DEPARTMENTOFCOMPUTERSCIENCEWITHCYBER SECURITY

Programme: B.Sc., Computer Science with Cyber Security

PO No.	Programme Outcomes Upon completion of the B.Sc., Degree Programme the graduate will be able to
PO-1	Understanding the professional, ethical, legal, security and social issues and responsibilities for the IT profession
PO-2	Acquire the knowledge and apply the programming skills into one's own work as a member and leader in a team to manage projects in multidisciplinary environments
PO-3	Apply the knowledge of cyber security to solve security threats from hackers and criminals to keep the data secure
PO-4	Produce the entrepreneurs who can innovate and develop software products in a secure way
PO-5	Design, implement and evaluate a computational system to meet desired goals within realistic constraints

PSO No.	Programme Specific Outcomes Upon completion of the courses the student would
PSO-1	To train and develop the graduates towards excellence through necessary soft skills for communicating with industrial experts
PSO-2	To make a positive impact on society through preventing and reducing hacking of security by applying a wide range of cyber security technical skills
PSO-3	To prepare students to be continuous learners in a connected world and imbibe professional skills.
PSO-4	To motivate the students for meeting the industry needs 0020 by applying security practices and strategies in real time software project development
PSO-5	To strengthen the Industry-Academia interface that will help the graduates to emerge as leaders in academics or an inspiring revolutionary in entrepreneurship

Course Title	DATA STRUCTURES USING C PROGRAMMING	
CODE	23CYUC101	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the concepts of C like variables, data types, manage I/O operations and operators.	K1
CO-2	Apply functions, strings and Arrays in C using data structure and Implementing structures, unions and pointers	K3
CO-3	Explore how to use the concepts of Data Structures in C	K2
CO-4	Implement the data structure concepts like array, sorting and searching using C	K4
CO-5	Implement the data structure concepts such as stacks and Queues.	K4

Course Title	DATASTRUCTURES USING C PROGRAMMING LAB	
CODE	23CYUCP01	
CO No.	Course Outcomes	Knowledge Level
CO-1	Construct C programs using arrays and operators	K1
CO-2	Demonstrate branching and looping concepts	K2
CO-3	Construct programs using Strings and Functions	K3
CO-4	Make use of pointers in C programs	K4
CO-5	Build Code for Problems in Data structures	K3

Course Title	FUNDAMENTALS OF INFORMATION TECHNOLOGY	
CODE	24ITUC102/ 24CYUC102/ 24AIUC102	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the generation, classification and anatomy of digital computer	K1
CO-2	Understand the components of Computer System Hardware and its functions	K2
CO-3	Understand and apply conversions using different number systems	K2
CO-4	Get an idea about types of software & programming fundamentals	K1
CO-5	Understand, Internet basics, protocols, addressing, search engine, mailing basics and multimedia	K2

Course Title	MATHEMATICS I (APPLIED MATHEMATICS) (Derivations Not Included – Problems Only)	
CODE	23AIUA101/ 23CYUA101	
CO No.	Course Outcomes	Knowledge Level
CO-1	Identify and Apply the matrix operations for solving any matrix related problems	K1 - K3
CO-2	Determine and apply appropriate numerical methods for solving System of Linear Equations	K2 - K4
CO-3	Compare and distinguish the use of differentiation/ integration methods and plan for solving scientific problems.	K3 - K4
CO-4	Apply appropriate method to find the initial basic feasible solution and solve the transportation and assignment problems towards optimality	K3
CO-5	Exercise and experiment the network construction by employing PERT for project planning and CPM for scheduling	K2-K3

Course Title	PROBLEM SOLVING WITH PYTHON	
CODE	**24CYUC203**	
CO No.	**Course Outcomes**	**Knowledge Level**
CO-1	Acquire the basic concept of Python Programming	K1
CO-2	Ability to utilize various types of conditional and loop statements	K2
CO-3	Implementation of functions and call	K3
CO-4	Apply the Data Structure concepts lists, tuples and Dictionaries	K2
CO-5	Construct the process if input/output with files, modules and packages in python	K4

Course Title	PYTHON PROGRAMMING lab	
CODE	**23CYUCP02**	
CO No.	**Course Outcomes**	**Knowledge Level**
CO-1	Demonstrate branching and looping concepts	K2
CO-2	Develop code using Lists and Tuples	K4
CO-3	Construct programs using Strings and Functions	K3
CO-4	Build Code for Problems using Dictionary, lists and tuples	K3
CO-5	Make use of Files in Python Programs	K4

Course Title	FUNDAMENTALS OF CYBER SECURITY	
CODE	24CYUC204	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the fundamental concepts and components of Information system and security.	K1
CO-2	Design, develop, and deploy secure applications, and effectively mitigate security threats throughout the application lifecycle.	K3
CO-3	Develop information systems that are resilient against security threats and protect the confidentiality, integrity, and availability of data	K2
CO-4	Identify, assess, and mitigate security issues in hardware components and systems, ensuring the integrity and confidentiality of data and systems.	K3
CO-5	Apply and manage security policies that effectively protect organizational assets, mitigate risks, and ensure compliance with relevant regulations and standards.	K4

Course Title	MATHEMATICS II (COMPUTATIONAL STATISTICS) (Derivations Not Included – Problems Only)	
CODE	23AIUA202/ 23CYUA202	
CO No.	Course Outcomes	Knowledge Level
CO-1	Analyze and infer the type of data for using measures of Central Tendency.	K1 - K3
CO-2	Analyze and compare two or more different data sets using Measures of Dispersion.	K2 - K4
CO-3	Understand moments as a convenient and unifying method for summarizing several descriptive statistical measures.	K3 - K4
CO-4	Recognize and apply the correlation/regression methods for finding the association between the dependent and independent variables.	K2 - K4
CO-5	Analyze the expected outcomes of given data using discrete uniform distribution, Binomial Distribution and Poison Distribution	K2 - K3

Course Title	INTRODUCTION TO OOP AND JAVA	
CODE	23CYUC305	
CO No.	Course Outcomes	Knowledge Level
CO-1	Define the basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods	K1
CO-2	Describe the fundamentals of operators and expressions, decision making, branching and looping statements	K2
CO-3	Implementing classes, objects, invoking methods, inheritance	K3
CO-4	Implement packages and Interface for real world problems	K4
CO-5	Make use of exception handling mechanisms and multithreaded model to solve real world problems	K4

Course Title	CYBER LAW AND ETHICS	
CODE	23CYUC306	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the concepts of cybercrime, cyber security and cyber laws.	K1
CO-2	Create an understanding on cyber offences and cybercrime, gives an idea of various attacks on mobile devices, security challenges by mobile devices.	K2
CO-3	Discuss different attacks that occur frequently in our day-to-day life.	K4
CO-4	Educate the concepts of cyberspace and cyber laws.	K3
CO-5	Provides proper sections, guidelines that should be followed in order to achieve proper security of computer systems. To understand the ethical responsibilities of information technology professionals towards stakeholders, such as clients, employers, and society	K2

Course Title	JAVA PROGRAMMING LAB	
CODE	23CYUCP03	
CO No.	Course Outcomes	Knowledge Level
CO-1	Demonstrate the creation of objects, classes and methods and the concepts of constructor, methods overloading, Arrays, branching and looping	K2
CO-2	Construct Java programs using Strings, Interfaces and Packages	K2
CO-3	Develop Java programs using Multithreaded Programming and Exception Handling	K3
CO-4	Build Java programs for Applets	K3
CO-5	Implement Multithreading in java programming	K3

Course Title	ORGANISATIONAL BEHAVIOUR	
CODE	23CYUA303	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the importance of an organisation and its function	K2
CO-2	Analyze individual perception and attitude	K2
CO-3	Learn about the knowledge of motivation and applications of it	K2
CO-4	Learn and apply communication and leadership	K2 &K3
CO-5	Knowledge and evaluate organizational structure and performance	K3

Course Title	CYBER SECURITY LAB	
CODE	23CYUSP01	
CO No.	Course Outcomes	Knowledge Level
CO-1	Demonstrate an understanding of the target's infrastructure, applications, and potential vulnerabilities.	K1
CO-2	Develop a malware removal and exploit vulnerabilities discovered during foot-printing and reconnaissance or vulnerability analysis.	K2
CO-3	Identify the exploits vulnerabilities in databases to manipulate, extract, or damage data. It can lead to data breaches and system compromise	K4
CO-4	Identify the attackers to take control of ongoing user sessions, potentially gaining unauthorized access to sensitive information	K4
CO-5	Analyze specific technologies, aiming to exploit vulnerabilities and gain unauthorized access or steal data	K3

Course Title	LINUX AND SHELL PROGRAMMING	
CODE	23CYUC407	
CO No.	Course Outcomes	Knowledge Level
CO-1	Explain the structure of Linux Operating System and perform the file processing and directory handling.	K2
CO-2	Create and secure a file in Linux.	K3
CO-3	Develop shell scripts using pipes, redirection, filters and Pipes	K2
CO-4	Develop shell scripts and control the process execution	K3
CO-5	Understand the concepts of process, backup, compression and networking commands in Linux	K3

Course Title	DATA COMMUNICATIONS AND NETWORKING	
CODE	23CYUC408	
CO No.	Course Outcomes	Knowledge Level
CO-1	Explain the structure of Linux Operating System and perform the file processing and directory handling.	K2
CO-2	Create and secure a file in Linux.	K3
CO-3	Develop shell scripts using pipes, redirection, filters and Pipes	K2
CO-4	Develop shell scripts and control the process execution	K3
CO-5	Understand the concepts of process, backup, compression and networking commands in Linux	K3

Course Title	LINUX AND SHELL PROGRAMMING LAB	
CODE	23CYUCP04	
CO No.	Course Outcomes	Knowledge Level
CO-1	Develop Linux utilities to perform File processing, Directory handling and User Management	K3
CO-2	Develop shell scripts using pipes, redirection, filters and Pipes	K3
CO-3	Develop shell scripts to display system configuration	K3
CO-4	Develop simple shell scripts using conditional statements	K3
CO-5	Develop simple shell scripts for files system	K3

Course Title	E-COMMERCE	
CODE	23CYUA404	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the basic concepts of E-commerce	K1
CO-2	Understand the basic concepts and Technologies of web applications	K1
CO-3	Identify the Security in E-commerce environment	K4
CO-4	Use the Knowledge about the electronic payment System	K2
CO-5	Discuss the Electronic Commerce and Banking	K3

Course Title	ETHICAL HACKING	
CODE	22CYUC508	
CO No.	Course Outcomes	Knowledge Level
CO-1	Analyze the ethical ramifications of hacking, considering its effects on individuals and communities, alongside examining hacker culture and reconnaissance methods.	K2
CO-2	Understand the usage of scanning tools to identify network vulnerabilities and threats, while also developing expertise in deploying and safeguarding against sniffers to maintain robust cyber security defenses.	K1
CO-3	Explore TCP/IP vulnerabilities, learning to identify and address potential security risks, while also mastering techniques to detect and mitigate spoofing attacks, thereby fortifying network defenses against malicious intrusion.	K3
CO-4	Comprehend the methodologies behind session hijacking, Trojan horse exploitation, and denial-of-service attacks, empowering them to implement robust countermeasures and safeguard network integrity against these malicious threats	K1
CO-5	Grasp the intricacies of buffer overflows and programming exploits, equipping them to identify vulnerabilities and develop secure coding practices to mitigate such risks.	K2

Course Title	OPERATING SYSTEMS	
CODE	22CSUC509/ 22CAUC509/ 22CTUC509/22CYUC509	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the basic concepts of a process and its states	K1
CO-2	Acquire the knowledge of real storage and virtual storage	K2
CO-3	Procure the facts of processor scheduling by means of various scheduling algorithms	K2
CO-4	Understand the basic operations on primary and secondary storage disks	K3
CO-5	Get awareness about the functions of a file system. Able to relate UNIX and LINUX operating system	K2

Course Title	PROBLEM SOLVING WITH PYTHON	
CODE	22CYUC510	
CO No.	Course Outcomes	Knowledge Level
CO-1	Acquire the basic concept of Python Programming	K1
CO-2	Ability to utilize various types of conditional and loop statements	K2
CO-3	Implementation of functions and call	K3
CO-4	Apply the Data Structure concepts lists, tuples and Dictionaries	K2
CO-5	Construct the process if input/output with files, modules and packages in python	K4

Course Title	PYTHON PROGRAMMING lab	
CODE	22CYUCP05	
CO No.	Course Outcomes	Knowledge Level
CO-1	Demonstrate branching and looping concepts	K2
CO-2	Develop code using Lists and Tuples	K4
CO-3	Construct programs using Strings and Functions	K3
CO-4	Build Code for Problems using Dictionary, lists and tuples	K3
CO-5	Make use of Files in Python Programs	K4

Course Title	BIG DATA ANALYTICS	
CODE	22CYUE511	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the evolution of data and its impact on various industries and develop a strong foundation in data science principles and techniques	K1
CO-2	Develop the skills to efficiently handle and process large volumes of data using Hadoop	K2
CO-3	Ability to work with big data and develop the skills to handle and process large volumes of data using Spark Scala, and HBase	K3
CO-4	Effectively use PIG for data processing and analysis in big data environments	K3
CO-5	Performance optimization in optimizing HIVE queries and improving the performance of data processing tasks	K4

Course Title	MACHINE LEARNING	
CODE	22CYUE521	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the basic concepts and terminology of machine learning, including supervised and unsupervised learning, classification, regression, and clustering.	K1
CO-2	Evaluate machine learning models using appropriate metrics such as accuracy, precision, recall, F1 score, and ROC-AUC.	K2
CO-3	Understand and apply techniques for feature selection and extraction.	K3
CO-4	Apply association rule mining to discover interesting patterns in datasets.	K3
CO-5	Analyze and solve the real world problems using neural networks.	K4

Course Title	DIGITAL FORENSIC	
CODE	22CYUE531	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understanding of the principles, methodologies, and techniques involved in the collection, analysis, and preservation of digital evidence.	K1
CO-2	Demonstrate an understanding of the best practices and techniques involved in live data acquisition, handling different types of digital evidence, ensuring data authenticity, and adhering to legal and ethical guidelines in the context of forensic duplication.	K2
CO-3	Analyze disk structures, file systems, and data stored within them for digital forensic investigations.	K3
CO-4	Comprehensive understanding of network protocols, traffic analysis, and packet examination.	K3
CO-5	Apply appropriate computer forensics tools and techniques to conduct thorough investigations, while maintaining the integrity of the evidence and adhering to industry standards and legal requirements.	K4

Course Title	ETHICAL HACKING LAB	
CODE	**22CYUSP03**	
CO No.	**Course Outcomes**	**Knowledge Level**
CO-1	Demonstrate an understanding of the target's infrastructure, applications, and potential vulnerabilities.	K1
CO-2	Develop a malware removal and exploit vulnerabilities discovered during foot-printing and reconnaissance or vulnerability analysis.	K2
CO-3	Identify the exploits vulnerabilities in databases to manipulate, extract, or damage data. It can lead to data breaches and system compromise	K4
CO-4	Identify the attackers to take control of ongoing user sessions, potentially gaining unauthorized access to sensitive information	K4
CO-5	Analyze specific technologies, aiming to exploit vulnerabilities and gain unauthorized access or steal data	K3

Course Title	SOFTWARE ENGINEERING AND TESTING	
CODE	**22CYUC611**	
CO No.	**Course Outcomes**	**Knowledge Level**
CO-1	Understand diverse software development methodologies	K1
CO-2	To extract software project requirements and crafting a detailed requirement model.	K3
CO-3	Implement software engineering principles, techniques, tools, and practices in practical applications.	K4
CO-4	Recognize and resolve design and implementation challenges to ensure the development of a high-quality software product.	K3
CO-5	Examine and contrast diverse software testing methodologies to enhance understanding and proficiency in testing practices.	K3

Course Title	WEB PROGRAMMING USING PHP	
CODE	22CYUC612	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the basic structure and components of a dynamic website and Set up a development environment, including installing and configuring necessary software and tools.	K1
CO-2	Declare and use variables effectively, including assigning values, changing their content, and understanding variable scope. Apply various operators in PHP, such as arithmetic, assignment, comparison, logical, and string operators	K2
CO-3	Ability to design and implement classes and objects to represent real-world entities or abstract concepts.	K3
CO-4	Manipulate arrays by performing operations like adding, removing, and modifying elements. Implement forms in web applications using HTML and CSS.	K4
CO-5	Implement and Apply security measures when working with files, sessions, and cookies to prevent unauthorized access or data breaches for efficient file handling, session management, and cookie usage in PHP	K4

Course Title	PHP and MYSQL lab	
CODE	22CYUCP06	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understand the basics of PHP syntax and how to write the PHP Scripts	K1
CO-2	Exploring the concepts with arrays, strings, and regular expressions in PHP	K2
CO-3	Analyze the use of control structures in PHP code and make appropriate modifications for improved functionality and readability	K3
CO-4	Develop and create a user registration form and store user credentials securely in a database	K3
CO-5	Apply and developing skills in creating dynamic and interactive web pages using PHP	K4

Course Title	CLOUD SECURITY	
CODE	22CYUE612	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understanding the fundamental concepts and principles of cloud computing	K1
CO-2	Analyze the various cloud service models	K2
CO-3	Discuss about the various service-oriented Architecture Techniques and Components	K3
CO-4	Identify and discuss cloud security threats and mitigation approaches	K3
CO-5	Implement the various cloud computing applications	K4

Course Title	BLOCK CHAIN TECHNOLOGY	
CODE	22CYUE622	
CO No.	Course Outcomes	Knowledge Level
CO-1	Understanding of blockchain technology, its applications, and various types of blockchain networks.	K1
CO-2	Analyze and compare different crypto currencies, assess their potential, and make informed decisions in the ever-evolving crypto-currency landscape.	K2
CO-3	Acquire the knowledge of the differences and similarities between public and private blockchain systems.	K3
CO-4	Skills to design, implement, and secure smart contracts within blockchain systems.	K4
CO-5	Apply the blockchain solutions in real world scenarios.	K4

Course Title	INTRODUCTION To IOT	
CODE	22CYUE632	
CO No.	Course Outcomes	Knowledge Level
CO-1	Equipped with the foundational knowledge to understand, design, and implement IoT solutions.	K1
CO-2	Expertise in IoT messaging, transport protocols, addressing with IPv4/IPv6 and gaining awareness of IPv5.	K3
CO-3	Deploying secure and efficient IoT solutions in cloud environments.	K2
CO-4	Acquire comprehensive skills in harnessing IoT data	K3
CO-5	Delve into IoT applications	K4

Course Title	MOBILE APPLICATION DEVELOPMENT LAB	
CODE	22CYUSP04	
CO No.	Course Outcomes	Knowledge Level
CO-1	Utilize Android Studio effectively for developing and debugging mobile applications	K3
CO-2	Demonstrate understanding of core Android concepts, programming principles, and best practices in app development	K4
CO-3	Design user-friendly interfaces and manage app resources efficiently	K4
CO-4	Integrate various Android APIs to enhance app functionality and user experience	K4
CO-5	Develop a strong foundation in Android app development, enabling them to create innovative and high-quality mobile applications for the Android ecosystem	K4