Master of Computer Applications

Programme-Specific Objectives

1. To provide a strong foundation in the science and mathematics of computing.

2. To equip the student with the knowledge and skill that form the basic building blocks for a career in computer science and applications.

3. To prepare the student with other necessary skills for employment in the area of software conceptualization, design and development in the present day.

4. To provide the student with the necessary know-how to pursue research in the area of Computer Science so that she considers this as a viable option for her career.

5. Overall, to provide an ambience for the student to gain knowledge and skills in all aspects of Computer Applications and to pursue a specialization of her choice.

6. To equip the student with a basic knowledge of other domains, disciplines and skills, a social and environmental consciousness and a strong value base.

Course Objectives and Outcomes

Semester 1

1) 1CA01a - Discrete Mathematics

Objectives:
1. To learn statement and predicate calculus.
2. To learn basics of set theory and graph theory.
3. To learn various algebraic structures.

Outcomes:
Upon completion of the course, the student will be able to
1. Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
2. Understand basics of predicate calculus and universally and existentially quantified statements.
3. Understand the basic principles of sets and operations in sets.
4. Understand groups, semigroups and monoids.
5. Undertsand basics of graph theory.

2) 1CA02c - Data Structures

Objectives:
1. To learn linear and non-linear data structures.
2. To learn specific searching and sorting algorithms.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain the various linear and non-linear data structures.
2. Describe the computer representation of linear and non-linear data structures.
3. Choose the appropriate data structure for simple problems.
4. Convert a given infix expression to postfix and evaluate it.
5. Given a binary tree, traverse the tree using the traversal algorithms learnt.
6. Given a graph, traverse the graph using the traversal algorithms learnt.
7. Given a graph, generate the minimum cost spanning tree using the algorithms learnt.
8. Explain specific searching and sorting algorithms and their characteristics.

9. Understand how to apply the specific searching and sorting algorithms to solve any given problem.

3) 1CA03b - Problem Solving Techniques and Applications

Objectives:
1. To understand the notions of algorithms and programs, and to know of the basic problem solving strategies.
2. To learn C language and code solutions using the various features of C.
3. To learn efficient strategies and the algorithms to solve standard problems, thus laying a firm foundation for designing algorithmic solutions to problems.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the systematic approach to problem solving.
2. Write programs in C language to solve problems.
3. Identify bugs in given code snippets and fix them.
4. Determine the output of a given code snippet.
5. Explain the approach and algorithms to solve specific problems, and understand the applications of such algorithms.

4) 1CA04a - Digital Design Concepts

Objectives:
1. To learn the functional units of a digital computer and various representation codes.
2. To learn the basic logic gates and Boolean algebra.
3. To learn to design combinational circuits and sequential circuits.
4. To learn the design of various functional units in the processor logic.
5. To learn the design of registers and basics of control design.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand number systems, conversions among them and binary arithmetic.
2. Solve conversion and arithmetic problems in binary and decimal number systems using complements.
3. Use various techniques learnt to simplify Boolean functions and design gated circuits to realize the Boolean functions.
4. Understand specific real-world problems, formulate the problem as a Boolean function and design combinational circuits from scratch to solve the problem.
5. Explain the basic types and circuitry of flip-flops and registers.
6. Explain the design of asynchronous and synchronous counters.
7. Explain the design of ALU.
   Describe the design of registers and basics of control design.

5) 1CA05a - Operating Systems

Objectives:

1. To learn the basic concepts and responsibilities of operating systems.
2. To understand any operating system based on the concepts studied.

Outcomes:
Upon completion of the course, the student will be able to
1. Articulate the main concepts, key ideas, strengths, limitations and core issues of OS.
2. Explain and solve problems using process and resource management algorithms.
3. Understand process synchronization.

4. Explain and solve problems using algorithms in deadlock handling.
5. Describe memory management techniques.
6. Calculate physical memory address, given a virtual memory address, based on the memory architecture.
7. Apply page replacement algorithms to solve problems.
8. Explain the basic concepts of file management & use disk-scheduling algorithms to calculate effective access time.
9. Describe the different aspects of operating system using windows as case study.

6) 1CAP1b - Practical I: Data Structures and Algorithms Laboratory

Objectives:

1. To learn to code, debug and execute programs in C Language in an IDE
2. To learn to realize the data structures and algorithms as programs.

Outcomes:
Upon completion of the course, the student will be able to
1. Write programs in C Language to implement the data structures and algorithms given.
2. Code, debug and execute a C program in an IDE.

7) 1CAP2a - Practical II: Digital Electronics Laboratory

Objectives:
1. To learn to construct combinational and sequential circuits.

Outcomes:
Upon completion of the course, the student will be able to
1. Construct basic logic gates.
2. Construct different types of adders and subtractors.
3. Construct basic combinational circuits and verify their functionalities.
4. Construct flip flops, registers and different types of counters.

Semester II

8) 2CBMS1 - Statistical Methods

Objectives:
1. To acquire a working understanding of Statistics including probability, probability distributions, sampling, hypothesis testing, correlation analysis, regression and analysis of variance.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand conditional probability and solve problems.
2. Understand Baye's formula and its application.
3. Understand the concept of continuous and random variables.
4. Understand various probability distributions and its applications.
5. Understand correlation and regression concepts, calculate correlation coefficient, rank correlation and linear regression.
6. Understand the concept of curve fitting and solve problems.
7. Explain the various types of sampling methods and understand and apply F, T and Chi-square test.
8. Understand ANOVA and apply it to solve problems.

9) 2CA07a – Computer Architecture

Objectives:
1. To learn Control Unit design.
2. To know the concepts of pipelining.
3. To learn the architecture of I/O Interface and Memory.
4. To learn interprocessor arbitration.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain the fundamentals of Register Transfer Language.
2. Write any given expression in various instruction formats.
3. Calculate effective address of operands in a given instruction, for various addressing modes.
4. Understand design of the Control Unit.
5. Apply computer arithmetic algorithms to solve simple problems.
6. Explain the concept of pipelining and design a pipeline for a simple problem.
7. Explain I/O Interface concepts.
8. Explain the architecture and working of Main Memory, Associative Memory and Cache Memory.
9. Explain the concept of interprocessor arbitration & different types of interconnection structures.

10) 2CA08d – Design and Analysis of Algorithms

Objectives:
1. To learn how to measure performance of an algorithm.
2. To learn various algorithm design strategies.
3. To gain a good understanding of how to derive performance metrics for algorithms and understand how to compare them.

Outcomes:
Upon completion of the course, the student will be able to
1. Appreciate the need for performance measurement of algorithms and asymptotic notation.
2. Explain the various algorithmic design strategies with their characteristics.
3. Write algorithms for specific problems using one of the given design strategies.
4. Analyze the specific algorithms and express their performance complexity in asymptotic notation.
5. Understand lower bound theory and methods to establish the lower bound for solving specific problems.

11) 2CA09a - Object Oriented Programming

Objectives:
1. To appreciate the need for and characteristics of object orientation.
2. To learn the grammar of and to use the programming constructs of the C++ programming language.
3. To learn to implement programs in C++ covering the object-oriented concepts.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain the various basic concepts of Object-orientation.
2. Conceptualize a given problem in an object-oriented way.

3. Write a program to solve a given problem, by applying the concepts of object orientation and features of C++.
4. Find and fix any bug in a given program snippet.
5. Determine the output of a given program snippet.

12) 2CA10a – Database Management Systems

Objectives:
1. To understand the need, basic concepts and applications of DBMSs.
2. To learn the E-R model and basic operations of Relational Algebra.
3. To learn Relational Database concepts and Normalization concepts.
4. To learn advanced SQL.
5. To learn the fundamental concepts of transaction processing, concurrency control protocols and database system architectures.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain the purpose, characteristics, components & applications of database management systems.
2. Know the fundamental operations of Relational Algebra and construct expressions.
3. Write DDL statements and advanced SQL queries.
4. Detect and fix errors in SQL statements and identify the output of given code.
5. Understand the basic concepts of NoSQL.
6. Understand E-R Model and construct an E-R diagram for a given simple database.
7. Understand normalization concepts and normalize a given simple database.
8. Understand the concepts of transaction management and recovery systems.
9. Explain the various protocols for concurrency control.
10. Describe the various types of database system architectures.

13) 2CAP3b - Practical III: Object Oriented Programming Laboratory

Objectives:
1. To learn to code, debug and execute programs in C++ in an IDE.
Outcomes:
Upon completion of the course, the student will be able to
1. Design classes and draw class diagrams for the given problems.
2. Write programs in C++.
3. Code, debug and execute a C++ program to solve the given problems in an IDE.

14) 2CAP4a - Practical IV: Database Management Systems Laboratory

Objectives:
1. To learn to create a database of tables for a given schema, and write SQL code or PL/SQL block to implement queries / triggers on the database.
Outcomes:
Upon completion of the course, the student will be able to
1. Create a database with requisite tables, primary keys and foreign keys.
2. Write SQL code / PL/SQL block to implement given queries and triggers.

Semester III

15) 3CBCM2 - Accounting and Financial Management

Objectives:
1. To gain an insight into the basics of Accounting Concepts.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the principles of Double entry.
2. Understand how to journalize a ledger.
3. Prepare a trial balance.
4. Understand how to prepare trading, profit & loss account and balance sheet.
5. Understand how to analyse and interpret financial statements, including ratio analysis.
6. Understand the concepts of break-even analysis and marginal costing.
7. Calculate break-even point.
8. Perform decision-making analysis such as profit planning and sales planning.
9. Understand the concept of budgeting and budget forecasting, including preparation of a functional budget.
10. Understand the methods of capital investment decision making including Pay back method, ARR, Cash Flow, NPV, IRR methods.

16) 3CA12b - Web Application Development

Objectives:
1. To understand the difference between server-side and client-side programming.
2. To learn HTML5 for designing web pages and Java script for client-side programming.
3. To learn XML to represent data and create user-defined tags.
4. To learn the concepts of Web 2.0 and ASP.NET.
5. To learn programming in C#.
6. To learn to interface databases with the web application using ADO.NET.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain the features of HTML 5 and create web pages.
2. Understand the features of Javascript and write simple scripts.
3. Represent web data and create user-defined tags using XML.
4. Explain the various ways to parse XML files.
5. Explain the various features of C# and ASP.NET and develop simple web applications.
6. Explain the concepts of ADO.NET.
7. Write code to interface a web application with a database using ADO.NET.
8. Identify bugs in a C# code snippet and fix them.
9. Determine the output of a given C# code snippet.

17) 3CA13a - Internet Programming

Objectives:
1. To learn socket programming, servlet programming and the use of integrated platforms to develop advanced Java applications.
2. To learn to write simple programs using servlets, Javabeans, spring, RMI and JSP.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain basics features and write programs using socket programming.
2. Write programs using JDBC.
3. Explain the basic concepts of servlets.
4. Understand applet-servlet, HTML-servlet communication and write programs.
5. Understand the concept of Java Beans and write simple programs.

6. Understand the basic concepts of Spring and build simple apps using Spring MVC.
7. Explain the concept of RMI & protocols used and write simple programs using RMI.
8. Explain basic concepts and protocols of JSP, and write simple programs.

18) 3CA14b – Personal Software Process

Objectives:
1. To learn the concept of software process and PSP.
2. To learn the various phases in a software project and the importance of planning.
3. To learn the key software metrics.
4. To learn the basics of software quality management.
5. To learn the Agile Process Model.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the concepts and importance of software process and the application of PSP.
2. Explain the basics of project planning.
3. Describe the important metrics used in measuring software size, and estimating software size, resources and schedule.
4. Estimate software size using function point method and PROBE size estimating method.
5. Articulate the important PSP metrics in the GQM paradigm.
6. Explain the concepts involved in software quality including benchmarking, yield management and defect removal and prevention.
7. Describe the aspects of design and code reviews in the software process.
8. Understand the Agile Process Model.

19) 3CAP5c - Practical V: Internet Programming Laboratory

Objectives:
1. To learn to code, debug and execute simple programs using servlets, Javabeans, spring, RMI and JSP using IDE.

Outcomes:
Upon completion of the course, the student will be able to
1. Implement socket programming and Client side scripting in Java.
2. Develop Java program using JDBC.
3. Design a web application to demonstrate HTML and applet communication with servlet.
4. Implement simple programs using spring.
5. Write code to connect client with remote server using RMI.
6. Develop simple applications using JSP.

20) 3CAP6b – Practical VI: Web Application Development Laboratory

Objectives:
1. To design interactive web pages using Javascript, HTML 5, XML, C# and ASP.NET.

Outcomes:
Upon completion of the course, the student will be able to
1. Design web pages using HTML5 and Java script.
2. Represent web data using XML while creating websites.
3. Code, debug and execute a C# program to solve the given problems using the .NET framework.
4. Develop simple web application using ASP.NET controls.

5. Interface a .NET web application to a database using ADO.NET.

Semester IV

21) 4CA16b - Object Oriented Analysis and Design

Objectives:

1. To learn to apply various methods used for performing object oriented analysis and design.
2. To learn to visualize the design of a system using the Unified Modelling Language (UML).

Outcomes:

Upon completion of the course, the student will be able to

1. Understand the various object-oriented methodologies.
2. Understand the need and modelling aspects of the UML.
3. Understand the role of object-oriented analysis in software design.
4. Understand Use cases and learn to identify and draw Use cases for a given problem.
5. Learn various approaches to classification apart from the Use case driven approach.
6. Understand the axioms and corollaries of object oriented design.
7. Identify and refine attributes, designing methods and protocols for a given problem, using Use case diagram and sequence/collaboration diagram.
8. Apply design axioms and corollaries for designing access layer and view layer classes.
9. Describe the concepts of design patterns.

22) 4CA17c - Mobile Application Development

Objectives:
1. To learn the components and structure of mobile application development frameworks for Android OS based mobiles.
2. To learn how to develop simple android applications.

Outcomes:

Upon completion of the course, the student will be able to

1. Understand the basics of Android devices and the Android platform.
2. Explain the basic building blocks of Android programming required for App development.
3. Explain the components used in Activity Life Cycle.
4. Understand how to create basic user interfaces with layouts, views and fragments.
5. Explain persistence and data storage mechanism in Android.
6. Describe advanced application concepts like Networking, Animations and Google Maps services.
7. Develop and publish Android applications to Android Market.

23) 4CA18c - Microprocessor and Microcontroller

Objectives:
1. To learn the architecture and instruction set of 8086 microprocessor and 8051 microcontroller, to gain a firm footing in Microprocessor theory using simple fundamental concepts.
2. To learn the basic concepts of assembly language programming, modular and I/O programming.
3. To learn to interface microprocessors with various peripherals.

Outcomes:

Upon completion of the course, the student will be able to

1. Understand the architecture of 8086 microprocessor.
2. Explain the instruction set and system bus structure of 8086 microprocessor.
3. Describe the various instructions of assembly language programming and write simple programs.
4. Understand the basic concepts of modular and I/O programming.
5. Describe serial and parallel I/O interfacing.
6. Understand the architecture of 8051 microcontroller.

24) 4CA19b - Principles of Compiler Design

Objectives:
1. To learn the fundamentals of finite automata.
2. To acquire knowledge of the design aspects in the various steps of a language compiler.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain the steps involved in the design of a lexical analyser.
2. Construct a state diagram, given a state table.
3. Minimize the number of states in a given state diagram.
4. Describe the various types of parsers and the design aspects involved.
5. Construct a parse tree for a given expression.
6. Apply algorithms to parse a given expression.
7. Understand syntax-directed translation schemes and symbol tables.
8. Learn Code Optimization principles and Code generation.
9. Understand code optimization techniques.

25) 4CAP7d - Practical VII: Microprocessor Laboratory

Objectives:
1. To learn to write simple assembly language programs.
2. To debug and execute programs using MASM software.

Outcomes:
Upon completion of the course, the student will be able to
1. Write programs to perform arithmetic and string operations.
2. Write programs to implement specific mathematical algorithms on a microrpocessor.

26) 4CAP8a - Practical VIII: Mobile Application Development Laboratory

Objectives:
1. To learn to code, debug and run Android Apps using Android Studio.

Outcomes:
Upon completion of the course, the student will be able to
1. Write programs to create Android Apps.
2. Code, debug and run the programs.
3. Create Apps for the given problems through Android programming.
4. Design and develop simple Android Apps.

Semester V

27) 5CA21b - Computer Graphics

Objectives:
1. To learn the basic concepts of computer graphics devices.
2. To learn the mathematical basis of and how to apply 2D and 3D transformation.
3. To learn some fundamental algorithms in raster scan graphics.

4. To learn various curve representations, clipping transformations and algorithms.
5. To learn various hidden line and hidden surface removal algorithms.

Outcomes:

Upon completion of the course, the student will be able to

1. Explain the working of various 2D and 3D graphical devices.
2. Know the mathematical basis for 2D and 3D transformations.
3. Apply 2D and 3D transformations on a graphical image.
4. Understand basic algorithms for line-drawing, circle-drawing, image compression, polygon-filling and aliasing for raster scan systems.
5. Explain the various types of plane and space curves.
6. Apply clipping and hidden line/surface removal algorithms.

28) 5CA22d – Computer Networks

Objectives:

1. To learn the basic terminology of computer networking.
2. To learn OSI Reference Model with the functions of, protocols, and algorithms involved in each layer.
3. To learn basics of TCP/IP protocol suite.
4. To learn the basics of cryptography and network security.

Outcomes:

Upon completion of the course, the student will be able to

1. Describe the basic aspects of computer networks, viz. network topologies, transmission modes, network categories, protocols and standards.
2. Understand in order to compare and contrast the features of OSI Reference Model and TCP/IP protocol suite.
3. Explain the responsibilities of each of the seven network layers.
4. Understand the protocols and algorithms connected with each layer.
5. Solve problems using error detection and correction methods.
6. Apply routing algorithms to calculate the shortest route in a given network.
7. Apply the Token Bucket Algorithm to avoid congestion in a given network.

29) 5CA23 – Artificial Neural Networks

Objectives:

1. To learn the fundamental theory and concepts of neural networks for creating computationally intelligent systems.
2. To understand the architecture, learning algorithms and issues of various feed forward and feed backward neural networks.

Outcomes:

Upon completion of the course, the student will be able to

1. Understand the need and basic concepts of neural networks.
2. Describe the various neural computational models.
3. Understand supervised and unsupervised learning methods.
4. Understand how to train a neural nework.
5. Explain the architecture of feed-forward and feed-backward neural networks.
6. Find the output of a neural network using various methods, given the inputs, input weights and learning rule.
7. Describe the basic concepts of expert systems.
8. Understand the basic concepts of pattern recognition using neural networks.

30) 5CA24a – UNIX, PHP and MySQL

Objectives:
1. To learn the basic concepts and commands of UNIX.
2. To learn basic UNIX Shell programming.
3. To learn the basic concepts and programming constructs of PHP.
4. To learn to create and use databases using MySQL.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand file system commands.
2. Understand the concept of pipes and filters.
3. Explain the basic concepts of shell programming
4. Write shell scripts for various applications.
5. Explain the programming constructs of PHP.
6. Write simple PHP programs.
7. Develop simple applications using PHP.
8. Create databases using MySQL and connect to it and manipulate it through a PHP application.

31) 5CAP9b - Practical IX: UNIX, PHP and MySQL Laboratory

Objectives:
1. To learn to use UNIX commands.
2. To learn to write shell scripts.
3. To use MySQL and PHP to develop simple applications on UNIX.

Outcomes:
Upon completion of the course, the student will be able to
1. Write simple UNIX shell scripts.
2. Write simple programs using PHP over the UNIX operating system.
3. Create a database using MySQL and develop simple applications using PHP.

32) 5CAP10b - Practical X: Artificial Neural Networks Laboratory

Objectives:
1. To gain hands-on experience in understanding the basics of ANN models and pattern recognition tasks.

Outcomes:
Upon completion of the course, the student will be able to
1. Develop solutions to demonstrate basic neural network features.
2. Create neural networks to solve specific problems.

Semester VI

33) 6CAPR - Project Work

Objectives:
1. To gain real-time experience in software project development in a production environment.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand how to execute a software project from scratch to delivery and deployment.
2. Understand the various processes involved in the engineering of software through practical implementation.

3. Understand how to develop a software solution for the given large problem.
4. Write a project report that incorporates all the stages of software engineering and processes involved in the project.

34) 6CAPV - Project Viva-voce

Objectives:
1. To learn to present project work done.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand how to make an effective presentation of the project work.
2. Explain the project work and answer technical questions on the work done.

Elective Stream 1

1) 3CAE1MC – Mobile Communication

Objectives:
1. To learn the fundamental concepts and technologies of mobile and wireless devices.
2. To learn the GSM architecture and protocols.
3. To learn the basic concepts and strategies in mobile network and transport layer.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the need and fundamental concepts of mobile and wireless devices.
2. Explain the GSM architecture and protocols.
3. Explain the concept of Wireless LAN, HiperLAN and bluetooth technologies.
4. Understand the basic concepts, goals and routing strategies of the mobile network layer.
5. Understand the concepts of mobile transport layer and methods for congestion control.

2) 4CAE2WT – Wireless Technology

Objectives:
1. To learn the architecture, transmission techniques and principles behind working of wireless networks.
2. To learn the fundamentals of different wireless technologies.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the basic concepts and characteristics of wireless networks.
2. Explain the different transmission techniques.
3. Understand the principles behind wireless network operation.
4. Describe the basic concepts and mechanisms of wireless LAN, WAN, ATM HIPERLAN, WPAN.
5. Explain the architecture, technologies and performance measures of wireless geolocation systems.

3) 5CAE3SC – Satellite Communication

Objectives:
1. To learn the concept of satellite orbits and launching.
2. To learn the basics of the communication systems involved.
3. To learn the various applications of satellites.

Outcomes:

Upon completion of the course, the student will be able to
1. Understand orbital mechanics and launch methodologies.
2. Describe satellite subsystems.
3. Explain the communication systems involved with satellites.
4. Explain the various applications of satellites.

Elective Stream 2

1) 3CAE1CR – Cryptography and Network Security

Objectives:
1. To learn the important role of cryptography in network security.
2. To study the mathematical concepts required for understanding the algorithms/techniques of cryptography.
3. To understand public key encryption standards and algorithms.
4. To learn the importance of network security, its principles and security protocols.

Outcomes:

Upon completion of the course, the student will be able to
1. Learn of various encryption techniques from classical to modern.
2. Understand the important aspects of number theory used in cryptography.
3. Understand the RSA algorithm and connected protocols.
4. Learn the importance of message authentication and understand the secure hash algorithm.
5. Describe the technique, protocols and standards for digital signature.
6. Explain the concept and types of user authentication, and Kerberos concepts.
7. Describe the various internet security services.

2) 4CAE2CF – Cyber Forensics

OBJECTIVES:
1. To learn the fundamentals of computer forensics technology and services.
2. To learn how to collect evidence using data recovery procedures.
3. To learn to analyze and validate forensics data using various tools.

OUTCOMES:

Upon completion of the course, the student will be able to
1. Explain the fundamentals of computer forensics and the types of technology.
2. Describe methods for evidence collection and data recovery.
3. Explain the hardware and software tools used for evidence recovery.
4. Understand address data hiding techniques.
5. Understand various email investigation processes.
6. Identify the vulnerabilities and explain the acquisition procedures for mobile devices.

3) 5CAE3BS – Biometric Systems

Objectives:
1. To learn the basic concepts of Biometric systems.
2. To understand the representation, techniques and applications of fingerprint identification, Iris & face recognition and voice scan.

Outcomes:

Upon completion of the course, the student will be able to
1. Understand the fundamental concepts of biometric systems.
2. Understand the technologies and applications of fingerprint identification.

3. Understand the basic concepts of Iris recognition, its representation, strengths and weaknesses.
4. Describe the basic concepts of face recognition, its representation, strengths and weaknesses.
5. Explain the technologies and methods for face detection.
6. Understand the basic concepts, approaches, strengths and weaknesses of voice scan.

Elective Stream 3

1) 3CAE1PC – Parallel Computing

Objectives:
1. To learn the design principles, architectures, network topologies and basic programming paradigms for parallel computing.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the various parallel computer models, issues and architectures.
2. Understand the design principles of processors for various parallel computing architectures.
3. Describe the various network topologies used for parallel computing.
4. Explain the programming models for parallel computing.

2) 4CAE2GC – Grid Computing

Objectives:
1. To understand the basic concepts of grid computing.
2. To learn grid computing architecture, core components and services.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain the fundamental concepts of grid and utility computing, the classification of grid computing organizations and their roles.
2. Describe the problems of coordinated resource sharing, virtual organization formation, and a protocol architecture solution for Grid problems.
3. Explain the current and prominent technology initiatives that are affecting the recent Grid Computing revolution.
4. Explain the merging Grid Services Architecture with the Web Services Architecture.
5. Explain the concept of Open Grid Service Architecture, GLOBUS GT3 Toolkit Architecture, its core components and services.

3) 5CAE3CC – Cloud Computing

Objectives:
1. To learn the main concepts, key technologies, strengths and limitations of cloud computing and the possible applications of cloud computing.
2. To learn the different types of cloud services and cloud service providers.
3. To learn cloud service architecture.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain the main concepts, strengths and limitations of cloud computing.
2. Explain various applications on service models.
3. Identify the architecture, infrastructure and delivery models of cloud computing.
4. Select the suitable cloud service provider and apply an appropriate deployment model for an organization.

5. Understand the concept of abstraction and virtualization.
6. Understand the concept of cloud management and security.
7. Understand the working of cloud storage.

Elective Stream 4

1) 3CAE1LA – Linear Algebra

Objectives:
1. To learn the methods of Linear Algebra in order to later apply them to machine learning problems and other applications.

Outcomes:
Upon completion of the course, the student will be able to
1. Solve a given system of linear equations.
2. Check for linear dependency between equations.
3. Find the inverse of a given matrix.
4. Explain the Leontief Input-Output Model.
5. Find the determinant of a matrix using Cramer's rule.
6. Find the vector space for a given matrix.
7. Explain the applications of difference equations and Markov chains.
8. Find the Eigen vector and Eigen values for a given matrix.
9. Check the orthogonality of a given matrix.
10. Explain the Gram-Schmidt process.
11. Understand and apply the concept of least squares.
12. Understand inner product spaces and their applications.
13. Diagonalize the given symmetric matrix.
14. Calculate singular value decomposition of a given matrix.
15. Learn to apply the concepts to image processing.

2) 4CAE2IP – Digital Image Processing

Objectives:
1. To gain knowledge of the various characteristics and aspects of digital images.
2. To learn how to apply spatial and frequency filters for intensity and image enhancements.
3. To learn the methods of image compression and restoration.
4. To learn the basics of colour image processing.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
2. Explain the basics of colour image processing.
3. Understand simple image enhancement techniques in spatial and frequency domains.
4. Understand the concept of filters.
5. Explain image compression and restoration techniques.

3) 5CAE3PR – Pattern Recognition

Objectives:
1. To learn the basic concepts, paradigms and data structures used for pattern recognition.
2. To learn the concepts of feature extraction, selection and clustering methods.
3. To learn the basic concepts of classifiers and different methods used for classification.

4. With a sample application, understand the concepts and methods involved pattern recognition.

Outcomes:
Upon completion of the course, the student will be able to
1. Explain the basic concepts and different paradigms for pattern recognition.
2. Explain the data structures used for representing patterns.
3. Undertstand feature extraction, feature selection, evaluation of classifers and clustering methods.
4. Understand the algorithms for nearest neighbour-based classifiers.
5. Understand the Bayes classifier, compare and contrast Bayes classifier with NN classifier.
6. Understand how Markov models, decision trees and support vector machines are used for classification.
7. Explain the methods used for combining classifiers.
8. Explain the concept of clustering and associated algorithms.
9. Understand the concepts of pattern recognition with an application.

Elective Stream 5

1) 3CAE1IS – Management Information Systems

Objectives:
1. To learn the basic concepts, techniques and security aspects of Information Systems.
2. To study the contributions of MIS in various functional areas and techniques used for decision-making.
3. To learn the concepts of Expert systems and its role in MIS.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the model of a system and its organizational structure.
2. Understand the types of information and needs at diferent levels.
3. Explain the basic concepts, structure and functions of MIS.
4. Understand the Newell-Simon model.
5. Understand the different models and techniques used for decision-making.
6. Compare and contrast MIS, DSS and Expert System structure.
7. Understand the various auditing and security aspects of MIS.

2) 4CAE2DM – Data Mining

Objectives:
1. To appreciate the types of problems for which Data Mining is used.
2. To learn the various issues involved in Data Mining, and how to handle them.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the concept of data discovery in various types of databases, and the need for data mining.
2. Understanding the various methods of data preprocessing.
3. Understand the need for data reduction and strategies to perform data reduction.
4. Learn the rules and algorithms involved in association rule mining.
5. Understand supervised and unsupervised learning techniques, including classification, prediction, clustering and outlier analysis.
6. To understand the concepts of web mining and spatial data mining.

3) 5CAE3DW – Data Warehousing

OBJECTIVES:
1. To understand the building blocks, architecture, principles and quality control in the context of data warehousing.

OUTCOMES:
Upon completion of the course, the student will be able to
1. Understand the fundamental concepts of data warehousing.
2. Explain the various aspects of planning and warehouse project management.
3. Describe the architectural components of a DW.
4. Understand the decision-making process for selection of infrastructure for a DW.
5. Understand the dimensions of quality control with respect to a DW.
6. Understand the architecture of STAR Schema.
7. Learn the importance of OLAP, its features, functions & models.
8. Understand the basic concepts of ERP and CRM.
9. Understand how to build a web enabled data warehouse.

Elective Stream 6

1) 3CAE1ST – Foundations of Software Testing and Quality Assurance

Objectives:
1. To learn the concepts of Software Quality Assurance.
2. To understand the basic concepts of testing, test design techniques and testing tools.
3. To get prepared for ISTQB Certified Tester Foundation Level (CTFL) examination.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the fundamental quality standards in SQA.
2. Understand the Metrics in a software process.
3. Describe the principles, processes, static techniques of testing.
4. Differentiate among the various test design techniques.
5. Understand how to do Test Management.
6. Understand the types and use of testing tools.

2) 4CAE2ST – Software Testing

Objectives:
1. To learn test process models and risk management in testing.
2. To learn different test techniques, review methods and tools for test automation.
3. To get prepared for ISTQB Advanced Certification for Advanced Test Analyst.

Outcomes:
Upon completion of the course, the student will be able to
1. Compare and contrast different Test Process Models.
2. Analyze Risks and apply Risk Mitigation Processes.
3. Explain different specification-based and structure-based testing techniques.
4. Understand the basic concepts of static and dynamic analysis methods.
5. Describe the quality attributes for domain and technical testing.
6. Explain the various types of test reviews.
7. Understand methods and tools for test automation.

3) Stream 6: 5CAE3ST – Advanced Software Testing

Objectives:
1. To learn to integrate testing into software lifecycle and test process models.

2. To learn risk-based testing techniques, risk analysis using FMEA.
3. To learn to schedule and monitor test progress.
4. To learn advanced tools for test automation.
5. To get prepared for the ISTQB Advanced Test Manager examination.

Outcomes:

Upon completion of the course, the student will be able to
1. Understand how testing is integrated in SDLC and test process models.
2. Understand quality risk analysis and determine the risk priority.
3. Use test management and test plan documentation templates.
4. Understand test estimating techniques and product risk metrics.

Soft Skills

1) OLCS: Language and Communication Skills

Objectives:
1. To revisit the basics of English grammar.
2. To develop better reading and writing skills.
3. To learn to communicate effectively, thereby enhancing interpersonal skills.

Outcomes:

Upon completion of the course, the student will be able to
1. Understand the different methods of verbal and non-verbal communication and use them effectively.
2. Develop reading and writing skills through specific methods and practice exercises.

2) OLMS: Life and Managerial Skills

Objectives:
1. To learn how to manage stress.
2. To learn the effective ways of dealing with people by developing social and conflict management skills.
3. To develop interpersonal skills.
4. To effectively manage time.
5. To learn various aspects involved in overall empowerment.

Outcomes:

Upon completion of the course, the student will be able to

1. Understand different stress management techniques.
2. Understand the types of conflict, conflict stimulation and conflict resolution techniques for effective conflict management.
3. Understand the concept of team, characteristics of a team member, recognizing one's own leadership, self-motivation and self-management methods.
4. Understand time management strategies and effectively manage time.
5. Create innovation and bring in change, understand different empowerment strategies.

3) OF1: French for Beginners I

Objectives:
1. To learn basics of French grammar.
2. To learn basic conversation in French.

Outcomes:

Upon completion of the course, the student will be able to
1. Write French alphabets and numbers.

2. Undertsand basics of French grammar.
3. Name and locate simple objects and colors.
4. Converse in French to ask directions, suggestions, date and time.
5. Give a simple description of people, profession and activities.
6. Use past tense.

4) OF2: French for Beginners II

Objectives:
1. To speak in French.
2. To gain knowledge of the French civilization.

Outcomes:
Upon completion of the course, the student will be able to
1. Speak in French about specific topics.
2. Reply to emails in French.
3. Know the culture, food habits, fashion, tourist spots and daily life of French people.

5) OG1: German for Beginners I

Objectives:
1. To learn basics of German Grammar.
2. To learn basic conversation in German.

Outcomes:
Upon completion of the course, the student will be able to
1. Write German alphabets and numbers.
2. Greet, introduce oneselves and ask simple questions.
3. Use verbs, pronouns, cases and tenses.
4. Know facts about Germany viz. Fall of Berlin Wall, Unification of Germany, education system, Universities, Germany and European Union and make a simple presentation in German.

6) OG2: German for Beginners II

Objectives:
1. To learn advanced German Grammar.
2. To develop reading and writing skills.

Outcomes:
Upon completion of the course, the student will be able to
1. Use clauses and adjectives.
2. Read, write and speak in German.

7) SAR1: Analytical Reasoning I

Objectives:
1. To gain mathematical and verbal reasoning skills in preparation for various competitive examinations.

Outcomes:
Upon completion of the course, the student will be able to
1. Solve problems in the given areas of objective arithmetic using simple methods and tricks.
2. Solve verbal reasoning problems of the given types.
3. Improve the speed of calculations while solving such problems.

8) SAR2: Analytical Reasoning II

Objectives:
1. To gain mathematical and verbal reasoning skills in preparation for various competitive examinations.

Outcomes:
Upon completion of the course, the student will be able to
1. Solve problems in the given areas of objective arithmetic using simple methods and tricks.
2. Solve verbal reasoning problems of the given types.
3. Improve the speed of calculations while solving such problems.

9) SAR3: Analytical Reasoning III

Objectives:
1. To gain mathematical and verbal reasoning skills in preparation for various competitive examinations.

Outcomes:
Upon completion of the course, the student will be able to
1. Solve problems in the given areas of objective arithmetic using simple methods and tricks.
2. Solve verbal reasoning problems of the given types.
3. Improve the speed of calculations while solving such problems.

10) OQCC: Quality Control Circles (Theory)

Objectives:
1. To develop the skill to solve problems using a systematic approach, both as an individual and in a team.

Outcomes:
Upon completion of the course, the student will be able to
1. Understand the importance, functions and structure of quality control circles.
2. Identify problems and formulate them in a formal, structured manner.
3. Understand and use the various problem solving tools.
4. Understand and implement the process of PDCA to solve problems.
5. Gain an understanding of leadership and motivation.

11) OQCCP: Quality Control Circles (Presentation)

Objectives:
1. To work as a part of a Quality Control Circle.
2. To identify and solve problems.
3. To develop team spirit and leadership qualities.
4. To acquire presentation skills.

Outcomes:
Upon completion of the course, the student will be able to
1. Function as a part of a Quality Control Circle.
2. Identify and solve problems in a team as part of QCC.
3. Understand the importance of team work and leadership in a QCC.
4. Learn to make presentations of solved problems to an audience, effectively and within a stipulated time.