KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

Re-accredited by NAAC with 'A+' Grade (4th cycle)

College of Excellence (UGC) Coimbatore – 641 029

DEPARTMENT OF COMPUTER SCIENCE WITH DATA ANALYTICS

COURSE OUTCOMES (CO) & PROGRAMME OUTCOME (PO)

For the students admitted in the Academic Year

2025-2026

Programme Outcomes (POs)	
On successful completion of the B.Sc. Computer Science with Data Analytics	
PO1	Exhibit good domain knowledge and completes the assigned responsibilities Effectively and efficiently in par with the expected quality standards
PO2	Apply analytical and critical thinking to identify, formulate, analyze, and solve complex problems in order to reach authenticated conclusions
PO3	Design and develop research-based solutions for complex problems with specified needs through appropriate consideration for the public health, safety, cultural, societal, and environmental concerns
PO4	Establish the ability to Listen, read, proficiently communicate and articulate complex ideas with respect to the needs and abilities of diverse audiences.
PO5	Deliver innovative ideas to instigate new business ventures and possess the qualities of a good entrepreneur
PO6	Acquire the qualities of a good leader and engage in efficient decision-making.
PO7	Graduates will be able to undertake any responsibility as an individual/member of multidisciplinary teams and have an understanding of team leadership
PO8	Function as socially responsible individual with ethical values and accountable to ethically validate any actions or decisions before proceeding and actively contribute to the societal concerns.
PO9	Identify and address own educational needs in a changing world in ways sufficient to maintain the competence and to allow them to contribute to the advancement of knowledge
PO10	Demonstrate knowledge and understanding of management principles and apply these to one own work to manage projects and in multidisciplinary environment.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Core Paper 1: Problem Solving using C Programming				
Batch 2025 - 2028	**Hours/Week** 5	**Total Hours** 75	**Credits** 4	**Skill Development**

COURSE OBJECTIVES

1. To introduce the principles of C Programming and the diverse programming constructs within the C programming language.
2. To offer experience in Problem-solving through programming and foster the development of programming skills.
3. To provide comprehensive understanding of programming language and problem-solving methodologies.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	CO1	Discuss the fundamentals of Computers, including their history, and exploring the various types of Software and Hardware devices.
	CO2	Gain the concepts of variables, constants, operators, and different types of expression
	CO3	Utilize Decision-making statements and looping constructs to solve basic programming problems.
	CO4	Create the programs by employing enumerated data types, functions, unions, and nested structures.
	CO5	Explore programs utilizing pointers and concepts related to File handling.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Core Practical 1: Problem Solving using C Lab				
Batch 2025 - 2028	**Hours/Week** 5	**Total Hours** 75	**Credits** 2	**Skill Development**

COURSE OBJECTIVES

1. To introduce the C Programming concepts to cultivate programming proficiency.
2. To improve analytical and problem-solving abilities to effectively write programs in C.
3. To guide the candidates to explore the fundamental building blocks of the programming language.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	Engaging in the learning process aids in gaining a thorough understanding of C language concepts.
	CO2	Creating programs utilizing control and conditional statements, as well as switch cases.
	CO3	Utilize various basic programming constructs such as functions, strings, and pointers.
	CO4	Developing programs in C by employing the concept of structures and simulating the operation.
	CO5	Implementing concepts related to strings and file handling.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Core Paper 2 - Object Oriented Programming in Java				
Batch **2025 - 2028**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **4**	**Skill development**

COURSE OBJECTIVES

1. Gain a deep understanding of Object-Oriented Programming concepts and basic characteristics of Java.
2. Learn the principles of Methods, packages, inheritance and interface in java.
3. Understand how to define exceptions and learn different I/O streams for file handling.
4. Learn to develop a Java application with threads and generics classes
5. Become proficient in design and build simple Graphical User Interfaces

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Learn and create Java programs using object-oriented programming (OOPs) principles, variables, operators, and math functions.
	CO2	Gain experience and show skill in Java programming with methods, inheritance, and interfaces.
	CO3	Learn how to build Java applications using exceptions and I/O streams.
	CO4	Develop Java programs with threads and generics with flexible data types.
	CO5	Learn how to create interactive Java programs using Swing and AWT components.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Core Practical 2 - Object Oriented Programming in Java Lab				
Batch **2025 - 2028**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **2**	**Skill development**

COURSE OBJECTIVES

1. Students will gain proficiency in writing clean and efficient code with Java language syntax and semantics.
2. Students will learn the concepts of Object-Oriented Programming Paradigm and the programming constructs of JAVA.
3. Gain a deep understanding of Java programs using packages, inheritance, and interface concepts.
4. Develop the ability to implement Java concepts such as variables conditional and iterative execution methods.
5. Gain hands-on experience in implementing and analyzing graphical User interfaces using AWT.
6. Become proficient in analyzing and demonstrating event-handling mechanisms.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	Apply the concepts of operators, control structures, inheritance, method overriding in Java.
	CO2	Implement the concept of interface, packages, multithreading and applets.
	CO3	Apply the various basic programming constructs of Java like decision-making statements. Looping statements, overloading, inheritance, polymorphism, constructors and destructors.
	CO4	Design programs using frames, menu bars, list boxes
	CO5	Evaluate programs using various file stream classes, file types, and frames.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Core Paper 3 - Python Programming				
Batch 2025 - 2028	**Hours/Week** 3	**Total Hours** 45	**Credits** 4	**Skill Development**

COURSE OBJECTIVES

1. Understanding Python Fundamentals, Gain a solid understanding of the core concepts and syntax of the Python programming language.
2. Acquire skills of Master control flow structures such as if statements, loops, and nested statements to control the flow of program execution.
3. Learn how to define and call functions, pass arguments, and return values to write modular and reusable code.
4. Understand various data structures like lists, tuples, sets, and dictionaries, and learn how to manipulate them efficiently.
5. Acquire skills in reading from and writing to files, handling file objects, and managing file systems in Python.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Able to understand the fundamentals of computer hardware architecture and its relevance to programming.
	CO2	Able to write the Python operators, including the various types and their applications in statements and expressions. This knowledge will empower students to write Python programs proficiently and solve complex problems involving strings and lists across different applications.
	CO3	Able to demonstrate a comprehensive understanding of Python data structures, including tuples, sets, and dictionaries, along with their respective operations, methods, and looping mechanisms.
	CO4	Able to write Python programs that efficiently process numerical data, iterate through sequences, and implement modular and reusable code structures using functions and loops.
	CO5	Able to equip students to develop robust Python applications for various domains, from data analysis and visualization and File Concept to software development and beyond.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Core Practical 3 - Python Programming Lab				
Batch **2025 - 2028**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **4**	**Employability/** **Skill Development**

COURSE OBJECTIVES

1. Write, test, and debug simple Python programs.
2. Implement Python programs with conditionals and loops.
3. Develop Python programs step-wise by defining functions and calling them.
4. Use Python lists, tuples, dictionaries for representing compound data.
5. Read and write data from/to files in Python.
6. Learn Syntax and Semantics and create Functions in Python

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	To develop proficiency in creating based applications using the Python Programming Language.
	CO2	To be able to understand the various data structures available in Python programming language and apply them in solving computational problems.
	CO3	To be able to do testing and debugging of code written in Python and To be able to draw various kinds of plots using PyLab.
	CO4	To be able to do text filtering with regular expressions in Python.
	CO5	To be able to create socket applications in Python and to create GUI applications in Python.

Programme Code:23	B.Sc Computer Science with Data Analytics			
Title of the Paper - Allied Paper 3: Distributed Operating System				
Batch **2025-2028**	**Hours / Week** **6**	**Total Hours** **90**	**Credits** **5**	**Skill Development/ Employability**

Course objective

1. To describe basic concepts of Operating System and Computer Networks.
2. To understand about naming, security, distributed file system.
3. To understand about message passing, remote procedure calls.
4. Understand the need of distributed shared memory, synchronization.
5. Understand the scope of resource, process management.

Course Outcome

K1 TO K5	CO1	Gain knowledge of distributed operating system architecture (Knowledge)
	CO2	Illustrate principles and importance of distributed operating system (Understand)
	CO3	Implement distributed client server applications using remote method invocation (Apply)
	CO4	Distinguish between centralized systems and distributed systems (Analyze)
	CO5	Create stateful and state-less applications (Create)

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the paper: Core paper 4: Fundamentals of Data Analytics				
Batch 2025 – 2028	**Hours/Week** 3	**Total Hours** 45	**Credits** 4	**Employability**

Course Objectives

1. To understand the various visualization techniques for data analytics.
2. To provide an overview of common text mining
3. To optimize business decisions and create competitive advantage with web data analytics
4. To provide solutions to the emerging problems with social media.
5. To understand the customer behavior, market trends, and protecting healthcare data.

Course Outcomes (CO)

K1 to K5	**CO1**	Understand the basics concepts of Data Analytics, Business Intelligence (BI)
	CO2	Apply a wide range of Classification, Clustering, Text mining techniques on Textual data
	CO3	Acquire knowledge of Web Analytics principles, understand the evolution, advantages, and limitationsc
	CO4	Understand the concept of Social network data Analytics
	CO5	Understand the concept of Retail, Finance and Healthcare Analytics

Programme Code:23	B.Sc Computer Science with Data Analytics			
Title of the Paper - Core Practical 4: Data Analytics lab				
Batch 2025-2028	**Hours / Week** 5	**Total Hours** 75	**Credits** 4	**Skill Development/ Employability**

Course Objectives

1. Learn data cleaning, transformation, and visualization techniques.
2. Apply text pre-processing, feature extraction, and clustering methods.
3. Gain insights from user interactions and sentiment analysis.
4. Use machine learning for classification and trend forecasting.
5. Implement techniques to protect sensitive information.

Course Outcomes (CO)

K3 TO K5	CO1	Understand data processing techniques, including data cleaning, transformation, and visualization.
	CO2	Apply text analytics methods such as text pre-processing, feature extraction, and clustering.
	CO3	Analyze web and social media data to extract insights from user interactions and sentiment analysis.
	CO4	Develop predictive models using machine learning techniques for classification and trend forecasting.
	CO5	Implement data security and privacy techniques to protect sensitive information.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Allied Paper 4: Design and Analysis of Algorithms				
Batch **2025 – 2028**	**Hours/Week** 6	**Total Hours** 90	**Credits** 5	**Skill Development**

Course Objectives

1. Gain a deep understanding of fundamental concepts in algorithms
2. Develop the ability to design efficient algorithms to solve complex computational problems
3. Become proficient in analyzing the time and space complexity of algorithms Understand the implications of different complexity classes on algorithm efficiency.
4. Familiarize oneself with various algorithmic paradigms and techniques, such as divide and conquer, dynamic programming, greedy algorithms, and backtracking.
5. Learn to choose the appropriate paradigm for solving specific problems and understand their limitations and advantages.
6. Develop strong problem-solving skills through algorithmic challenges and exercises.
7. Learn to decompose complex problems into smaller, manageable sub problems and devise efficient algorithms to solve them.
8. Gain hands-on experience in implementing and analyzing algorithms to solve real-world problems.

Course Outcomes (CO)

K1 to K5	**CO1**	Understand and possess a comprehensive understanding of the fundamental principles underlying algorithm design, analysis, and the role of algorithms in computing.
	CO2	Understand and demonstrate proficiency in applying the Divide and Conquer paradigm to efficiently solve a wide range of computational problems, including sorting, searching, numerical computations, and geometric algorithms.
	CO3	Understand and prove proficiency in the application of Greedy Algorithms and Brute Force techniques to solve a diverse range of computational problems.
	CO4	Understand and demonstrate a comprehensive understanding of dynamic programming, greedy techniques, and hashing algorithms, along with their applications in solving complex computational problems efficiently.
	CO5	Understand and exhibit proficiency in applying advanced algorithmic techniques, including Backtracking, Iterative Improvement, Decision Trees, Branch and Bound, to tackle computationally challenging problems across various domains.

Programme Code: 23		B.Sc. Computer Science with Data Analytics		
Title of the Paper: Core Paper 5 - R Programming				
Batch 2025 - 2028	**Hours / Week** 6	**Total Hours** 90	**Credits** 4	**Skill Development**

COURSE OBJECTIVES

1. Understand the fundamental concepts of R Programming.
2. To develop advanced skills in Data Manipulation.
3. To acquire knowledge and skills in working with Data Frames, Factors, and Tables.
4. Understand the Object-Oriented Programming concepts in R.
5. To equip the students to Visualize and Analyses the Data using R.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Explain the basics in R programming in the terms of Data structure, Constructs, Control statements, String functions.
	CO2	Demonstrate about Matrices and Lists in R.
	CO3	Apply the Complex Data sets using Data Frames and Factors.
	CO4	Analyze the Object-Oriented Programming in R.
	CO5	Understand the Concepts of Interface R with Other Languages, Conduct Statistical Analysis and Clustering.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Core Practical 5 - R Programming Lab				
Batch 2025 – 2028	**Hours / Week** 6	**Total Hours** 90	**Credits** 4	**Skill Development**

COURSE OBJECTIVES

1. To learn to install and configure R and RStudio.
2. Develop a solid foundation in R programming.
3. Enhance proficiency in data analysis techniques using R.
4. Acquire practical skills in applying R for exploratory data analysis and visualization**.**

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	Understand the basics in R programming in terms of constructs, control statements, string functions.
	CO2	Develop skills in data manipulation and analysis.
	CO3	Learn exploratory data analysis techniques to derive insights from datasets
	CO4	Develop skills in creating informative graphs to represent data visually
	CO5	Enhance capability to handle diverse datasets effectively.

Programme Code: 23	B. Sc Computer Science with Data Analytics			
Title of the Paper: Core Paper 6 - Relational Database Management System				
Batch 2025 - 2028	**Hours / Week** 5	**Total Hours** 75	**Credits** 4	**Skill development**

COURSE OBJECTIVES

1. Students will learn introduction of DBMS, RDBMS & basics of SQL commands including DDL and DML.
2. Gain a deep understanding of normalization, keys and ER models.
3. Students will familiarize the concepts of different joins and transactions.
4. Gain a knowledge on PL/SQL , stored procedures and triggers.
5. Students will learn different types of databases like object oriented, distributed and SQL database.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Understanding the concepts of DBMS, RDBMS and applying types of SQL commands.
	CO2	Understanding the concepts of Keys, Normalization and ER Models.
	CO3	Able to understand joins and transaction concepts.
	CO4	Understand the concepts of PL/SQL, procedures, triggers and exception handling.
	CO5	Understand different of Databases and NO SQL.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : Core Practical 6 - Relational Database Management System Lab				
Batch 2025 – 2028	**Hours / Week** 6	**Total Hours** 90	**Credits** 4	**Skill Development**

COURSE OBJECTIVES

1. To understand the use of Structured Query Language (SQL) and its syntax.
2. To understand and apply the principles of data modeling using Entity Relationship and develop a good database design.
3. To study the concepts and techniques relating query processing using SQL engines.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	Designing the basic concepts of Database.
	CO2	Implementing data Integrity constraints in Database.
	CO3	Validating the various fundamental tasks to perform data Modeling.
	CO4	Implementing functions, packages, stored procedures and user defined exception.
	CO5	Applying various types of database management systems for developing the program.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : Core Paper 7 - Artificial Intelligence and its Applications				
Batch 2025– 2028	**Hours / Week** 5	**Total Hours** 75	**Credits** 4	**Skill Development**

COURSE OBJECTIVES

1. To learn the basics of Artificial Intelligence.
2. To develop problem-solving skill, logical reasoning and handling uncertainty problems.
3. To understand the search algorithms for games and constraint satisfaction problems.
4. Explore the AI techniques for knowledge representation, planning and managing uncertainty.
5. To gain the introductory knowledge in robotics.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Understand the basic ideas and progress in AI.
	CO2	Describe the various problem-solving algorithms and search strategies to solve both toy and real-world problems
	CO3	Apply the adversarial search algorithms for games and constraint satisfaction problems
	CO4	Analyze the AI techniques for knowledge representation, reasoning, and planning techniques
	CO5	Assess the robotics principles and their real-world applications.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Core Practical 7 - Artificial Intelligence and Machine Learning Lab				
Batch 2025– 2028	**Hours / Week** 5	**Total Hours** 75	**Credits** 4	**Skill Development**

COURSE OBJECTIVES

1. To learn to generate utility application using java program in ai.
2. To apply appropriate algorithms for solving given ai problems.
3. To execute the basic search strategies in AI applications.
4. To develop the proficiency in text processing tasks using Python
5. Implement the machine learning algorithms to solve real world problems

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	Understand the utility applications like electricity billing systems using Java.
	CO2	Illustrate the problem-solving abilities by implementing backtracking and local search algorithms for complex problems.
	CO3	Apply the fundamental AI search strategies to find solutions in various applications, enhancing decision-making processes.
	CO4	Analyze the large text datasets efficiently using Python, enabling insights extraction and data manipulation.
	CO5	Execute the machine learning algorithms for practical applications like spam detection and fraud prevention.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : Core Paper 8 - Machine Learning				
Batch **2025 - 2028**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **4**	**Skill Development**

COURSE OBJECTIVES

1. To understand the basics of Machine Learning (ML)
2. To understand the methods of Machine Learning
3. To know about the implementation aspects of machine learning
4. To understand the concepts of Data Analytics and Machine Learning
5. To understand and implement use cases of ML

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Understand the basics, Linearity and Non-Linearity in Machine Learning.
	CO2	Understand various Machine Learning methods regression, classification, SVM and its applications
	CO3	Demonstrate how to create an ML Model and learn about ML studio to create ML Applications.
	CO4	Explore knowledge of predictive Data Analytics and know-how information-based learning and similarity-based learning help for predictive data analytics.
	CO5	Understand about various ML applications.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Core Practical 8 - Data Visualization Lab				
Batch **2025 - 2028**	**Hours/Week** **4**	**Total Hours** **60**	**Credits** **4**	**Skill Development /Employability**

COURSE OBJECTIVES

1. To understand the concepts of MS –EXCEL in advance.
2. To represent complex datasets in a structured and understandable manner.
3. To understand the concepts of Data Analytics.
4. To apply advanced data modeling techniques in Power BI for business intelligence solutions.
5. To gain hands-on experience in deploying and sharing Power BI solutions.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	Using advanced formulas to crunch data and analyses it to get simpler answers.
	CO2	Interpretation and Analysis of Data and Visual Reporting
	CO3	Understand how to analyze datasets and derive meaningful insights through visualizations, enhancing their analytical skills.
	CO4	Students will explore advanced DAX techniques, such as time intelligence functions, iterator functions, and context manipulation, to solve complex analytical problems.
	CO5	Explore how to publish dashboards to the Power BI service and share them with stakeholders, including configuring security settings and setting up scheduled data refresh.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Project and Viva Voce				
Batch **2025 - 2028**	**Hours/Week** **4**	**Total Hours** **60**	**Credits** **5**	**Employability**

COURSE OBJECTIVES

1. To acquire the knowledge about selecting the task based on their course skills.
2. To get the knowledge about analytical skill for solving the selected task.
3. To get confidence by implementing the task in a real time project.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	Applying programming skill for solving the project.
	CO2	Analyzing the task and to collect the necessary information and software development
	CO3	Evaluating and Testing the task based on the software.
	CO4	Implementing the software for getting the Report.
	CO5	Implementing and analyzing real time project

Programme Code:23	B.Sc. Computer Science with Data Analytics			
Title of the paper: Major Elective - Internet of Things				
Batch 2025 - 2028	**Hours / Week** 5	**Total Hours** 75	**Credits** 5	**Employability/ Skill Development**

COURSE OBJECTIVES

1. To Study Fundamental Concepts of IoT.
2. To Understand Roles of Sensors in IoT.
3. To Learn Different Protocols Used for IoT Design.
4. Understand the Role of IoT in Various Domains of Industry.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Identify the Various Concepts, Terminologies and Architecture of IoT Systems
	CO2	Understand the use of Sensors and Actuators for Design of IoT.
	CO3	Applying Various Protocols for Design of IoT Systems.
	CO4	Analyzing Various Techniques of Data Storage and Analytics in IoT.
	CO5	Evaluating the usage of IoT devices and its function in various Sectors.

Programme Code: 23	**B.Sc. Computer Science with Data Analytics**			
Title of the Paper : Major Elective - Software Testing and Quality Assurance				
Batch 2025 - 2028	**Hours / Week** 5	**Total Hours** 75	**Credits** 5	**Employability/ Skill Development**

COURSE OBJECTIVES

1. To understand the basics of testing, test planning &design and test team organization.
2. To study the various types of test in the life cycle of the software product.
3. To build design concepts for system testing and execution.
4. To learn the software quality assurance, metrics, defect prevention techniques.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Identify Software Testing Principles and fundamental concepts of software testing, including its purpose, objectives, and principles.
	CO2	Understand the Knowledge of Testing Techniques such as White-box testing, Black-box testing, UNIT testing, Integration testing, System testing, Regression testing, and Acceptance testing.
	CO3	Apply techniques of Integration Testing, its purpose, significance, and Principles of Integration testing in the Software Development Lifecycle.
	CO4	Analyze the uniqueness of Software Quality Assurance and distinctive aspects of software quality assurance compared to quality assurance in other domains, such as manufacturing.
	CO5	Evaluate Software quality metrics, Cost Metrics Responsibilities of Software Quality and Assurance.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : Major Elective - Cloud Computing Fundamentals				
Batch 2025 - 2028	**Hours / Week** 5	**Total Hours** 75	**Credits** 5	**Employability/ Skill Development**

COURSE OBJECTIVES

1. Understand the Concepts of Cloud Computing.
2. To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental, technologies, applications and implementations.
3. To motivate students to do programming and experiment with the various cloud computing environments.
4. To shed light on the Security issues in Cloud Computing.
5. To introduce about the Cloud Standards.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Find the knowledge about cloud computing and the establishment of cloud concepts
	CO2	Understand the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
	CO3	Identify the core issues of cloud computing such as security, privacy, and management of cloud.
	CO4	Analyze the appropriate cloud computing solutions and recommendations according to the applications used.
	CO5	Evaluate about the cloud providers and their Functionalities,

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Major Elective - Digital Forensics				
Batch 2025 - 2028	**Hours / Week** 5	**Total Hours** 75	**Credits** 5	**Employability/** **Skill Development**

COURSE OBJECTIVES

1. To introduce the principle and concepts of digital forensic
2. To detail about the various investigation procedures like data acquisition and evidence gathering
3. To understand the basics of digital forensics and the techniques for conducting the forensic examination on different digital devices.
4. To understand how to examine digital evidences such as the data acquisition, identification analysis.
5. To understand the various categories of tools and procedures used in the digital forensic process

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Understand the foundations of digital forensics, covering its principles, methodologies, various types including networks and guidelines for first responders.
	CO2	Apply the procedural steps of Cyber Crime investigation, preservation, examination, analysis, documentation, reporting, and maintaining chain of custody.
	CO3	Analyzing the data acquisition techniques, email investigations, password cracking, preservation from encrypted systems, and addressing challenges in cybercrime investigations.
	CO4	Analyze on diverse data acquisition methods, spanning live, shutdown, and remote systems, email analysis, and navigating challenges in cybercrime investigations.
	CO5	Apply on Windows and Linux forensics, covering system artifacts and recover important evidence on Cyber Crime.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the paper : Major Elective - Natural Language Processing				
Batch 2025 - 2028	**Hours/Week** 5	**Total Hours** 75	**Credits** 5	**Employability/ Skill Development/**

COURSE OBJECTIVES

1. To learn the fundamental concepts and techniques of natural language processing.
2. Give a deep understanding of N-grams, part of speech tagging, and NLP Libraries.
3. Develop the ability to use CFG and PCFG in NLP
4. Gain a deep understanding of the role of deep learning algorithms
5. To analyze language models, types, and problems

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Understand a given text with basic Language features, Language modeling, Regular expressions, Tokenization and applications.
	CO2	Understand and demonstrate about word level analysis, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging and NLP Libraries.
	CO3	Understand the concepts of Context-free grammars (CFG), parsing, probabilistic CFG.
	CO4	Understand and demonstrate a comprehensive understanding of deep learning algorithms, back propagation networks and autoencoders.
	CO5	Understand and possess a comprehensive understanding of the Discourse Processing and Language Modeling.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : Major Elective - Deep Learning				
Batch **2025 - 2028**	**Hours/Week** **5**	**Total Hours** **75**	**Credits** **5**	**Employability/ Skill Development/**

COURSE OBJECTIVES

1. Gain a deep understanding of the basic concepts and techniques of deep Learning and TensorFlow.
2. Learn convolutional neural networks, RNN and LSTM neural network with applications.
3. Get knowledge about Reinforcement learning and Q Learning.
4. Develop an ability to design and implement deep learning algorithms for AI, Boltzmann Machines and Autoencoders.
5. Learn about data science, deep learning and visualization of neural networks.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Understand the basic concepts and techniques of neural networks in Deep Learning.
	CO2	Understand and apply CNN, RNN and LSTM networks in applications.
	CO3	Understand and demonstrate a comprehensive understanding of reinforcement learning and Q Learning.
	CO4	Examine the foundations of neural networks, perceptron's, Hopfield Nets.
	CO5	Explore and create deep learning applications with data science tools, Data modeling, and futurization.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper: Major Elective - Data Warehousing and Data Mining				
Batch 2025 - 2028	**Hours/Week** 5	**Total Hours** 75	**Credits** 5	**Employability/ Skill Development**

COURSE OBJECTIVES

1. To learn the basic concepts of data mining algorithms, methods and tools.
2. To develop and apply critical thinking, problem- solving and decision-making skills.
3. To discover interesting patterns, analyze and estimate the accuracy of algorithms.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Familiarizing oneself with the principles and techniques of data mining.
	CO2	Comprehending the principles of processing raw data through the utilization of data mining algorithms.
	CO3	Acquiring proficiency in data mining algorithms for constructing analytical applications.
	CO4	Gaining information about the characteristics of Datamining and OLAP
	CO5	Knowing about the applications in warehousing.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : Major Elective - Cryptography and Information System				
Batch	**Hours / Week**	**Total Hours**	**Credits**	**Employability/ Skill Development**
2025-2028	5	75	5	

COURSE OBJECTIVES

1. To provide deeper understanding into cryptography, its application to network security, Threats/vulnerabilities to networks and countermeasures.
2. To explain various approaches to Encryption techniques, strengths of Traffic Confidentiality, Message Authentication Codes.
3. To familiarize Digital Signature Standard and provide solutions for their issues.
4. To familiarize with cryptographic techniques for secure (confidential) communication of two parties over an insecure (public) channel; verification of the authenticity of the source of a message

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 to K5	**CO1**	Identify Security Protocols and the security of information systems by assessing the effectiveness of cryptographic protocols in protecting data confidentiality, and integrity.
	CO2	Understand Block Cipher principles, standards of DES, and Advanced Encryption Standards (AES).
	CO3	Apply HASH and Mac Algorithm, key management and public key Cryptographic principles.
	CO4	Analyze Authentication Applications and Combining Security Associations and Key Management.
	CO5	Evaluate effective skills in web security, threat mitigation strategies against intruders and firewall design principles to ensure robust protection of web-based systems.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : Skill Based Subject 1 - Cyber Security				
Batch 2025 - 2028	**Hours / Week** 2	**Total Hours** 30	**Credits** 3	**Skill Development**

COURSE OBJECTIVES

1. The course introduces the basic concepts of Cyber Security
2. To develop an ability to understand about various modes of Cyber Crimes and Preventive measures
3. To understand about the Cyber Legal laws and Punishments

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 ↕ K5	CO1	To Understand the Concepts of Cybercrime and Cyber Frauds.
	CO2	To Know about Cyber Terrorism and its preventive measures.
	CO3	To Analyze about the Internet, Mobile Phone and E-commerce security issues.
	CO4	To Understand about E-mail and Social Media Issues.
	CO5	To Describe about various legal responses to Cybercrime.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : Skill Based Subject 2 - Web Design Lab				
Batch 2025 - 2028	**Hours/Week** 2	**Total Hours** 30	**Credits** 3	**Entrepreneurship**

COURSE OBJECTIVES

1. Students will learn to create well-structured, semantic HTML documents and style them effectively using CSS.
2. Students will gain proficiency in writing clean and efficient code, adhering to best practices in web development.
3. Students will be introduced to JavaScript programming concepts and learn how to use it to enhance the interactivity and functionality of web pages.
4. Students will gain proficiency in using industry-standard web design tools such as HTML, CSS, JavaScript, and PHP frameworks to develop responsive and visually appealing websites.
5. To develop an ability to design and implement static and dynamic website and to develop skills in analyzing the usability of a web site.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	Able to use the standard basic HTML tags.
	CO2	Able to use the images, Table and formatting tags to Design Web Pages
	CO3	Able to use the CSS selectors and specificity, including the different types of CSS Style sheet in Web Pages
	CO4	Able to use and Understand to Developing dynamic web pages using JavaScript.
	CO5	Able to use and Understand to analyze and build web applications using PHP and Integrate HTML forms to PHP scripts and SQL

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : Skill Based Subject 3- Basics of IPR				
Batch 2025 - 2028	**Hours/Week** 2	**Total Hours** 30	**Credits** 3	**Employability/ Skill Development**

COURSE OBJECTIVES

1. To create awareness about recent trends in IPR and Innovation.
2. To explore the basic concepts IPR.
3. To focus upon trademarks, copyrights, patents, industrial designs and traditional knowledge.
4. To learn more about managing IP rights and legal aspects.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	CO1	Know about basic concepts of IPR and patent.
	CO2	Understand copyrights, industrial designs and geographical indication of goods.
	CO3	Differentiate between trademarks and trade secrets.
	CO4	Acquire knowledge on protection of traditional knowledge and plant varieties.
	CO5	Manage and protect IP Rights.

Programme Code: 23	B.Sc. Computer Science with Data Analytics			
Title of the Paper : EDC - Internet Basics and Advanced Excel Lab				
Batch 2025 - 2028	**Hours/Week** 2	**Total Hours** 30	**Credits** 3	**Entrepreneurship**

COURSE OBJECTIVES

1. Introduce the fundamentals of Internet and the Web functions.
2. Impart knowledge and essential skills necessary to use the internet and its various components.
3. Find, evaluate, and use online information resources.
4. Use Google Apps for education effectively and to Create and develop various forms in Google.
5. To understand the concepts MS-Excel in advance.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K3 to K5	**CO1**	Understand features of Internet and email
	CO2	Understanding and remember various menus in office automation
	CO3	Implementing the concepts of Internet techniques
	CO4	Using advanced formulas to crunch data and analyses it to get simpler answers.
	CO5	Interpretation and Analysis of Data and Visual Reporting

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : PART IV – Environmental Studies			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2025 - 2028	2	30	2

COURSE OBJECTIVES

1. The course will provide students with an understanding and appreciation of the complex interactions of man, health and the environment. It will expose students to the multi-disciplinary nature of environmental health sciences
2. To inculcate knowledge and create awareness about ecological and environmental concepts, issues and solutions to environmental problems.
3. To shape students into good "Eco citizens" thereby catering to global environmental needs.
4. This course is designed to study about the types of pollutants including gases, chemicals petroleum, noise, light, global warming and radiation as well as pollutant flow and recycling and principles of environmental pollution such as air, water and soil.
5. The course will address environmental stress and pollution, their sources in natural and workplace environments, their modes of transport and transformation, their ecological and public health effects, and existing methods for environmental disease prevention and remediation.

COURSE OUTCOMES

On successful completion of the course, the students will be able to

K1 ↕ K5	**CO 1**	Understand how interactions between organisms and their environments drive the dynamics of individuals, populations, communities and ecosystems
	CO2	Develop an in depth knowledge on the interdisciplinary relationship of cultural, ethical and social aspects of global environmental issues
	CO3	Acquiring values and attitudes towards complex environmental socio-economic challenges and providing participatory role in solving current environmental problems and preventing the future ones
	CO4	To gain inherent knowledge on basic concepts of biodiversity in an ecological context and about the current threats of biodiversity
	CO5	To appraise the major concepts and terminology in the field of environmental pollutants, its interconnections and direct damage to the wildlife, in addition to human communities and ecosystems

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : Value Education - Moral And Ethics			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2025 - 2028	2	30	2

COURSE OBJECTIVES

1. To impart Value Education in every walk of life.
2. To help the students to reach excellence and reap success.
3. To impart the right attitude by practicing self-introspection.
4. To portray the life and messages of Great Leaders.
5. To insist the need for universal brotherhood, patience and tolerance.
6. To help the students to keep them fit.
7. To educate the importance of Yoga and Meditation.

COURSE OUTCOMES (CO)

On successful completion of the course, the students will be able to

K1 to K5	**CO1**	Will be able to recognize Moral values, Ethics, contribution of leaders, Yoga and its practice
	CO2	Will be able to differentiate and relate the day to day applications of Yoga and Ethics in real life situations
	CO3	Can emulate the principled life of great warriors and take it forward as a message to self and the society
	CO4	Will be able to Analyze the Practical outcome of practicing Moral values in real life situation
	CO5	Could Evaluate and Rank the outcome of the pragmatic approach to further develop the skills

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : PART IV - Non Major Elective 1 - Human Rights			
Batch 2025 - 2028	**Hours / Week** 2	**Total Hours** 30	**Credits** 2

COURSE OBJECTIVES

1. To prepare for responsible citizenship with awareness of the relationship between HumanRights, democracy and development.
2. To impart education on national and international regime on Human Rights.
3. To sensitive students to human suffering and promotion of human life with dignity.
4. To develop skills on human rights advocacy.
5. To appreciate the relationship between rights and duties.
6. To foster respect for tolerance and compassion for all living creature.

COURSE OUTCOMES

After Completion of the Course the student will be able to

K1 to K5	**CO1**	To understand the hidden truth of Human Rights by studying various provisions in the Constitution of India.
	CO2	To acquire overall knowledge regarding the Feminist perspectives in the Liberative Empowerment of Women.
	CO3	To gain knowledge about various gender roles and stereotypes involved in the comprehension of gender equality and women's rights.
	CO4	To comprehend the legal provisions and policies that foreground the safety of children in the society and to promote awareness.
	CO5	To gain enhanced knowledge about sexual and gender minorities to recognize, celebrate and acknowledge the diversified forms of gender expressions and rights.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : Part IV -Non- Major Elective – II Women's Rights			
Batch 2025 - 2028	**Hours / Week** 2	**Total Hours** 30	**Credits** 2

COURSE OBJECTIVES

- To know about the laws enacted to protect Women against violence.
- To impart awareness about the hurdles faced by Women.
- To develop a knowledge about the status of all forms of Women to access to justice.
- To create awareness about Women's rights.
- To know about laws and norms pertaining to protection of Women.
- To understand the articles which enables the Women's rights.
- To understand the Special Women Welfare laws.
- To realize how the violence against Women puts an undue burden on healthcare services.

COURSE OUTCOMES

After Completion of the Course the student will be able to

K1	CO1	Appraise the importance of Women's Studies and incorporate Women's Studies with other fields
↕	CO2	Analyze the realities of Women Empowerment, Portrayal of Women in Media, Development and Communication
	CO3	Interpret the laws pertaining to violence against Women and legal consequences
	CO4	Contribute to the study of the important elements in the Indian Constitution, Indian Laws for Protection of Women
K5	CO5	Spell out and implement Government Developmental schemes for women and create awareness on modernization and impact of technology on Women

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : Non- Major Elective 3 - Consumer Affairs			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2025 - 2028	2	30	2

COURSE OBJECTIVES

1. To familiarize the students with their rights and responsibilities as a consumer.
2. To understand the procedure of redress of consumer complaints.
3. To know more about decisions on Leading Cases by Consumer Protection Act.
4. To get more knowledge about Organizational set-up under the Consumer Protection Act.
5. To impart awareness about the Role of Industry Regulators in Consumer Protection.
6. To understand Contemporary Issues in Consumer Affairs.

COURSE OUTCOMES (CO)

After Completion of the Course the student will be able to

K1 ↕ K5	**CO1**	Able to know the rights and responsibility of consumers.
	CO2	Understand the importance and benefits of Consumer Protection Act.
	CO3	Apply the role of different agencies in establishing product and service standards.
	CO4	Analyze to handle the business firms' interface with consumers.
	CO5	Assess Quality and Standardization of consumer affairs

Programme Code:23		B.Sc. Computer Science with Data Analytics		
Course code: 25UDA5IT		Internship Training		
Batch 2025 - 2028	**Semester** V	**Hours / Week** -	**Total Hours** -	**Grade**

Course objective

1. To provide an opportunity to work in industry/institute under the mentorship of an industrial personnel.
2. To develop key skill sets that are industry relevant for future placements.
3. To have a flavor of corporate life in an industry sector.
4. To build strength, sprit of team work and self-confidence.
5. To prepare the students to comprehend industrial problem.