



## University Institute of Computer Science and Application

### Programme Offered

1. B.C.A. (Bachelor of Computer Application)
2. M.Sc. (Cyber Security)
3. M.C.A. (Master of Computer Application Lateral entry)

### Bachelor of Computer Applications (BCA)

#### Programme Outcomes

- PO-1.** Graduates should be able to do creative research and develop new technologies in the field of concern programme, which can contribute to the industry and to academia.
- PO-2.** Graduates should be able to practice concern programme in a responsible, professional and ethical manner and implement eco-friendly sustainable technologies for the benefit of industry as well as society.
- PO-3.** Graduates obtain position in successful career in industry, research institutions, academic, government organizations and entrepreneurship.
- PO-4.** Graduates to be professionally competent in concern programme to solve the problems in environmental, food, biochemical and biomedical engineering.
- PO-5.** Graduate to be able to interact with their peers in industry and society as engineering professionals and leaders to set up technical ambience in the society.

#### Programme Specific Outcomes

- PS0-1.** Ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.
- PS0-2.** Ability to design, implement, and evaluate a computer-based system, process, component, or program to solve the given problem.
- PS0-3.** Ability to communicate effectively through oral and written means.
- PS0-4.** Ability to work in a team to achieve a common goal

### Semester-1

#### Paper 1: Fundamentals Of Computer And Programming

##### Course Outcomes

On successful completion of this course, a student will be able to:

- CO-1.** Handle a computer system for day-to-day use.

- CO-2. Enumerate different types of input/ output devices and types of memory.
- CO-3. Perform basic arithmetic operations using different number systems including binary arithmetic.
- CO-4. Differentiate between system and application software.
- CO-5. Prepare documents /spreadsheets/power point presentation

## **Paper 2: Operating Systems (Dos, Windows and Unix)**

### **Course Outcomes**

- CO-1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- CO-2. To understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.
- CO-3. Understanding of design issues associated with operating systems.
- CO-4. Understand various process management concepts including scheduling, synchronization, and deadlocks.
- CO-5. To have a basic knowledge about multithreading.

## **Paper 3: Mathematical Foundation**

### **Course Outcomes**

- CO-1. Demonstrate their understanding of and apply methods of discrete mathematics in CS to subsequent courses in algorithm design and analysis, automata theory and computability, information systems, computer networks.
- CO-2. Use logical notation to define fundamental mathematical concepts such as sets & operations on sets, Boolean algebra, relations, functions and various algebraic structures, reason mathematically using such structures,
- CO-3. Evaluate arguments that use such structures. - model and analyze a computation or communication process and construct elementary proofs based on such structures.
- CO-4. Evaluate elementary differentiation, elementary integration and partial differentiation

## **Paper 4: Programming In C**

### **Course Outcomes**

- CO-1. Identify situations where computational methods and computers would be useful.
- CO-2. Given a computational problem, identify and abstract the programming task involved.
- CO-3. Approach the programming tasks using techniques learned and write pseudo-code.
- CO-4. Choose the right data representation formats based on the requirements of the problem.
- CO-5. Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.

## **Paper 5: Communicative English**

### **Course Outcomes**

- CO-1. Develop English language skills in listening, speaking, reading and writing by having learners engage in a range of communicative tasks and activities from Canadian Language Benchmarks levels 4 to 9.
- CO-2. Encourage the use of strategies, such as contextualization of new vocabulary, use of previewing, skimming and scanning techniques, and knowledge of text organization and discourse markers, to aid the comprehension of written and spoken language.
- CO-3. Expand the learner's use of grammatically correct and situationally and culturally appropriate language in speaking and writing for effective communication in a variety of interpersonal and academic situations.
- CO-4. Create awareness about learning styles and college resources, encourage the adoption of study skills, and increase competence in the use of technology so that learners may more effectively achieve academic goals.

**CO-5.** Build cross-cultural understanding and confidence in using language through collaboration with classmates, increased participation in college activities, and increased interaction within the college and the larger community in order to complete class assignments such as surveys, reports and presentations.

## **Semester-2**

### **Paper 1: Computer System Architecture**

#### **Course Outcomes**

**CO-1.** To make students understand the basic structure, operation and characteristics of digital computer.

**CO-2.** To familiarize the students with arithmetic and logic unit as well as the concept of the concept of pipelining.

**CO-3.** To familiarize the students with hierarchical memory system including cache memories and virtual memory.

**CO-4.** To make students know the different ways of communicating with I/O devices and standard I/O interfaces.

### **Paper 2: Internet Concepts and Web Design**

#### **Course Outcome**

**CO-1.** HTML is highly flexible and supported on all browsers.

**CO-2.** User friendly and an open technology.

**CO-3.** CSS provides powerful control over the presentation of an HTML document.

**CO-4.** CSS saves many times as it can be reused in many HTML pages.

**CO-5.** CSS can be used to make responsive web pages, which are compatible on multiple devices.

### **Paper 3 : Data Structure & Algorithms**

#### **Course Learning Outcomes**

**CO-1.** Implement and empirically analyse linear and non-linear data structures like Arrays, Stacks, Queues, Lists, Trees, Heaps and Hash tables as abstract data structures.

**CO-2.** Write a program, choosing a data structure, best suited for the application at hand.

**CO-3.** Re-write a given program that uses one data structure, using a more appropriate/efficient data Structure.

**CO-4.** Write programs using recursion for simple problems.

**CO-5.** Explain the advantages and disadvantages of recursion.

### **Paper 4 : CYBER SECURITY**

#### **Course Learning Outcomes**

**CO-1.** Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.

**CO-2.** Develop an understanding of security policies (such as authentication, integrity and confidentiality).

**CO-3.** Develop an understanding of Cryptography and Network Security.

**CO-4.** Identify some of the factors driving the need for Cyber security

**CO-5.** Identify and classify particular examples of attacks

### **Paper 5: Discrete Mathematics**

#### **Course Learning Outcomes**

**CO-1.** Upon completion of the course, the student will be able to use logical notation

**CO-2.** Perform logical proofs

**CO-3.** Apply recursive functions and solve recurrence relations

**CO-4.** Determine equivalent logic expressions

CO-5. Describe useful standard library functions, create functions, and declare parameters

### Semester-3

#### **Paper 1: Data Base Management System**

##### **Course Outcomes**

- CO-1. Differentiate between database systems and file systems.
- CO-2. Describe the features of database management systems.
- CO-3. Analyses the problem and arrive at an information model in the form of an ER diagram.
- CO-4. Normalize a database.
- CO-5. Transform an ER model into a relational database schema.

#### **Paper 2: OOPS IN C ++**

##### **Course Outcomes**

- CO-1. Learn the concepts of data, abstraction and encapsulation
- CO-2. Be able to write programs using classes and objects, packages.
- CO-3. Understand conceptually principles of Inheritance and Polymorphism and their use and program level implementation.
- CO-4. Learn exception and basic event handling mechanisms in a program
- CO-5. To learn typical object-oriented constructs of specific object-oriented programming language

#### **Paper3: E-Commerce Security**

##### **Course Outcomes**

- CO-1. Understand the basic concepts and technologies used in the field of management information systems;
- CO-2. Have the knowledge of the different types of management information systems.
- CO-3. Understand the processes of developing and implementing information systems.
- CO-4. Create a marketing plan and promotional plan for an ecommerce site.
- CO-5. Create a strategy for the different, non-traditional areas surrounding ecommerce.

#### **Paper 4: Principles Of Management**

##### **Course Outcomes**

- CO-1. Understand the nature of management and describe the functions of management.
- CO-2. Understand the Information presentation and reporting
- CO-3. Principles and Types of report MIS.
- CO-4. Develop understanding of different approaches to designing organizational structures.
- CO-5. Understand the role of personality, learning and emotions at work.

#### **Paper 5- El-1: Internet Of Things**

##### **Course Outcomes**

- CO-1. Able to understand the application areas of IOT.
- CO-2. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.
- CO-3. Able to understand building blocks of Internet of Things and characteristics.

#### **Paper 6- El-2: Digital Image Processing**

##### **Course Outcomes**

- CO-1. Describe and explain basic principles of digital image processing.
- CO-2. Design and implement algorithms that perform basic image processing (e.g. noise removal and imageenhancement).
- CO-3. Design and implement algorithms for advanced image analysis (e.g. image compression, image segmentation).
- CO-4. Assess the performance of image processing algorithms and systems.

### **Paper 7- EI-3: Cloud Computing**

#### **Course Outcomes**

- CO-1.** Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
- CO-2.** Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
- CO-3.** Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
- CO-4.** Analyze various cloud programming models and apply them to solve problems on the cloud.

### **Paper 8- EI-4: Client-Server Computing**

#### **Course Outcomes**

Understand how new systems can be built to work effectively with today's capabilities and at the same time can be based on a technical architecture that will allow them to take advantage of future technologies.

## **Semester-4**

### **Paper 1: Programming With Vb.Net**

#### **Course Outcomes**

- CO-1.** Understand the programming algorithm, process, and structure
- CO-2.** Understand and identify the fundamental concepts of object-oriented programming
- CO-3.** Understand .NET Framework and describe some of the major enhancements to the new version of Visual Basic.
- CO-4.** Describe the basic structure of a Visual Basic .NET project and use main features of the integrated development environment (IDE)

### **Paper 2: Financial Accounting And Tally**

#### **Course Outcomes**

- CO-1.** This course helps students to work with well-known accounting software i.e. Tally ERP.9
- CO-2.** Student will learn to create company, enter accounting voucher entries including advance voucher entries, do reconcile bank statement, do accrual adjustments, and also print financial statements, etc. in Tally ERP.9 software
- CO-3.** Accounting with Tally certificate course is not just theoretical program, but it also includes continuous practice, to make students ready with required skill for
- CO-4.** employability in the job market.

### **Paper 3: Theory Of Operating Systems**

#### **Course Outcomes**

- CO-1.** Describe the important computer system resources and the role of operating system in their management policies and algorithms.
- CO-2.** To understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved overtime.
- CO-3.** Understanding of design issues associated with operating systems.
- CO-4.** Understand various process management concepts including scheduling, synchronization, and deadlocks.
- CO-5.** To have a basic knowledge about multithreading.

### **Paper 4: Software Engineering**

#### **Course Outcomes**

- CO-1.** Basic knowledge and understanding of the analysis and design of complex systems.
- CO-2.** Ability to apply software engineering principles and techniques.
- CO-3.** To produce efficient, reliable, robust and cost-effective software solutions.
- CO-4.** Ability to work as an effective member or leader of software engineering teams.

**CO-5.** To manage time, processes and resources effectively by prioritizing competing demands

**Paper 5 - El-1: System Analysis And Design Management Information System (Sad/Mis)**

**Course Outcomes**

**CO-1.** This module aims to as to introduce variety of new software used by analysts, designers to manage projects, analyze and document systems, design new systems and implement their plans.

**CO-2.** It introduces also a recent coverage of UML, wireless technologies and ERP; web based systems for e-commerce and expanded coverage on RAD and GUI design.

**CO-3.** Translate the role of information systems in organizations, the strategic management processes, with their implications for the management.

**Paper 6- El-2: E-Mobile Technology**

**Course Outcomes**

**CO-1.** Understand cellular concepts like frequency reuse, hand-off and Interference.

**CO-2.** Apply knowledge of reflection, diffraction and scattering to calculate link budget using path loss models.

**CO-3** Understand the importance of Equalization and different diversity techniques.

**CO-4.** Know fundamentals of GSM. viz., channels, coding techniques, data transmission, services.

**CO-5.** Know fundamentals of CDMA. viz., channels, coding techniques, data transmission, services.

**Paper 7- EL-3: PHP and My-SQL**

**Course Outcomes**

**CO-1.** This course is specially designed for students who are interested in learning the hottest programming language PHP and specially those who are interested in Web development with minimum entry requirements.

**CO-2.** Students who don't have any programming experience or programming knowledge in using object oriented techniques are encouraged to attend this course.

**CO-3.** Write PHP code to produce outcomes and solve problems.

**CO-4.** Display and insert data using PHP and MySQL.

**CO-5.** Test, debug, and deploy web pages containing PHP and MySQL.

**Paper 8- El-4: Python Programming**

**Course Outcomes**

**CO-1.** Improve programming skills

**CO-2.** To develop console application in python

**CO-3.** To develop database application in python

**CO-4.** Appreciate Python Programming Paradigm

**CO-5.** Hands on Regular Expression

**Semester-5**

**Paper 1 : Computer Network**

**Course Outcomes**

**CO-1.** Understand the structure of Data Communications System and its components.

**CO-2.** Be familiarize with different network terminologies.

**CO-3.** Familiarize with contemporary issues in network technologies.

**CO-4.** Know the layered model approach explained in OSI and TCP/IP network models.

**CO-5.** Identify different types of network devices and their functions within a network.

**Paper 2: Asp.Net With C# Programming**

**Course Outcomes**

**CO-1.** Introduce to .NET IDE Component Framework.

**CO-2.** Programming concepts in .NET Framework.

**CO-3.** Creating website using ASP.NET Controls.

**CO-4.** ASP.NET is a server-side scripting language introduced by the Microsoft for building dynamic web pages.

**CO-5.** Create user interactive web pages using ASP.Net.

### **Paper 3: Java Programming**

#### **Course Outcomes**

**CO-1.** Develop software in the Java programming language,

**CO-2.** Identify classes, objects, members of a class and relationships among them needed for a specific problem

**CO-3.** Use the Java programming language for various programming technologies

**CO-4.** Knowledge of object-oriented paradigm in the Java programming language.

**CO-5.** Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirement

### **Paper 4 : Data Mining Concepts**

#### **Course Outcomes**

**CO-1.** Learn the concepts of database technology evolutionary path which has led to the need for data mining and its applications.

**CO-2.** Examine the types of the data to be mined and present a general classification of tasks and primitives to integrate a data mining system.

**CO-3.** Apply preprocessing statistical methods for any given raw data.

**CO-4.** Explore DWH and OLAP, and devise efficient & cost effective methods for maintaining DWHs.

### **Paper 5- EI-1: Software Testing And Quality Assurance**

#### **Course Outcomes**

**CO-1.** Design and develop the bug free software systems using basic concepts of software testing.

**CO-2.** Identify, formulate, review, estimate and analyze complex engineering problems of software testing using principles of mathematics.

**CO-3.** Create, select and apply appropriate techniques, modern engineering concepts and IT tools for software testing.

**CO-4.** Apply verification, validation activities, static, dynamic testing, debugging tools and techniques and importance of working in teams.

**CO-5.** Implement concepts of object oriented testing, web testing and regression testing.

### **Paper 6- EI-2: Open Source Technology**

#### **Course Outcomes**

**CO-1.** Leaned the need of open source technology, open source development model, application of open sources, aspects of open source movement

**CO-2.** The students will be aware about the problems with traditional commercial software.

**CO-3.** The student will be familiar with basis syntax of PHP, common PHP scripts elements.

**CO-4.** The student will be familiar with creating of the server side scripting using PHP.

**CO-5.** Implement PHP database connectivity, perform operation on database and open source database management system.

### **Paper 7- EI-3: System Programming Using Linux**

#### **Course Outcomes**

**CO-1.** Grasp the concepts and principles, and be familiar with the approaches and methods of developing system-level software (e.g., compiler, and networking software);

**CO-2.** Apply the knowledge and techniques learnt to develop solutions to realworld problems;

**CO-3.** Select and make use of the OS kernel functions and their APIs, standard programming languages, and utility tools;

**CO-4.** Organize and manage software built for deployment and demonstration;

**CO-5.** Students will be able to create file systems and directories and operate them.

## **Paper 8- EI-4: Advanced Database Management System**

### **Course Outcomes**

- CO-1.** Create Stored Database Procedures for writing consistent, well-tuned backend code.
- CO-2.** Develop database application using XML data model.
- CO-3.** Understand developments in database technologies.
- CO-4.** Understand developments NOSQL.

## **M.Sc. (Cyber Security)**

### **Programme Outcomes (PO)**

- PO-1.** Critical Thinking: Identifying the assumptions that frame our actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.
- PO-2.** Effective Communication: Read, Write, Speak and listen clearly in English and Hindi (Bilingual).
- PO-3.** Social Interaction: Provide a social exchange between two or more individuals.
- PO-4.** Effective Citizenship: Demonstrate social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.
- PO-5.** Ethics: Recognize different value and moral systems and correlate them with present system.
- PO-6.** Environment & Sustainability: To understand the responsibility to conserve natural resources and protect global ecosystems to support health & wellbeing.
- PO-7.** Self-Directed & Life-long learning: It focuses on the process by which students take control of their own learning, in particular how they set their own learning goals, locate appropriate resources, decide on which learning methods to use and evaluate their progress.

### **Programme Specific Outcomes (PSO)**

Upon successful completion of the programme, candidates'

- PSO-1.** Expertise with cyber security landscapes.
- PSO-2.** Able to Analyze and evaluate the cyber security needs of an organization.
- PSO-3.** Determine and analyze software vulnerabilities and security solutions to reduce the risk of exploitation.
- PSO-4.** Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.

## **Semester-1**

### **Paper 1: Microprocessor Architecture & Assembly Language Programming**

#### **Course Outcomes**

- CO-1.** Describe the architecture of 8085.
- CO-2.** Illustrate the organization of registers and memory in microprocessors.
- CO-3.** Differentiate Minimum and Maximum Mode bus cycle.
- CO-4.** Identify the addressing mode of an instruction.
- CO-5.** Develop programming skills in assembly language.

### **Paper 2 : Operating System Design Principle**

#### **Course Outcomes**

Describe the important computer system resources and the role of operating system in their management policies and algorithms.



- CO-1.** To understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved overtime.
- CO-2.** Understanding of design issues associated with operating systems.
- CO-3.** Understand various process management concepts including scheduling, synchronization, and deadlocks.
- CO-4.** To have a basic knowledge about multithreading.
- CO-5.** To understand concepts of memory management including virtual memory.

### **Paper 3 : Fundamentals Of Information Security**

#### **Course Outcomes**

- CO-1.** Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
- CO-2.** Gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.
- CO-3.** Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
- CO-4.** Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.
- CO-5.** Develop an understanding of Firewalls, Improving Security through Firewalls.

### **Paper 4: Compiler Design**

#### **Course Outcomes**

- CO-1.** After completion of this course each student will implement a compiler for a small programming language.
- CO-2.** Define the phases of a typical compiler, including the front- and backend.
- CO-3.** Identify tokens of a typical high-level programming language; define regular expressions for tokens and design; implement a lexical analyzer using a typical scanner generator.
- CO-4.** Explain the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation; design and implement a parser using a typical parser generator.
- CO-5.** Apply an algorithm for a top-down or a bottom-up parser construction; construct a parser for a small context-free grammar.

## **Semester-2**

### **Paper 1: Internals Of Operating Systems**

#### **Course Outcomes**

- CO-1.** Describe the basic concepts of operating systems, including development and achievements, functionalities and objectives, structure and components
- CO-2.** Explain how memory, I/O devices, files, processes and threads are managed, and evaluate the performance of various scheduling algorithms
- CO-3.** Explain the concepts covered in concurrency control, including mutual exclusion and synchronization, deadlock and starvation
- CO-4.** Develop software using multi process and multithread programming techniques
- CO-5.** Analyze the relationship between the operating system and the hardware environment in which it runs

### **Paper 2: Computer Networks**

#### **Course Outcomes**

- CO-1.** Understand the structure of Data Communications System and its components. Be familiarize with different network terminologies.
- CO-2.** Familiarize with contemporary issues in network technologies.
- CO-3.** Know the layered model approach explained in OSI and TCP/IP network models.
- CO-4.** Identify different types of network devices and their functions within a network.
- CO-5.** Learn basic routing mechanisms, IP addressing scheme and internetworking concepts.

### **Paper 3: DIGITAL FORENSICS AND TOOLS**

#### **Course Outcomes**

- CO-1. Explain the origins of forensic science
- CO-2. Understand and utilize the fundamental concept of computers and digital forensics
- CO-3. Students shall be prepared for various technologies/tools to combat and investigate computer and cybercrimes.
- CO-4. The first part deals with fundamentals of computer architecture, importance of hardware , software , input output devices, processor, memory, storage devices, then make you learn about various file systems and encoding and decoding in computers.
- CO-5. The second half of the syllabus is dedicated to various types of cyber-crimes and its investigation and finally we would understand some of the challenges faced in present scenario.

### **Paper 4-El-1: Advanced Data Structures**

#### **Course Outcomes**

- CO-1. To be familiar with fundamental data structures and with the manner in which these data
- CO-2. structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles
- CO-3. To have knowledge of complexity of basic operations like insert, delete, search on these data structures.
- CO-4. Ability to choose a data structure to suitably model any data used in computer applications.
- CO-5. Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc.

### **Paper 5-El- 2: Mathematical Foundations Of Information Security**

#### **Course Outcomes**

- CO-1. Effectively express the concepts and results of Number Theory.
- CO-2. Understand basic concepts of various algebraic structures and theorems like Euler's theorem for
- CO-3. Designing security algorithm.
- CO-4. Understand coding theory which will be useful for data compression, information hiding.
- CO-5. Illustrate various pseudorandom number generation used for designing security protocols and for its analysis.

### **Paper 6-El-3: Python Programming**

#### **Course Outcomes**

- CO-1. Develop and execute simple Python programs.
- CO-2. Structure a Python program into functions.
- CO-3. Using Python lists, tuples to represent compound data
- CO-4. Develop Python Programs for file processing

## **Semester-3**

### **Paper 1: Secure Software Engineering**

#### **Course Outcomes**

- CO-1. Basic knowledge and understanding of the analysis and design of complex systems.
- CO-2. Ability to apply software engineering principles and techniques.
- CO-3. To produce efficient, reliable, robust and cost-effective software solutions.
- CO-4. Ability to work as an effective member or leader of software engineering teams.
- CO-5. To manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals Identify and analyzes the common threats in each domain.

### **Paper 2: Computer Forensics Analysis And Investigations**

#### **Course Outcomes**

- CO-1. Understand and utilize the fundamental concept of computers and digital forensics.
- CO-2. Students shall be prepared for various technologies/tools to combat and investigate computer and cybercrimes.

**CO-3.** Dedicated to various types of cyber-crimes and its investigation and finally we would understand some of the challenges faced in present scenario.

**CO-4.** Outline a range of situations where digital forensics may be applicable.

**CO-5.** Determining what data to collect and analyze.

### **Paper 3: Cryptography & Network Security**

#### **Course Outcomes**

**CO-1.** Learn fundamentals of cryptography and its application to network security.

**CO-2.** Understand network security threats, security services, and countermeasures.

**CO-3.** Acquire background on well-known network security protocols such as IPSec, SSL, and WEP.

**CO-4.** Understand vulnerability analysis of network security.

**CO-5.** Acquire background on hash functions; authentication; firewalls; intrusion detection techniques.

### **Paper 4- EI-1: E-Commerce Security**

#### **Course Outcomes**

**CO-1.** Understand the basics of E-commerce, current and emerging business models.

**CO-2.** Familiarize with basic business operations such as sales, marketing, HR etc. on the web.

**CO-3.** Enhance the students' skills for designing and developing website.

**CO-4.** Identify the emerging modes of e-payment.

**CO-5.** Understand the importance of security, privacy, ethical and legal issues of e-commerce.

### **Paper 5-EI-2: Artificial Intelligence**

#### **Course Outcomes**

**CO-1.** Explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.

**CO-2.** Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

**CO-3.** Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc).

**CO-4.** Identify appropriate AI technique for the problem at hand

**CO-5.** Compare strengths and weaknesses of different artificial Intelligence techniques.

### **Paper 6-EI-3: Machine Learning**

#### **Course Outcomes**

**CO-1.** Differentiate between supervised, unsupervised machine learning approaches

**CO-2.** Ability to choose appropriate machine learning algorithm for solving a problem

**CO-3.** Design and adapt existing machine learning algorithms to suit applications

**CO-4.** Understand the underlying mathematical relationships across various machine learning algorithms

**CO-5.** Design and implement machine learning algorithms to real world applications.

## **Semester-4**

### **Paper 1 : Ethical Hacking**

#### **Course Outcomes**

**CO-1.** Learn the difference between a vulnerability assessment and a penetration test

**CO-2.** Learn about the different tools and techniques that hackers—including ethical hackers—employ

**CO-3.** Discover the elements of a four-phase penetration test and how the four phases help a successful test

**CO-4.** Knowledge: Students will learn the underlying principles and techniques associated with the cybersecurity practice known as penetration testing or ethical hacking. They will become familiar with the entire penetration testing process including planning, reconnaissance, scanning, exploitation, post-exploitation and result reporting.

**CO-5.** Skills: For every offensive penetration technique the students will learn the corresponding remedial technique. By this, the students will develop a practical understanding of the current cybersecurity issues and the ways how the errors made by users, administrators, or programmers can lead to exploitable insecurities.

## Paper 2: Cyber Laws And Information Security

### Course Outcomes

**CO-1.** Understand the constraints of cyber law and security concern.

**CO-2.** Understand the importance of information security and how can manage the security of network as well as data.

**CO-3.** Know the working of security models and applied algorithms.

## Master of Computer Applications (MCA)

### Programme Outcomes

**PO-1. Problem Analysis:** Identify, formulate and solve complex computing problems reaching substantiated conclusions.

**PO-2. Development of Solutions:** Design and evaluate solutions for complex computing problems with appropriate consideration.

**PO-3. Investigations of complex Computing problems:** Use research-based knowledge and research methods for analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO-4. Modern Tool Usage:** Create, identify and apply appropriate techniques, resources, and modern computing tools to complex computing activities.

**PO-5. Professional Ethics:** Understand and commit to professional ethics and cyber regulations for professional computing practices.

**PO-6. Life-long Learning:** Identify the need and have the ability, to engage in independent learning as a computing professional.

**PO-7. Project management and finance:** Understand and apply computing, management principles to manage multidisciplinary projects.

### Programme Specific Outcomes

**PSO-1.** The students will be able to improve their technical skill, research, innovations in computer Science and Information Technology for significant contribution to the globalized technical society, industry and nation.

**PSO-2.** Apply the knowledge of computer application to find solutions for real-life application.

**PSO-3.** Ability to analyze, design, develops and maintains the software application with latest technologies.

**PSO-4.** Utilize skills and knowledge for computing practice with commitment on social, ethical, cyber and legal values.

### Semester-1

#### Paper 1: Object Oriented Programming In C++

##### Course Outcomes

**CO-1.** Learn the concepts of data, abstraction and encapsulation.

**CO-2.** Be able to write programs using classes and objects, packages.

**CO-3.** Understand conceptually principles of Inheritance and Polymorphism and their use and program level implementation.

**CO-4.** Learn exception and basic event handling mechanisms in a program.

**CO-5.** To learn typical object-oriented constructs of specific object oriented programming language.

#### Paper 2: Relational data base management system (sql prog. using oracle)

##### Course Outcomes

**CO-1.** Gain knowledge of database systems and database management systems software.

**CO-2.** Ability to model data in applications using conceptual modelling tools such as ER Diagrams and design data base schemas based on the model.

CO-3. Formulate, using SQL, solutions to a broad range of query and data update problems.

CO-4. Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.

CO-5. Be acquainted with the basics of transaction processing and concurrency control.

### **Paper 3: Computer Network**

#### **Course Outcomes**

CO-1. Understand the structure of Data Communications System and its components. Be familiarizing with different network terminologies.

CO-2. Familiarize with contemporary issues in network technologies.

CO-3. Know the layered model approach explained in OSI and TCP/IP network models.

CO-4. Identify different types of network devices and their functions within a network.

CO-5. Learn basic routing mechanisms, IP addressing scheme and internetworking concepts.

### **Paper 4: Operational Research**

#### **Course Outcomes**

CO-1. Analyze any real life system with limited constraints and depict it in a model form.

CO-2. Convert the problem into a mathematical model.

CO-3. Explain the concepts of linear programming problem

CO-4. Solve the linear programming problem by using Simplex method. Computational steps of Big-m-Method. Write the dual of the given linear programming problem.

CO-5. Find the initial basic feasible solution to the given Assignment problems.

### **Paper 5: Operating System Concepts**

#### **Course Outcomes**

CO-1. Describe the important computer system resources and the role of operating system in their management policies and algorithms.

CO-2. To understand various functions, structures and history of operating systems and should be able to specify objectives of modern operating systems and describe how operating systems have evolved over time.

CO-3. Understanding of design issues associated with operating systems.

CO-4. Understand various process management concepts including scheduling, synchronization, and deadlocks.

CO-5. To have a basic knowledge about multithreading.

## **Semester-2**

### **Paper 1: Object Oriented Analysis & Design**

#### **Course Outcomes**

CO-1. Basic knowledge and understanding of the analysis and design of complex systems.

CO-2. Ability to apply software engineering principles and techniques.

CO-3. To produce efficient, reliable, robust and cost-effective software solutions.

CO-4. Ability to work as an effective member or leader of software engineering teams.

CO-5. To manage time, processes and resources effectively by prioritizing competing demands to achieve personal and team goals Identify and analyzes the common threats in each domain.

### **Paper 2: .Net Technologies**

#### **Course Outcomes**

CO-1. Use .NET framework architecture, various tools, and Validation techniques,

CO-2. Use of different templates available in Visual Studio.

CO-3. Implementation and testing strategies in real time applications.

CO-4. Use advanced concepts related to Web Services, WCF, and WPF in project development.

CO-5. Understand the programming algorithm, process, and structure

### **Paper 3: Java Programming**

#### **Course Outcomes**

- CO-1. Knowledge of the structure and model of the Java programming language,
- CO-2. Use the Java programming language for various programming technologies
- CO-3. Develop software in the Java programming language,
- CO-4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements
- CO-5. Identify Java code utilities in applets, awt, I/O, Java packages, and classes.

### **Paper 4: Theory Of Computation**

#### **Course Outcomes**

- CO-1. Demonstrate advanced knowledge of formal computation and its relationship to languages.
- CO-2. Distinguish different computing languages and classify their respective types.
- CO-3. Recognize and comprehend formal reasoning about languages.
- CO-4. Design a finite automaton, pushdown automaton or a Turing machine for a problem at hand.
- CO-5. Apply pumping lemma to prove that a language is non-regular/non-context-free.

### **Paper 5: Computer Graphics With Multimedia**

#### **Course Outcomes**

- CO-1. Acquire familiarity with the concepts and relevant mathematics of computer graphics.
- CO-2. Ability to implement various algorithms to scan, convert the basic geometrical primitives, transformations, area filling, clipping.
- CO-3. Describe the importance of viewing and projections.
- CO-4. Ability to design basic graphics application programs.
- CO-5. Familiarize with fundamentals of animation and Virtual reality technologies

### **Paper 6-EI-3: Advanced Data Structures**

#### **Course Outcomes**

- CO-1. To be familiar with fundamental data structures and with the manner in which these data structures can best be implemented; become accustomed to the description of algorithms in both functional and procedural styles
- CO-2. To have knowledge of complexity of basic operations like insert, delete, search on these data structures.
- CO-3. Ability to choose a data structure to suitably model any data used in computer applications.
- CO-4. Design programs using various data structures including hash tables, Binary and general search trees, heaps, graphs etc.
- CO-5. Ability to assess efficiency tradeoffs among different data structure implementations.

### **Paper 7: Software Engineering**

#### **Course Outcomes**

- CO-1. Students will get foundation of software engineering, various process models and can apply the new models in development process.
- CO-2. Students will have effective communication and interaction skills for requirement engineering tasks.
- CO-3. Students can apply design principles for various types of software and designing object-oriented software using UML tools.
- CO-4. Students can implement testing strategies thoroughly using testing tools.
- CO-5. Students will understand the need of lifelong learning and adapt to new software engineering concepts.

### **Paper 8: Open-Source Software Development**

#### **Course Outcomes**

Ability to install and run open-source operating systems. Ability to gather information about Free and Open-Source Software projects from software releases and from sites on the internet. Ability to build and modify one or more Free and Open-Source Software packages. Ability to use a version control system and to interface with version control systems used by development communities.

Ability to contribute software to and interact with Free and Open-Source Software development projects.

### **Paper 9: Unix Administration & Shell Scripting**

#### **Course Outcomes**

- CO-1. Describe the architecture and features of UNIX Operating System and distinguish it from other Operating System
- CO-2. Demonstrate UNIX commands for file handling and process control
- CO-3. Write Regular expressions for pattern matching and apply them to various filters for a specific task
- CO-4. Analyze a given problem and apply requisite facets of SHELL programming in order to devise a SHELL script to solve the problem.

## **Semester-3**

### **Paper 1: Digital Forensics**

#### **Course Outcomes**

- CO-1. Explain the origins of forensic science
- CO-2. Understand and utilize the fundamental concept of computers and digital forensics
- CO-3. Students shall be prepared for various technologies/tools to combat and investigate computer and cybercrimes.
- CO-4. The first part deals with fundamentals of computer architecture, importance of hardware , software , input/output devices, processor, memory, storage devices, then make you learn about various file systems and encoding and decoding in computers.
- CO-5. The second half of the syllabus is dedicated to various types of cyber-crimes and its investigation and finally we would understand some of the challenges faced in present scenario.

### **Paper 2 : Python Programming**

#### **Course Outcomes**

- CO-1. Develop and execute simple Python programs.
- CO-2. Structure a Python program into functions.
- CO-3. Using Python lists, tuples to represent compound data
- CO-4. Develop Python Programs for file processing

### **Paper 3: Cloud Computing**

#### **Course Outcomes**

- CO-1. Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.
- CO-2. Compare the advantages and disadvantages of various cloud computing platforms.
- CO-3. Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google App Engine.
- CO-4. Program data intensive parallel applications in the cloud.
- CO-5. Analyze the performance, scalability, and availability of the underlying cloud technologies and software.

### **Paper 4-El-1: Data Warehousing & Data Mining**

#### **Course Outcomes**

- CO-1. Understand data mining principles and techniques: Introduce DM as a cutting-edge business intelligence method and acquaint the students with the DM techniques for building competitive advantage through proactive analysis, predictive modelling, and identifying new trends and behaviors. Learning objectives include.
- CO-2. Building basic terminology.
- CO-3. Learning how to gather and analyze large sets of data to gain useful business understanding.
- CO-4. Learning how to produce a quantitative analysis report/memo with the necessary information to make decisions.

CO-5. Describing and demonstrating basic data mining algorithms, methods, and tools

### **Paper 5: Machine Learning**

#### **Course Outcomes**

CO-1. Differentiate between supervised, unsupervised machine learning approaches

CO-2. Ability to choose appropriate machine learning algorithm for solving a problem

CO-3. Design and adapt existing machine learning algorithms to suit applications

CO-4. Understand the underlying mathematical relationships across various machine learning algorithms

CO-5. Design and implement machine learning algorithms to real world applications.

### **Paper 6-El-3: Big Data Hadoop**

#### **Course Outcomes**

CO-1. Ability to identify the characteristics of datasets and compare the trivial data and big data for various applications.

CO-2. Ability to select and implement machine learning techniques and computing environment that are suitable for the applications under consideration.

CO-3. Ability to solve problems associated with batch learning and online learning, and the big data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.

CO-4. Ability to understand and apply scaling up machine learning techniques and associated computing techniques and technologies.

CO-5. Ability to recognize and implement various ways of selecting suitable model parameters for different machine learning techniques.

### **Paper 7-El-4: Computer Vision & Digital Image Processing**

#### **Course Outcomes**

CO-1. Describe general terminology of Digital Image Processing and the roles of image processing systems in a variety of applications.

CO-2. Describe the basic issues and the scope (or principal applications) of image processing.

CO-3. Explain representation and manipulation of digital images, image acquisition, reading, writing, enhancement, displaying and segmentation and image Fourier transform.

CO-4. Various types of images, intensity transformations and spatial filtering.

CO-5. Understand the basic theory and algorithms that are widely used in digital image processing.

### **Paper 8-El-1: Compiler Design**

#### **Course Outcomes**

CO-1. After completion of this course each student will implement a compiler for a small programming language.

CO-2. Define the phases of a typical compiler, including the front- and backend.

CO-3. Identify tokens of a typical high-level programming language; define regular expressions for tokens and design; implement a lexical analyzer using a typical scanner generator.

CO-4. Explain the role of a parser in a compiler and relate the yield of a parse tree to a grammar derivation; design and implement a parser using a typical parser generator.

CO-5. Apply an algorithm for a top-down or a bottom-up parser construction; construct a parser for a small context-free grammar.

### **Paper 4-El-2: Artificial Intelligence**

#### **Course Outcomes**

CO-1. Explain what constitutes "Artificial" Intelligence and how to identify systems with Artificial Intelligence.

CO-2. Identify problems that are amenable to solution by AI methods, and which AI methods may be suited to solving a given problem.

CO-3. Formalize a given problem in the language/framework of different AI methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, etc).

CO-4. Identify appropriate AI technique for the problem at hand.

CO-5. Compare strengths and weaknesses of different artificial Intelligence techniques.



### **Paper 5-El-3: Cyber Laws And Information Security**

#### **Course Outcomes**

**CO-1.** Understand the constraints of cyber law and security concern.

**CO-2.** Understand the importance of information security and how can manage the security of network as well as data.

**CO-3.** Know the working of security models and applied algorithms.

### **Paper 6-El-4: Bioinformatics**

#### **Course Outcomes**

With a working knowledge of the practical and theoretical concepts of bioinformatics, you will be well qualified to progress onto advanced graduate study. The portfolio of skills developed on the programme is also suited to academic research or work within the bioinformatics industry as well as range of commercial settings.