry out advanced types of testing

CO5: Automate the software testing using Selenium and Test NG

CO-PO-PSO Mapping Table

Course Outcomes	Program Outcomes									Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO	PO9	PO10	PO11	PO1	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	1	1	3	2	3	2	3
CO2	2	3	1	1	1	2	2	1	2	1	2	3
CO3	2	2	1	3	1	1	3	1	2	2	3	2
CO4	2	1	3	2	1	1	1	1	2	3	1	2
CO5	2	2	1	3	1	1	3	2	1	2	1	3
Level of Correlation of the course	2	3	2	2	2		-	-		-	-	3

3- High mapping**2-Medium Mapping****1- Low Mapping**

COURSE CONTENT:

Module-I: FOUNDATIONS OF SOFTWARE TESTING

Why do we test Software?, Black-Box Testing and White-Box Testing, Software Testing Life Cycle, V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing.

Module-II: TESTPLANNING

The Goal of Test Planning, High Level Expectations, Intergroup Responsibilities, Test Phases, Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

Module-III: TESTDESIGNAND EXECUTION

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

Module-IV: ADVANCED TESTINGCONCEPTS

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing the Documentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.

Module- V: TESTAUTOMATIONAND TOOLS

Automated Software Testing, Automate Testing of Web Applications, Selenium: Introducing Web Driver and Web Elements, Locating Web Elements, Actions on Web Elements, Different Web Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

EXPERIENTIAL LEARNING:

1. Develop the test plan for testing commerce web/mobile application(www.amazon.in)
2. Design the test cases for testing thee-commerce application
3. Test thee –commerce application and report the defectsinit.
4. Develop the test plan and design the test cases for an inventory control system.
5. Execute the test cases against a client server or desktop application and Identify the defects.
6. Test the performance of thee-commerce application.
7. Automate the testing of e-commerce applications using Selenium.
8. Integrate Test NG with the above test automation.
9. Mini Project:

- i. Build a data-driven framework using Selenium and Test NG
- ii. Build Page object Model using Selenium and Test NG
- iii. Build BDD framework with Selenium, Test NG and Cucumber

RESOURCES

TEXTBOOKS

1. Yogesh Singh, "Software Testing", Cambridge University Press, 2012
2. Unmesh Gundecha, Satya Avasarala, "Selenium WebDriver 3 Practical Guide"
Second Edition 2018

REFERENCES

1. Glenford J. Myers, Corey Sandler, Tom Badgett, The Art of Software Testing, 3rd Edition, 2012, John Wiley & Sons, Inc.
2. Ron Patton, Software testing, 2nd Edition, 2006, Sams Publishing
Paul C. Jorgensen, Software Testing: A Craftsman's Approach, Fourth Edition, 2014, Taylor & Francis Group.
3. Carl Cocchiaro, Selenium Framework Design in Data-Driven Testing, 2018, Packt Publishing.
4. Elfriede Dustin, Thom Garrett, Bernie Gaurf, Implementing Automated Software Testing, 2009, Pearson Education, Inc.
5. Satya Avasarala, Selenium Web Driver Practical Guide, 2014, Packt Publishing.
6. Varun Menon, TestNG Beginner's Guide, 2013, Packt Publishing.

VIDEO LECTURES:

1. https://onlinecourses.nptel.ac.in/noc22_cs61/preview
2. https://onlinecourses.nptel.ac.in/noc23_cs38/preview
3. <https://www.coursera.org/specializations/software-testing-automation>

WEB RESOURCES:

1. <https://online.umn.edu/software-testing-and-automation>
2. <https://shiftasia.com/column/software-testing-automation-and-the-misconceptions/>
3. <https://link.springer.com/book/10.1007/978-3-031-22057-9>

Course Code**Course Title****22LG201701L****PERSONALITY DEVELOPMENT****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: This course gives awareness to students about the various dynamics of personality development.

COURSE OUTCOMES: After successful completion of the course, students will be able to:

CO1.Demonstrate knowledge in Self-Management and Planning Career

CO2. Analyze the functional knowledge in attitudes and thinking strategies

CO3. Learn and apply soft skills for professional success.

CO4. Function effectively as an individual and as a member in diverse teams

CO5.Communicate effectively in public speaking in formal and informal situations.

CO-PO Mapping Table

Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	2	-	-	3	-	-	-	-	2	-	-
CO4	1	1	-	-	-	-	-	-	3	3	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	-
Course Correlation Mapping	2	2	3	-	3	-	-	-	3	3	-	-

Correlation Levels:**3: High;****2: Medium;****1: Low**

COURSE CONTENT

Module 1: SELF-ESTEEM & SELF-IMPROVEMENT

Know Yourself – Accept Yourself; Self-Improvement: Plan to Improve – Actively Working to Improve Yourself- Exercises- case studies

Module 2: DEVELOPING POSITIVE ATTITUDES

How Attitudes Develop – Attitudes are Catching – Improve Your Attitudes – Exercises- case studies

Module 3 SELF-MOTIVATION & SELF-MANAGEMENT

Show Initiative – Be Responsible Self-Management; Efficient Work Habits – Stress Management – Employers Want People Who can Think – Thinking Strategies- Exercises- case studies

Module 4 GETTING ALONG WITH THE SUPERVISOR

Know your Supervisor – Communicating with your Supervisor – Special Communication with your Supervisor – What Should you Expect of Your Supervisor? – What your Supervisor expects of you – Moving Ahead Getting Along with your Supervisor- Exercises- case studies

Module 5 WORKPLACE SUCCESS

First Day on the Job – Keeping Your Job – Planning Your Career – Moving Ahead- Exercises- case studies

EXPERIENTIAL LEARNING

1. List out the self-improvements in you on the charts and explain in detail.
2. Discuss different famous personalities and their attitudes.
3. Describe different personalities with respect to self-motivation and self-management.
4. Imagine you are a supervisor and illustrate different special communications.
5. Assume and Interpret different experiences on the first day of your job.

(Note: It's an indicative one. Course instructor may change the activities and the same shall be reflected in course handout)

RESOURCES

TEXTBOOK:

1. Harold R. Wallace and L. Ann Masters, *Personal Development for Life and Work*, Cengage Learning, Delhi, 10th edition Indian Reprint, 2011. (6th Indian Reprint 2015)
2. Barun K. Mitra, *Personality Development and Soft Skills*, Oxford University Press, 2011.

REFERENCE BOOKS:

1. K. Alex, *Soft Skills*, S. Chand & Company Ltd, New Delhi, 2nd Revised Edition, 2011.
2. Stephen P. Robbins and Timothy A. Judge, *Organizational Behaviour*, Prentice Hall, Delhi, 16th edition, 2014

VIDEO LECTURES:

1. <https://www.youtube.com/watch?v=6Y5VWBLi1es>
2. <https://www.youtube.com/watch?v=H9qA3inVMrA>

WEB RESOURCES:

1. <https://www.universalclass.com/.../the-process-of-perso...>
2. <https://www.ncbi.nlm.nih.gov/pubmed/25545842>
3. <https://www.youtube.com/watch?v=Tuw8hxrFBH8>

Course Code**Course Title****22CA108001L****CAPSTONE PROJECT****Pre-Requisite** -**Anti-Requisite** -**Co-Requisite** -

COURSE DESCRIPTION: Identification of topic for the project work; Literature survey; Collection of preliminary data; Identification of implementation tools and methodologies; Performing critical study and analysis of the topic identified; Time and cost analysis; Implementation of the project work; Preparation of thesis and presentation.

COURSE OUTCOMES: After successful completion of this course, the students will be able to:

- CO1.** Create/Design computer science engineering systems or processes to solve complex computer science engineering and allied problems using appropriate tools and techniques following relevant standards, codes, policies, regulations and latest developments.
- CO2.** Consider society, health, safety, environment, sustainability, economics and project management in solving complex computer science engineering and allied problems.
- CO3.** Perform individually or in a team besides communicating effectively in written, oral and graphical forms on computer science engineering systems or processes.

CO-PO Mapping Table:

Course Outcome	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	3	-	-	-	3
CO2	-	-	-	-	-	3	3	-	-	-	3	-
CO3	-	-	-	-	-	-	-	-	3	3	-	-
Course Correlation Mapping	3	3	3	3	3	3	3	3	3	3	3	3

Correlation Level: 3-High; 2-Medium; 1-Low