

SEMESTER- III

U23MAT32 DISCRETE MATHEMATICS

COURSE OUTCOMES:

- CO1:** **Summarize** the concept of elementary mathematical logical arguments
- CO2:** **Apply** basic counting techniques to solve combinatorial problems .
- CO3:** **Identify** the applications of Graph theory models and data structures
- CO4:** **Apply** the concepts and properties of algebraic structures such as groups, rings and fields.
- CO5:** **Extend** the concepts of Boolean algebra in the area of lattices
- CO6:** **Apply** the concepts and properties of algebraic structures such as groups, rings and fields

U23CST31 COMPUTER ARCHITECTURE & ORGANIZATION

COURSE OUTCOMES:

- CO1:** **Understand** the basic structures of a computer system.
- CO2:** **Explain** the various arithmetic operations used in computers
- CO3:** **Apply** pipelined control units and the different types of hazards in the instructions
- CO4:** **Interpret** the concepts of parallel processing architecture
- CO5:** **Summarize** the fundamentals of memory system
- CO6:** **Explain** the concepts of I/O Devices

U23CST32 DATA STRUCTURES

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Explain** linear data structures using array and linked list.
- CO2:** **Understand** the concept of stacks & queues.
- CO3:** **Explain** non-linear data structures of tree traversal.
- CO4:** **Understand** Breadth-first traversal and Depth-first traversal.
- CO5:** **Apply** Searching and sorting techniques in data structures.
- CO6:** **Apply** hashing techniques in data structures

U23CST33 DATABASE MANAGEMENT SYSTEMS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Explain** the fundamental concepts of relational database and SQL.
- CO2:** **Build** the ER model for Relational model mapping to perform database design Effectively.
- CO3:** **Summarize** the properties of transactions and concurrency control mechanisms.
- CO4:** **Compare** and contrast various indexing strategies in different database systems.
- CO5:** **Extend** Distributed Databases
- CO6:** **Explain** the different advanced databases.

U23CST34 OBJECT ORIENTED PROGRAMMING

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Develop** Java programs using Object Oriented Programming principles
- CO2:** **Explain** Java programs with inheritance and interface concepts
- CO3:** **Build** Java applications using exceptions
- CO4:** **Build** Java applications with I/O and generics classes
- CO5:** **Develop** interactive Java programs using JAVAFX event handling
- CO6:** **Understand** the Concept of Controls components

U23CSP31 DATABASE MANAGEMENT SYSTEMS LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1:** **Utilize** typical data definitions and manipulation commands
- CO2:** **Develop** applications to test Nested and Join Queries
- CO3:** **Build** simple applications using Views
- CO4:** **Build** Procedures and Functions
- CO5:** **Develop** and manipulate data using NOSQL database.
- CO6:** **Develop** applications that require a Front-end Tool

U23CSP32 DATA STRUCTURES LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 :** **Develop** and array implement of Stack and Queue ADTs
- CO2 :** **Develop** and array implement of List ADT
- CO3:** **Develop** and implement List, Stack and Queue ADTs.
- CO4:** **Apply** the concept of Binary Trees , Binary Search Trees, AVL Trees
- CO5:** **Develop** and implement Heaps using Priority Queues
- CO6:** **Apply** the concept of searching and sorting algorithms

U23CSP33 OBJECT ORIENTED PROGRAMMING LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 :** **Develop** and implement Java programs for simple applications that make use of classes and packages
- CO2 :** **Develop** and implement Java programs for simple applications that make use of interfaces
- CO3:** **Develop** and implement Java programs with array list and exception handling
- CO4:** **Develop** and implement Java programs with multithreading
- CO5:** **Design** applications using file processing and generic programming
- CO6:** **Design** applications using event handling

SEMESTER-IV

U23CBT41 FOUNDATIONS OF DATA SCIENCE

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Analyze** the data science process
- CO2:** **Understand** different types of data description for data science process
- CO3:** **Explain** Gain knowledge on relationships between data
- CO4:** **Make Use of** the Python Libraries for Data Wrangling
- CO5:** **Apply** visualization Libraries in Python to interpret and explore data
- CO6:** **Analyze** the efficiency of Geographic Data with Basemap

U23AIT44 FUNDAMENTALS OF COMPUTER NETWORKS AND COMMUNICATION

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand the basic layers and its functions in computer networks.
- CO2:** Evaluate the performance of a network.
- CO3:** Understand the basics of how data flows from one node to another.
- CO4:** Analyze and design routing algorithms.
- CO5:** Design protocols for various functions in the network.
- CO6:** Understand the working of various application layer protocols

U23CBT43 CRYPTOGRAPHY AND CYBER SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
- CO2:** Apply the different cryptographic operations of symmetric cryptographic algorithms
- CO3:** Apply the different cryptographic operations of public key cryptography
- CO4:** Apply the various Authentication schemes to simulate different applications..
- CO5:** Understand various cyber crimes and cyber security
- CO6:** Explain the Network Access Control

U23CBT44 OPERATING SYSTEMS AND SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand the concepts of Operating Systems.
- CO2:** Make use of acquire knowledge on process management concepts including scheduling, synchronization threads and deadlock.
- CO3:** Understand the memory, file and I/O management activities of OS.
- CO4:** Understand security issues in operating systems and appreciate the need for security models
- CO5:** Understand the exposure to the operating systems security models of WINDOWS and UNIX OS.
- CO6:** Analyze the efficiency of Windows Security, Windows Authorization and Windows Vulnerabilities

U23CBT45 INTRODUCTION TO CYBER SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Explain the basics of cyber security, cyber crime and cyber law
- CO2:** Classify various types of attacks and learn the tools to launch the attacks
- CO3:** Apply various tools to perform information gathering
- CO4:** Apply intrusion techniques to detect intrusion
- CO5:** Apply intrusion prevention techniques to prevent intrusion
- CO6:** Explain the techniques used for RestNet and Inception v3.

U23GET41 ENVIRONMENTAL SCIENCE AND ENGINEERING

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Demonstrate** a comprehensive understanding of the world's biodiversity and the importance of its conservation.
- CO2:** **Discover** knowledge in ecological perspective and value of environment
- CO3:** **Categorize** different types of pollutions and their control measures.
- CO4:** **Understand** the significance of various natural resources and its management.
- CO5:** **Analyze** global environmental problems and come out with best possible solutions.
- CO6:** **Understand** environmental laws and sustainable development.

U23CBP41 FOUNDATIONS OF DATA SCIENCE LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 :** **Make use of** the python libraries for data science
- CO2 :** **Make use of** the basic Statistical and Probability measures for data science.
- CO3:** **Define** and descriptive analytics on the benchmark data sets.
- CO4:** **Implement** correlation and regression analytics on standard data sets
- CO5:** **Implement** and interpret data using visualization packages in Python.
- CO6:** **Analyze** the interpret data using visualization packages in Python.

U23CBP42 CRYPTOGRAPHY AND CYBER SECURITY LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 :** **Develop** a code for classical encryption techniques.
- CO2 :** **Build** a symmetric and asymmetric algorithm.
- CO3:** **Construct** a code for various Authentication schemes.
- CO4:** **Apply** the principles of digital signature.
- CO5:** **Understand** the Visualizing Geographic Data with Basemap
- CO6:** **Develop** a digital signature scheme

SEMESTER V

U23ITT62 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

COURSE OUTCOMES:

At the end of the course the students would be able to

- CO1:** Use appropriate search algorithms for problem solving.
- CO2:** Explain reasoning under uncertainty.
- CO3:** Understand supervised learning models.
- CO4:** Understand ensemble and unsupervised models.
- CO5:** Explain deep learning neural network models.
- CO6:** Explain the concept of batch normalization and regularization.

U23CBT53 ENGINEERING SECURE SOFTWARE SYSTEMS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Identify** various vulnerabilities related to memory attacks.
- CO2:** **Apply** security principles in software development.
- CO3:** **Evaluate** the extent of risks.
- CO4:** **Explain** selection of testing techniques related to software security in the testing phase of software development.
- CO5:** **Apply** tools for securing software.
- CO6:** **Show** the secure project management with implementation

U23CST64 INFORMATION SECURITY

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO1:** Discuss the basics of information security
- CO2:** Illustrate the legal, ethical and professional issues in information security
- CO3:** Demonstrate the aspects of risk management.
- CO4:** Become aware of various standards in the Information Security System
- CO5:** Design and implementation of Security Techniques
- CO6:** Discuss the basics of information security

U23ITT43 WEB TECHNOLOGIES

COURSE OUTCOMES:

At the end of the course the students would be able to

- CO1:** Create simple Website by understand the basics
- CO2:** Apply HTML and CSS effectively to create interactive and dynamic websites
- CO3:** Build dynamic web pages with validation using Java Script objects and apply different event handling mechanisms
- CO4:** Demonstrate simple web pages using Typescript
- CO5:** Illustrate Servlets in web applications
- CO6:** Create simple database applications.

U23CSV22 APP DEVELOPMENT

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Develop Native applications with GUI Components.
- CO 2:** Develop hybrid applications with basic event handling.
- CO 3:** Implement cross-platform applications with location and data storage capabilities.
- CO 4:** Implement cross platform applications with basic GUI and event handling.
- CO 5:** Develop web applications with cloud database access.
- CO 6:** Implement the non-functional characteristics of application frameworks.

U23CSV23 CLOUD SERVICES MANAGEMENT

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Explain cloud-design skills to build and automate business solutions using cloud technologies.
- CO 2:** Extend Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services.
- CO 3:** Solve the real-world problems using Cloud services and technologies.
- CO 4:** Discover Cloud service management operations.
- CO 5:** Understand the pricing models for cloud services.
- CO 6:** Evaluate the values of cloud services.

**U23CSV24
UI AND UX
DESIGN**

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Build UI for user Applications.
- CO 2:** Evaluate UX design of any product or application.
- CO 3:** Demonstrate UX Skills in product development.
- CO 4:** Implement Sketching principles.
- CO 5:** Create Wireframe and Prototype.
- CO 6:** Develop solutions for real world problems using information architecture.

U23CSV25 SOFTWARE TESTING AND AUTOMATION

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Understand the basic concepts of software testing and the need for software testing.
- CO 2:** Design Test planning and different activities involved in test planning.
- CO 3:** Design effective test cases that can uncover critical defects in the application.
- CO 4:** Extend out advanced types of testing.
- CO 5:** Explain the software testing using Selenium and TestNG.
- CO 6:** Understand Web driver events using automation tools.

U23CSV28 PRINCIPLES OF PROGRAMMING LANGUAGES

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Demonstrate syntax and semantics of programming languages.
- CO 2:** Explain data, data types, and basic statements of programming languages.
- CO 3:** Design and implement subprogram constructs.
- CO 4:** Apply object-oriented, concurrency, and event handling programming constructs and Develop programs in Scheme, ML, and Prolog.
- CO 5:** Understand and adopt new programming languages.
- CO 6:** Understand the fundamentals of functional programming languages.

U23ITV27 DEVOPS

COURSE OUTCOMES:

At the end of the course the students would be able to

- CO1:** Understand different actions performed through version control tools like Git.
- CO2:** Perform continuous integration and continuous testing and continuous deployment using Jenkins by building and automating test cases using Maven & Gradle.
- CO3:** Ability to perform automated continuous deployment.
- CO4:** Ability to do configuration management using Ansible.
- CO5:** Understand to leverage cloud-based DevOps tools using Azure DevOps.
- CO6:** Use Github Accounts and Azure pipelines.

U23CSV26 WEB APPLICATION SECURITY

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Understanding the basic concepts of web application security and the need for it.
- CO 2:** Explain the process for secure development and deployment of web applications.
- CO 3:** Apply the skill to design and develop Secure Web Applications that use Secure APIs.
- CO 4:** Explain the importance of carrying out vulnerability assessment and penetration
- CO 5:** Apply the skill to think like a hacker and to use hackers tool sets.
- CO 6:** Construct the solutions for hacking problems using tools.

U23CBT51 THEORY OF COMPUTATION

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Construct** automata theory using Finite Automata.
- CO2:** **Write** regular expressions for any pattern.
- CO3:** **Design** context free grammar and Pushdown Automata
- CO4:** **Design** Turing machine for computational functions
- CO5:** **Differentiate** between decidable and undecidable problems
- CO6:** **Develop** and implement the Class P and NP.

U23CBT45 INTRODUCTION TO CYBER SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Explain the basics of cyber security, cyber crime and cyber law
- CO2:** Classify various types of attacks and learn the tools to launch the attacks
- CO3:** Apply various tools to perform information gathering
- CO4:** Apply intrusion techniques to detect intrusion
- CO5:** Apply intrusion prevention techniques to prevent intrusion
- CO6:** **Explain** the techniques used for RestNet and Inception v3.

U23CBT53 ENGINEERING SECURE SOFTWARE SYSTEMS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Identify** various vulnerabilities related to memory attacks.
- CO2:** **Apply** security principles in software development.
- CO3:** **Evaluate** the extent of risks.
- CO4:** **Explain** selection of testing techniques related to software security in the testing phase of software development.
- CO5:** **Apply** tools for securing software.
- CO6:** **Show** the secure project management with implementation

U23CST64 INFORMATION SECURITY

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO1:** Discuss the basics of information security
- CO2:** Illustrate the legal, ethical and professional issues in information security
- CO3:** Demonstrate the aspects of risk management.
- CO4:** Become aware of various standards in the Information Security System
- CO5:** Design and implementation of Security Techniques
- CO6:** Discuss the basics of information security

U23CBT62 NETWORK SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Describe computer and network security fundamental concepts and principles.
- CO2:** Acquire the knowledge of various authentication protocols, key exchange mechanism, and digital certificates.
- CO3:** Analyze and get better knowledge on fundamental concepts of cryptography, encryption and hashing techniques.
- CO4:** Identify and assess different types of threats and attacks such as social engineering, rootkit, and botnets, etc.
- CO5:** Acquire Demonstrate the ability to select among available network security technology and protocols such as IDS, firewalls, SSL , TLS, etc.
- CO6:** Demonstrate the applications of social networks

U23CBT61 EMBEDDED SYSTEMS AND IOT

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Explain the architecture of embedded processors.
- CO2:** Write embedded C programs.
- CO3:** Design simple embedded applications.
- CO4:** Compare the communication models in IOT
- CO5:** Design IoT applications using Arduino/Raspberry Pi /open platform.
- CO6:** Explain about Arduino and its types

U23CBT71 CYBER FORENSICS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand the basics of cyber crime and computer forensics
- CO2:** Apply a number of different computer forensic tools to a given scenario
- CO3:** Analyze and validate forensics data
- CO4:** Understand Admissibility of evidence in India with Cyber laws and Case Studies
- CO5:** Identify the vulnerabilities in a given network infrastructure
- CO6:** Implement real-world hacking techniques to test system security

U23CBT43 CRYPTOGRAPHY AND CYBER SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1: Understand** the fundamentals of networks security, security architecture, threats and vulnerabilities
- CO2: Apply** the different cryptographic operations of symmetric cryptographic algorithms
- CO3: Apply** the different cryptographic operations of public key cryptography
- CO4: Apply** the various Authentication schemes to simulate different applications..
- CO5: Understand** various cyber crimes and cyber security
- CO6: Explain** the Network Access Control

U23CBT63 ETHICAL HACKING

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1: Evaluate** knowledge on basics of computer-based vulnerabilities
- CO2: Analyze** the different foot printing, reconnaissance and scanning methods.
- CO3: Construct** the enumeration and vulnerability analysis methods
- CO4: Discover** knowledge on hacking options available in Web and wireless applications.
- CO5: Summarize** knowledge on the options for network protection.
- CO6: Illustrate** tools to perform ethical hacking to expose the vulnerabilities.

U23CBT73 SECURITY AND PRIVACY IN CLOUD

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1: Understand** the cloud concepts and fundamentals.
- CO2: Explain** the security challenges in the cloud.
- CO3: Extend** cloud policy and Identity and Access Management.
- CO4: Understand** various risks and audit and monitoring mechanisms in the cloud.
- CO5: Explain** the various architectural and design considerations for security in the cloud
- CO6: Discuss** the Information and Event Management

U23CBP51 ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 :** **Make use of** appropriate search algorithms for problem solving
- CO2 :** **Apply** reasoning under uncertainty
- CO3:** **Build** supervised learning models
- CO4:** **Build** ensembling and unsupervised models
- CO5:** **Build** deep learning neural network models

- CO6:** **Apply** Machine Learning algorithms to solve real world problems

U23CBP52 ENGINEERING SECURE SOFTWARE SYSTEMS LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 :** **Identify** various vulnerabilities related to memory attacks.

- CO2 :** **Apply** security principles in software development.

- CO3:** **Evaluate** the extent of risks.

- CO4:** **Apply** and **Involve** selection of testing techniques related to software security in the testing phase of software development.

- CO5:** **Make use of** tools for securing software.

- CO6:** **Apply** Machine Learning algorithms to solve real world problems

SEMESTER VI

U23CBT61 EMBEDDED SYSTEMS AND IOT

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Explain** the architecture of embedded processors.
- CO2:** **Write** embedded C programs.
- CO3:** **Design** simple embedded applications.
- CO4:** **Compare** the communication models in IOT
- CO5:** **Design** IoT applications using Arduino/Raspberry Pi /open platform.

CO6: Explain about Arduino and its types

U23CBT62 NETWORK SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Describe computer and network security fundamental concepts and principles.
- CO2:** Acquire the knowledge of various authentication protocols, key exchange mechanism, and digital certificates.
- CO3:** Analyze and get better knowledge on fundamental concepts of cryptography, encryption and hashing techniques.
- CO4:** Identify and assess different types of threats and attacks such as social engineering, rootkit, and botnets, etc.
- CO5:** Demonstrate the ability to select among available network security technology and protocols such as IDS, firewalls, SSL, TLS, etc.
- CO6:** Demonstrate the applications of social networks

U23CBT63 ETHICAL HACKING

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Evaluate knowledge on basics of computer-based vulnerabilities
- CO2:** Analyze the different foot printing, reconnaissance and scanning methods.
- CO3:** Construct the enumeration and vulnerability analysis methods
- CO4:** Discover knowledge on hacking options available in Web and wireless applications.
- CO5:** Summarize knowledge on the options for network protection.
- CO6:** Illustrate tools to perform ethical hacking to expose the vulnerabilities.

U23CST71 CLOUD COMPUTING

COURSE OUTCOMES:

At the end of the course the students would be able to

- CO1 :** Understand the design challenges in the cloud.
- CO2 :** Apply the concept of virtualization and its types.
- CO3:** Experiment with virtualization of hardware resources and Docker
- CO4:** Develop and deploy services on the cloud and set up a cloud environment

- CO5:** Explain security challenges in the cloud environment.
- CO6:** Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

U23CSV32 VIRTUALIZATION

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Analyze the virtualization concepts and Hypervisor
- CO 2:** Apply the Virtualization for real-world applications
- CO 3:** Construct and Configure the different VM platforms
- CO 4:** Understand the concepts of storage virtualization
- CO 5:** Understand the Virtualization tools
- CO 6:** Examine with the VM with various software

U23CBV23 DIGITAL WATERMARKING AND STEGANOGRAPHY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Know the History and importance of watermarking and steganography.
- CO2:** Analyze Applications and properties of watermarking and steganography.
- CO3:** Demonstrate Models and algorithms of watermarking.
- CO4:** Design and Possess the passion for acquiring knowledge and skill in preserving authentication of Information.
- CO5:** Identify the theoretic foundations of steganography and steganalysis.
- CO6:** **Understand** the Steganography communication.

U23ITV31 DATA WAREHOUSING

COURSE OUTCOMES:

At the end of the course the students would be able to

- CO1:** Understand the fundamentals of data warehouse architecture for various Problems.
- CO2:** Explain the ETL and Online Analytical Processing Technologies and its operations.
- CO3:** Use the Categories of Metadata & Partitioning strategy technique.
- CO4:** Learn the differentiation of various schemas for given problem.

- CO5:** Frame roles of Data Warehousing Process Managers and System Configuration Managers.
- CO6:** Identify the skills and knowledge to effectively manage and optimize the various processes within a data warehouse.

U23CSV34 STORAGE TECHNOLOGIES

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment
- CO 2:** Illustrate the usage of advanced intelligent storage systems and RAID
- CO 3:** Illustrate various storage networking architectures - SAN, including storage subsystems and virtualization
- CO 4:** Examine the different role in providing disaster recovery and remote replication technologies
- CO 5:** Infer the security needs and security measures to be employed in information storage management
- CO 6:** Understand the functions of storage management process

U23CSV35 SOFTWARE DEFINED NETWORKS

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Explain the motivation behind SDN
- CO 2:** Identify the functions of the data plane and control plane
- CO 3:** Apply and develop network applications using SDN
- CO 4:** Apply Orchestrate network services using NFV
- CO 5:** Explain the Virtualized Network Functions of NFV
- CO 6:** Explain various use cases of SDN and NFV

U23AIV61 DISTRIBUTED COMPUTING

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO1:** Explain the foundations of distributed systems
- CO2:** Solve synchronization and state consistency problems
- CO3:** Use resource sharing techniques in distributed systems
- CO4:** Apply working model of consensus and reliability of distributed systems
- CO5:** Explain the fundamentals of cloud computing
- CO6:** Explain about cloud services.

U23CSV36 STREAM PROCESSING

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Understand the applicability and utility of different streaming algorithms.
- CO 2:** Apply current research trends in data-stream processing.
- CO 3:** Analyze the suitability of stream mining algorithms for data stream systems.
- CO 4:** Build stream processing systems, services and applications.
- CO 5:** Understand the basic concepts of streaming and functions of streaming.
- CO 6:** Solve problems in real-world applications that process data streams

U23CSV47 ANDROID SECURITY

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO1:** Identify various malwares and understand the behavior of malwares in real world applications.
- CO2:** Explain different malware analysis techniques.
- CO3:** Understand the malware behavior in android.
- CO4:** Understand the purpose of malware analysis.
- CO5:** Identify the various tools for malware analysis.
- CO6:** Motivate the student to use Secure USB Debugging

U23CBV32 WEB & DATABASE SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand the Web architecture and applications
- CO2:** Understand client side and server-side programming

- CO3:** Understand how common mistakes can be bypassed and exploit the application
- CO4:** Identify common application vulnerabilities
- CO5:** Understand Damage Quarantine and Recovery
- CO6:** Analyse and explain the Mobile Environment

U23CBV33 MOBILE APPLICATION SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand common mobile application security vulnerabilities
- CO2:** Define the security controls of multiple mobile operating systems
- CO3:** Understand and analyze Bluetooth technology
- CO4:** Understand and analyze overview of SMS security and Enterprise security
- CO5:** Illustrate the Encryption and Full Disk Encryption
- CO6:** Make use of the Windows Mobile, iPhone, Android

U23CSV43 SOCIAL NETWORK SECURITY

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO1:** Explain semantic web related simple applications
- CO2:** Extend Privacy and Security issues in Social Networking
- CO3:** Explain the data extraction and mining of social networks
- CO4:** Discuss the prediction of human behavior in social communities
- CO5:** Demonstrate the applications of social networks
- CO6:** Design the role of Identity provisioning

U23CSV44 MODERN CRYPTOGRAPHY

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO1:** Interpret the basic principles of cryptography and general crypt analysis.
- CO2:** Determine the concepts of symmetric encryption and authentication.
- CO3:** Identify the use of public key encryption, digital signatures, and key establishment.
- CO4:** Explain the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.
- CO5:** Extend the use of Message Authentication Codes.

CO6: Analyzethe perform of Shamir's Secret Sharing Scheme

U23ITV41 DIGITAL AND MOBILE FORENSICS

COURSE OUTCOMES:

At the end of the course the students would be able to

- CO1:** Understand the knowledge on digital forensics.
- CO2:** Know about digital crime and investigations.
- CO3:** Be forensic ready.
- CO4:** Identify digital evidence from iOS devices.
- CO5:** Identify the digital from Android devices.
- CO6:** Learn the Oxygen Forensics.

- CO2:** Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain.
- CO3:** Understand the function of Block chain as a method of securing distributed ledgers.
- CO4:** Apply hyper ledger Fabric and Ethereum platform to implement the Block chain Application.
- CO5:** Discuss about knowledge on the options for network protection.
- CO6:** Utilize the Hyper ledger Fabric, Ethereum networks

U23CSV26 WEB APPLICATION SECURITY

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Understanding the basic concepts of web application security and the need for it.
- CO 2:** Explain the process for secure development and deployment of web applications.
- CO 3:** Apply the skill to design and develop Secure Web Applications that use Secure APIs.
- CO 4:** Explain the importance of carrying out vulnerability assessment and penetration testing.
- CO 5:** Apply the skill to think like a hacker and to use hackers tool sets.
- CO 6:** Construct the solutions for hacking problems using tools.

U23CBP61 EMBEDDED SYSTEMS AND IOT LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 :** **Explain** the architecture of embedded processors.
- CO2 :** **Write** embedded C programs.
- CO3:** **Design** simple embedded applications.
- CO4:** **Compare** the communication models in IOT
- CO5:** **Design** IoT applications using Arduino/Raspberry Pi /open platform.
- CO6:** **Implement** IoT based weather monitoring system

U23CBP62 NETWORK SECURITY LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 :** Describe computer and network security fundamental concepts and principles.
- CO2 :** Demonstrate the knowledge of various authentication protocols, key exchange mechanism, and digital certificates.
- CO3:** Analyze and to get better knowledge on fundamental concepts of cryptography, encryption and hashing techniques.
- CO4:** Identify and assess different types of threats and attacks such as social engineering, rootkit, and botnets,etc.
- CO5:** Demonstrate the ability to select among available network security technology and protocols such as IDS, firewalls, SSL , TLS, etc.
- CO6:** Construct a code for various Authentication schemes.

SEMESTER VII

U23CBT71 CYBER FORENSICS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand the basics of cyber crime and computer forensics
- CO2:** Apply a number of different computer forensic tools to a given scenario
- CO3:** Analyze and validate forensics data
- CO4:** Understand Admissibility of evidence in India with Cyber laws and Case Studies
- CO5:** Identify the vulnerabilities in a given network infrastructure
- CO6:** Implement real-world hacking techniques to test system security

U23GET61 HUMAN VALUES AND ETHICS

COURSE OUTCOMES:

At the end of the course the students would be able to

- CO1 :** Understand definition and classification of values.
- CO2 :** Understand purusartha.
- CO3:** Understand sarvodaya idea.
- CO4:** Understand sustenance of life.
- CO5:** Understand the hierarchy of values.
- CO6:** Compare hierarchical views of Pt. Madan Mohan Malviya and Mahatma Gandhi.

U23CBT73 SECURITY AND PRIVACY IN CLOUD

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Understand** the cloud concepts and fundamentals.
- CO2:** **Explain** the security challenges in the cloud.
- CO3:** **Extend** cloud policy and Identity and Access Management.
- CO4:** **Understand** various risks and audit and monitoring mechanisms in the cloud.
- CO5:** **Explain** the various architectural and design considerations for security in the cloud
- CO6:** **Discuss** the Information and Event Management

U23CSV51 AUGMENTED REALITY / VIRTUAL REALITY

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Understand the basic concepts of AR and VR.
- CO 2:** Understand the tools and technologies related to AR/VR.
- CO 3:** Explain the working principle of AR/VR related Sensor devices.
- CO 4:** Design various models using modeling techniques.
- CO 5:** Develop VR applications in different domains.
- CO 6:** Develop AR applications in different domains.

U23CSV13 NEURAL NETWORKS AND DEEP LEARNING

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Apply Convolution Neural Network for image processing.
- CO 2:** Explain the basics of associative memory and unsupervised learning networks.
- CO 3:** Apply CNN and its variants for suitable applications.
- CO 4:** Analyze the key computations underlying deep learning and use them to build and train deep neural networks for various tasks.

U23CSV61 ROBOTIC PROCESS AUTOMATION

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Explain the key distinctions between RPA and existing automation techniques and Platforms.
- CO 2:** Build control flows and work flows for the target process
- CO 3:** Apply recording, web scraping and process mining by automation
- CO 4:** Apply UiPath Studio to detect, and handle exceptions in automation processes
- CO 5:** Analyze and use Orchestrator for creation, monitoring, scheduling, and controlling of automated bots and processes.
- CO 6:** Develop Comprehensive RPA Deployment Plans.
- CO 5:** Apply auto encoders and generative models for suitable applications.
- CO 6:** Apply auto Decoders and generative models for suitable applications.

U23CBV44 INTRUSION DETECTION AND PREVENTION SYSTEM

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** **Summarize** the Fundamental concepts of Network Protocol Analysis and demonstrate the skill to capture and analyze network packets.
Make use of various protocol analyzers and Network Intrusion Detection
- CO2:** Systems as security tools to detect network attacks and troubleshoot network problems.
- CO3:** **Summarize** knowledge on the options for network protection.
- CO4:** **Understand** the Intrusion Detection

- CO5:** Illustrate Law Enforcement
- CO6:** Develop and Evaluating Organizations and Standardizations.

U23CSV64 QUANTUM COMPUTING

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Understand the basics of quantum computing.
- CO 2:** Understand the background of Quantum Mechanics.
- CO 3:** Analyze the computation models.
- CO 4:** Build the circuits using quantum computation. Environments and frameworks.
- CO 5:** Understand the quantum operations such as noise and error–correction.
- CO 6:** Develop and Evaluation of Quantum Key Distribution Protocols.

U23CBV46 AD HOC & SENSOR NETWORKS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand the concepts of sensor networks and applications
- CO2:** Understand and compare the MAC and routing protocols for adhoc networks
- CO3:** Understand the transport protocols of sensor networks
- CO4:** Design and Understand MAC layer
- CO5:** Implement the dynamic nature of WSNs.
- CO6:** Make use of Transport layer, High-level application layer

U23CSV56 GAME DEVELOPMENT

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Explain the concepts of 2D and 3d Graphics.
- CO 2:** Design game design documents
- CO 3:** Evaluate the gaming engines.
- CO 4:** Construct the gaming environments and frameworks.
- CO 5:** Develop a simple game in Pygame.
- CO 6:** Demonstrate the overview of Isometric games.

U23CSV66

3D PRINTING AND DESIGN

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Outline and examine the basic concepts of 3D printing technology
- CO 2:** Outline 3D printing workflow
- CO 3:** Explain and categories the concepts and working principles of 3D printing using inkjet technique
- CO 4:** Explain and categories the working principles of 3D printing using laser technique
- CO 5:** Explain various method for designing and modeling for industrial applications
- CO 6:** Explain Future Trends in Manufacturing.

U23CSV15 BUSINESS ANALYTICS

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Explain the real-world business problems and model with analytical solutions.
- CO 2:** Identify the business processes for extracting Business Intelligence
- CO 3:** Apply predictive analytics for business fore-casting
- CO 4:** Apply analytics for supply chain and logistics management
- CO 5:** Explain analytics for marketing and sales.
- CO 6:** Extend predictive analytics for sales.

U23CSV17

COMPUTER VISION

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO 1:** Understand basic knowledge, theories and methods in image processing and computer vision.
- CO 2:** Explain about advanced image processing techniques in OpenCV.
- CO 3:** Apply 2D a feature-based based image alignment, segmentation and motion estimations
- CO 4:** Apply 3D image reconstruction techniques
- CO 5:** Design and develop innovative image processing and computer vision applications
- CO 6:** Design and develop innovative computer vision applications

U23AIV65 HUMAN COMPUTER INTERACTION

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Design effective dialog for HCI
- CO2:** Design effective HCI for individuals and persons with disabilities.
- CO3:** Analyze the importance of user feedback.
- CO4:** Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- CO5:** Develop meaningful user interface.
- CO6:** Explain the importance of Contextual Tools.

U23CBV54 EDGE ANALYTICS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand the concepts of Edge Analytics, both in theory and in practical application
- CO2:** Demonstrate a comprehensive understanding of different tools used at edge analytics
- CO3:** Design and implement the solutions for real world edge analytics
- CO4:** Understand the concepts of Micropython
- CO5:** Implement the Visual Recognition
- CO6:** Creating and implementing the Node-RED dashboard

U23CST72 NATURAL LANGUAGE PROCESSING

COURSE OUTCOMES:

At the end of the course the students would be able to

- CO1 :** Understand text with basic Language features.
- CO2 :** Apply rule based system to tackle morphology/syntax of a language

- CO3:** Explain the concept of Context Free Grammar
- CO4:** Explain Semantic analysis
- CO5:** Build tools to process natural language and design innovative NLP applications.
- CO6:** Evaluate lexical resources.

U23CBV56 MULTIMEDIA SECURITY & FORENSICS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Design and develop various applications of digital watermarking
- CO2:** Analyze the main properties and classifications of digital watermarking systems
- CO3:** Design of digital watermarking systems modelling
- CO4:** **Design** Selected digital watermarking algorithms (e.g. LSB based approach and those in DCT domain)
- CO5:** **Implement** Security of digital watermarking systems
- CO6:** **Understand** the Multimedia Processing and Digital Forensics

U23ITV65 OPTIMIZATION TECHNIQUES

COURSE OUTCOMES:

At the end of the course the students would be able to

- CO1:** Understand the Formulate and solve linear programming problems (LPP).
- CO2:** Evaluate Integer Programming Problems, Transportation and Assignment Problems.
- CO3:** Use the solution to network problems using CPM and PERT techniques.
- CO4:** Learn to optimize the functions object to the constraints.
- CO5:** Identify and solve problems under Markovian queuing models.
- CO6:** Explain Queuing system and multiple service channels.

U23CBV58 BIG DATA ANALYTICS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Describe big data and use cases from selected business domains.
- CO2:** Explain NoSQL big data management.
- CO3:** Install, configure, and run Hadoop and HDFS.
- CO4:** Perform map-reduce analytics using Hadoop.
- CO5:** Usage Hadoop-related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.
- CO6:** Describe big data and use cases from selected business domains.

U23CBP71 CYBER FORENSICS LABORATORY

COURSE OUTCOMES:

At the end of the course the students will be able to

- CO1 :** Understand the basics of cyber crime and computer forensics
- CO2 :** Apply a number of different computer forensic tools to a given scenario
- CO3:** Analyze and validate forensics data
- CO4:** Understand Admissibility of evidence in India with Cyber laws and Case Studies
- CO5:** Identify the vulnerabilities in a given network infrastructure
- CO6:** Implement real-world hacking techniques to test system security

SEMESTER VIII

U23CBT81 MALWARE ANALYSIS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Analyze various malicious file types
- CO2:** Build and utilize a sandbox environment for malware analysis
- CO3:** Apply various tools to Identify the vulnerabilities and to perform Malware analysis
- CO4:** Apply malware classification and functionality & anti-reverse engineering techniques
- CO5:** Explain about knowledge on the In-Depth Malware Analysis
- CO6:** Illustrate the detection of malware using evade analysis toolkit

U23CSV67 KNOWLEDGE ENGINEERING

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO1:** Understand the basics of Knowledge Engineering.
- CO2:** Apply methodologies and modelling for Agent Design and Development.
- CO3:** Design and develop ontologies.
- CO4:** Apply reasoning with ontologies and rules.
- CO5:** Understand learning and rule learning.
- CO6:** Explain Hypothesis Learning.

U23CBV62 SOFTWARE PROJECT MANAGEMENT**COURSE OUTCOMES:**

At the end of the course the students would be able to:

- CO1:** Understand Project Management principles while developing software.
- CO2:** Gain extensive knowledge about the basic project management concepts, framework and the process models.
- CO3:** Obtain adequate knowledge about software process models and software effort estimation techniques.
- CO4:** Estimate the risks involved in various project activities.
- CO5:** Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- CO6:** Learn staff selection process and the issues related to people management

U23ITV45 CLOUD SECURITY**COURSE OUTCOMES:**

At the end of the course the students would be able to

- CO1:** Understand the cloud concepts and fundamentals.
- CO2:** Learn security design principles for cloud computing and virtualization
- CO3:** Use cloud security controls, including access management, incident response, and auditing techniques.
- CO4:** Understand various risks ,audit and monitoring mechanisms in the cloud.
- CO5:** Show monitoring and management strategies to detect, respond to, and mitigate security threats in cloud environments.
- CO6:** Define the various architectural and design considerations for security in the cloud.

U23CBV64 5G TECHNOLOGIES

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand 5G and 5G Broadband Wireless Communications
- CO2:** Understand 5G wireless Propagation Channels
- CO3:** Understand the significance of radio access technologies for 5G
- CO4:** Analyze Device-to-device (D2D) communications
- CO5:** Learn Massive MIMO propagation channel models
- CO6:** Explain the Massive MIMO propagation channel models

U23CBV65 IOT SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Incorporate the best practices learnt to identify the attacks and mitigate the same
- CO2:** Adopt the right security techniques and protocols during the design of IoT products
- CO3:** Assimilate and apply the skills learnt on ciphers and block chains when appropriate
- CO4:** Describe the essential components of IoT
- CO5:** Design and implementation of Authentication Techniques
- CO6:** Understand the Authentication Techniques

U23CSV44

MODERN CRYPTOGRAPHY

COURSE OUTCOMES:

At the end of the course the students will be able to:

- CO1:** Interpret the basic principles of cryptography and general crypt analysis.
- CO2:** Determine the concepts of symmetric encryption and authentication.
- CO3:** Identify the use of public key encryption, digital signatures, and key establishment.
- CO4:** Explain the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.
- CO5:** Extend the use of Message Authentication Codes.
- CO6:** Analyzethe perform of Shamir's Secret Sharing Scheme

U23CBV67

CYBER LAWS AND ETHICS

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Make learner conversant with the social and intellectual property issues emerging from cyberspace.
- CO2:** Explore the legal and policy developments in various countries to regulate cyberspace
- CO3:** Develop the understanding of relationship between commerce and cyberspace
- CO4:** Give learners in depth knowledge of information technology act and legal frame work of right to privacy, data security and data protection.
- CO5:** Make Study on Various Case Studies on Real Time Crimes.
- CO6:** Understand the ethical laws of computer for different countries.

U23CBV68 BIOMETRIC SECURITY

COURSE OUTCOMES:

At the end of the course the students would be able to:

- CO1:** Understand the privacy challenges of Biometrics
- CO2:** Explain different biometrics parameters
- CO3:** Understand the various modules constituting a bio-metric system.
- CO4:** Understand the concept of Biometric Modalities
- CO5:** Design and implement of multimodal biometric systems
- CO6:** Implement the Biometric System Security