M.Sc. Information Technology

Programme-Specific Objectives

- To help the student gain expertise in current information technology areas, primarily web and communication technologies, without compromising on core fundamentals.
- The syllabus is intent on providing a strong foundation in computers, with a clear technology focus.
- 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 I

1) 1IT01a - 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.

2) 1IT02b - Data Structures and Algorithms

Objectives:

1. To learn linear and non-linear data structures.
2. To learn specific searching and sorting algorithms.
3. To learn various algorithmic approaches and applications of the same.

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. Understand the algorithmic design strategies of Divide-and-Conquer, Greedy, Dynamic Programming, Backtracking and Branch & Bound, and know how these strategies are applied to solve the given specific problems.
9. Explain specific searching and sorting algorithms and their characteristics.

10. Understand how to apply the specific algorithms learnt for searching and sorting, to solve any given problem.

3) 1IT03b - 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. Understand the basic commands & constructs in shell programming & write simple programs.

4) 1IT04b – Digital Design and Computer Architecture

Objectives:

1. To learn the functional units of a digital computer, representation codes, gates, combinational circuits and sequential circuits.
2. To learn the concepts that are building blocks of computer architecture.

Outcomes:

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

1. Understand and solve problems in number systems, conversions, binary arithmetic.
2. Use various techniques to simplify Boolean functions and design gated circuits.
3. Design and explain the design of combinational circuits.
4. Explain the basic types and circuitry of flip-flops, registers and counters.
5. Explain the fundamentals of Register Transfer Language.
6. Write any given expression in various instruction formats.
7. Calculate effective address of operands for various addressing modes.
8. Explain the concept of pipelining and design a pipeline for a simple problem.
9. Explain I/O Interface concepts.

5) 1IT05 – Data Communication and Networking

Objectives:

1. To learn the basic concepts of data communication and computer networking.
2. To learn the basics of the OSI Reference Model.
3. To learn the protocols and algorithms involved in the Physical, Data Link, Network and Application layers of the OSI Model and the types of networking devices.

Outcomes:

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

1. Understand the basic concepts involved in data communication and networking.
2. Explain the various classifications of network and transmission modes.

3. Understand the layers in the OSI Reference Model and TCP/IP Reference Model, and their responsibilities.
4. Understand the Physical and Data Link layer functions related to transmission media and error detection and correction mechanisms.
5. Explain the protocols and algorithms of the Network Layer, Transport Layer and Application Layer.
6. Explain the types and properties of networking devices.

6) 1ITP1b - 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.
1.

7) 1ITP2a - Practical II: Data Communication and Networking Laboratory

Objectives:

1. To learn to implement the protocols in the TCP/IP suite.
2. To learn socket programming fundamentals.

Outcomes:

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

1. Implement protocols using TCP, UDP and Raw Sockets.
2. Simulate routing algorithms and protocols.
3. To implement simple application using RMI.

Semester II

8) 2IT06b – 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.

9) 2IT07a - 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.

10) 2IT08b – 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.

11) 2IT09 - 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.

12) 2IT10 - Enterprise Resource Planning

Objectives:

1. To learn the importance and principles of ERP.
2. To learn the technologies associated with ERP and implement them using various ERP tools.

Outcomes:

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

1. Understand the basic concepts, benefits and risks of ERP.
2. Explain the various technologies associated with ERP.
3. Explain the challenges behind implementing ERP and the ERP implementation strategies.
4. Understand the ERP softwares used to integrate business functions.
5. Reengineer existing business processes for successful ERP implementation using various ERP tools.

13) 2ITP3a - 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) 2ITP4a – 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) 3IT11a – 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.

16) 3IT12b – 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.

17) 3IT13a – 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.

18) 3IT14 - 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.

19) 3ITP5a - Practical V: Web Applications 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.

20) 3ITP6c - Practical VI: 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.

Semester IV

21) 4IT16 – Business Enterprise Architecture and Green IT

Objectives:

1. To learn the concepts of Enterprise Architecture and how it enables an organization to accomplish its business goals.
2. To learn the concepts and methods of Green IT to develop environmentally responsible Enterprise Architecture.

Outcomes:

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

1. Describe the fundamental concepts and applications of Enterprise Architecture.
2. Understand Business Process Modelling and SOA.
3. Explain the infrastructure for building an enterprise architecture.
4. Understand the goals, policies, assets, standards & optimization methods for Green IT.
5. Understand the Socio-cultural aspects of Green IT, its protocols and standards.
6. Understand how to apply Green IT strategies and applications through case studies.

22) 4IT17 – 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) 4ITP7a - Practical VII: 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.

24) 4ITPR - 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.

25) 4ITPV - 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 I

1) Stream 1: 3ITE1WT – 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.

2) Stream 2: 3ITE1CR - 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.

3) Stream 3: 3ITE1PC – 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 architecture.
3. Describe the various network topologies used for parallel computing.
4. Explain the programming models for parallel computing.

4) Stream 4: 3ITE1ST – 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.

Elective II

5) Stream 1: 4ITE2SC – 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.

6) Stream 2: 4ITE2BS - 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.

7) Stream 3: 4ITE2GC – 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 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.

8) Stream 4: 4ITE2ST – 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.

Soft Skills

1) 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.

2) 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.

3) 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.

4) 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. OQCCP: Quality Control Circles (Presentation)

5) 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.

Every student would be member of a Quality Circle and will be evaluated for a project presentation.