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) OF
DEPARTMENT OF COMPUTER SCIENCE
WITH DATA ANALYTICS

For the students admitted in

the Academic Year 2023 -2024

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : Core Paper 1 - Programming for Problem Solving using C			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To introduce the concepts of Procedure Oriented Programming and the various Programming constructs of C programming.
2. To provide exposure to problem solving through programming and to develop programming skills.
3. To impart adequate knowledge of programming languages and problem solving techniques.

Course Outcomes (CO)

K1 to K5	**CO1**	Describe about the about the fundamentals of computers, history and various types of software and hardware devices.
	CO2	Interpret the concepts of Variables, Constant, Operators and various types ofexpressions.
	CO3	Apply the concept of Decision making statements and looping constructs for solving basic programs.
	CO4	Developing programs using pointer, enumerated data types, function, Union and nested structures.
	CO5	Designing programs using pointers and file concepts.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : Core Practical 1: Programming for Problem Solving using C Laboratory			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2024	5/15	75	2

Course Objectives

1. To introduce C Programming concepts to develop the programmingknowledge.
2. To enhance their analyzing and problem solving skills and use the same for writing programs in C.
3. To guide the candidates to explore the fundamental building blocks in the programming language.

Course Outcomes (CO)

K3 to K5	**CO1**	Learning process helps in deep understanding the concepts of C language.
	CO2	Developing programs using control statements, Arrays and Strings.
	CO3	Apply the various basic programming constructs like structures, pointers and files
	CO4	Design programs using the concept of files in C and be able to simulate operations.
	CO5	Implementing the strings and files concepts.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : Core Paper 2: Object Oriented Programming in C ++			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To introduce the concepts of Object Oriented Programming Paradigm and the programming constructs of C++.
2. To develop an in-depth understanding of functional, logic, and object-oriented programming paradigms.
3. To program using more advanced OOP's features such as objects, operator overloading, dynamic memory allocation, inheritance and polymorphism, FileI/O.

Course Outcomes (CO)

K1 to K5	**CO1**	Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and object.
	CO2	Demonstrate the various basic programming constructs like decision-makingstatements. Looping statements and functions.
	CO3	Explain the object oriented concepts like operator overloading, inheritance & virtual base classes.
	CO4	Implementing the concepts of pointers, virtual functions and polymorphism.
	CO5	Evaluating the usage of concepts of various file stream classes, file types, usage of templates and exception handling mechanisms.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : Core Practical 2 : Object Oriented Programming in C ++ Laboratory			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2024	5/15	75	2

Course Objectives

1. To introduce the concepts of Object Oriented Programming Paradigm and the programming constructs of C++.
2. To develop the ability to write a program to solve specificproblems.
3. To practice the fundamental methodology to implement file and I/O streamconcepts.

Course Outcomes (CO)

K3 to K5	**CO1**	Designing programs using appropriate predefined functions and classes in C++.
	CO2	Developing applications using Friend functions, Inheritance and polymorphism.
	CO3	Illustrate the concept of virtual classes, inline functions and friend functions.
	CO4	Compare the various file stream classes, file types and exception handling mechanisms.
	CO5	Implementing stream I/O, Files and usage of the available classes to handle stream objects.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 3: Object Oriented Programming in Java			
Batch 2023-2024	**Hours/ week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To understand Object Oriented Programming concepts and basic characteristics of Java.
2. To know the principles of packages, inheritance and interfaces.
3. To define exceptions and use I/O streams.
4. To develop a java application with threads and generics classes.
5. To design and build simple Graphical User Interfaces.

Course Outcomes (CO)

K1 to K5	**CO1**	Develop Java programs using OOP principles
	CO2	Develop Java programs with the concepts inheritance and interfaces
	CO3	Build Java applications using exceptions and I/O streams
	CO4	Develop Java applications with threads and generics classes
	CO5	Develop interactive Java programs using swings

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Practical 3**:** Object Oriented Programming in Java Laboratory			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 2

Course Objectives

1. To introduce the concepts of Object Oriented Programming Paradigm and the programming constructs of JAVA.
2. To implement the Java language syntax and semantics.
3. To develop Java program using packages, inheritance and interface.
4. To implement concepts such as variables, conditional and iterative executionmethods.
5. To develop graphical User Interface usingAWT.
6. Demonstrate event-handlingmechanism.

Course Outcomes (CO)

K3 to K5	**CO1**	Applying the concepts of operators, control structures, inheritance, method overriding in Java.
	CO2	Implementing 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 4: Big Data Science and Data Analytics			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To optimize business decisions and create competitive advantage with Big Data analytics.
2. To explore the fundamental concepts of big data analytics.
3. To learn to analyze the big data using intelligenttechniques.
4. To understand the various search methods and visualization techniques.
5. To learn to use various techniques for mining datastream.
6. To understand the applications using Map Reduce Concepts.
7. To introduce programming tools PIG & HIVE in Hadoop echo system.

Course Outcomes (CO)

K1 to K5	**CO1**	Work with big data platform and explore the big data analytics techniques business applications.
	CO2	Design efficient algorithms for mining the data from large volumes.
	CO3	Analyze the HADOOP and Map Reduce technologies associated with big data analytics.
	CO4	Explore on Big Data applications Using Pig and Hive.
	CO5	Understand the fundamentals of various big data analytics technique

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 5: Data Warehousing and Data Mining			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

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)

K1 to K5	**CO1**	Knowing the data mining principles and techniques.
	CO2	Understanding the concepts of raw data processing using data mining algorithms.
	CO3	Learning data mining algorithms to build analytical applications.
	CO4	Gaining information to extract patterns and to solve problems.
	CO5	Knowing about the applications in warehousing.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper: Allied Paper 3: Text and Predictive Analytics			
Batch 2023-2024	**Hours / Week** 6/15	**Total Hours** 90	**Credits** 5

Course Objectives

1. To provide an overview of common text mining and social media data analytic activities.
2. To understand the complexities of processing text and network data from different data sources.
3. It introduces theoretical foundations, algorithms, methodologies, and Applications of streaming data and provides practical knowledge for handling and analyzing streaming data.
4. It introduces theoretical foundations, algorithms, methodologies for analyzing data in various domains such Retail, Finance, Risk and Healthcare.
5. To optimize business decisions and create competitive advantage with text and Predictive Data analytics.

Course Outcomes (CO)

K1 to K5	**CO1**	Work with data application platform Text and Predictive analytics techniques. Interpret the terminologies, metaphors and perspectives of social media analytics.
	CO2	Apply a wide range of classification, clustering, estimation and prediction algorithms on Textual data.
	CO3	Recognize challenges in dealing with data sets in domains such as finance, risk and healthcare.
	CO4	Identify real-world applications of machine learning in domains such as finance, risk and healthcare.
	CO5	Having an ability to design and conduct experiments, as well as to analyze and interpret data.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 6: Python Programming			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To acquire programming skills in core Python and to learn and understand Python programming basics and paradigm.
2. To learn core Python scripting elements such as variables and flow control structures.
3. To learn and understand python looping, control statements and string manipulations.
4. To learn how to use exception handling in Python applications for error handling.
5. To use Python data structures, lists, tuples,dictionaries.
6. To do input/output with files in Python.

Course Outcomes (CO)

K1 to K5	**CO1**	Develop algorithmic solutions to simple computational problems and Read, write, execute by hand simple Python programs
	CO2	Structure simple Python programs for solving problems
	CO3	Decompose a Python program into functions and Discover how to work with lists and sequence data
	CO4	Represent compound data using Python lists, tuples, dictionaries
	CO5	Read and write data from/to files in Python Programs.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Practical 4: Python Programming Laboratory			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 2

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)

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 : Core Paper 7: Relational Database Management System			
Batch 2023-2024	**Hours / Week** **5/15**	**Total Hours** **75**	**Credits** **5**

Course Objectives

1. To develop the knowledge in various Database concepts, queries, normalization and reports.
2. To study the basics of PL/SQL and apply with different concepts.
3. To learn procedural interfaces using SQL queries and to gain knowledge about databases.
4. To describe stored procedures and functions.
5. Use PL/SQL programming constructs and conditionally control code flow (loops, control structures, and explicit cursors.

Course Outcomes (CO)

K1 to K5	**CO1**	Understanding the concepts of Database and RDBMS and applying types of SQL commands.
	CO2	Understanding the concepts of Normalization and ER Models.
	CO3	Analyzing Queries, joins, triggers, synonym and views using PL/SQL statements.
	CO4	Applying various types of database management systems for developing the program.
	CO5	Analyzing types of Databases.

Programme Code : 23	B. Sc Computer Science with Data Analytics		
Title of the Paper : Core Practical 5: Relational Database Management Systems Laboratory			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 3

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)

K3 to K5	**CO1**	Designing the basic concepts ofDatabase.
	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: Allied Paper 4 - Web and Social Network Analytics			
Batch 2023-2024	**Hours / Week** 6/15	**Total Hours** 90	**Credits** 5

Course Objectives

1. To optimize business decisions and create competitive advantage with web and social Network Data analytics
2. To provide an overview of common text mining and social media data analyticactivities.
3. To learn to analyze the data using intelligent techniques.
4. To understand the various search methods and visualization techniques for web and social network analytics.
5. To learn to use various techniques for data Analytics stream.
6. To provide solutions to the emerging problems with social media such as behavior analytics and Recommendation systems.

Course Outcomes (CO)

K1 to K5	**CO1**	Familiarize the learners with the concept of social media analytics and understand its significance
	CO2	Familiarize the learners with the tools of social media analytics.
	CO3	Analyze technologies associated with big data with web and social networks analytics.
	CO4	Enable the learners to develop skills required for analyzing the effectiveness of social media for business purposes
	CO5	Apply state of the art web mining tools and libraries on realistic data sets as a basis for business decisions and applications.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 8: R Programming			
Batch 2023-2024	**Hours / Week** 6/15	**Total Hours** 90	**Credits** 4

Course Objectives

1. To expose the student to learn the fundamental concepts of R Programming
2. This course is to equip the students to visualize and analyses the data using R and to communicate statistical results in correct manner.

Course Outcomes (CO)

K1 to K5	**CO1**	Establish an efficient scientific computing environment
	CO2	Understand the basics in R programming in terms of constructs, control statements, string functions
	CO3	Create reports using R design and write efficient programs using R (and similar high-level languages) to perform routine and specialized data manipulation/management and analysis tasks
	CO4	Document analytical workflow using R, markdown languages, and version control
	CO5	Apply probability and statistics in real life problems and Draw scientific inference from data using R

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Practical 6: R Programming Laboratory			
Batch 2023-2024	**Hours / Week** 6/15	**Total Hours** 90	**Credits** 3

Course Objectives

1. Perform analytics using Rprogramming.
2. Manipulate data within R and to create simple graphs and charts used in introductory statistics.
3. Perform and interpret different distribution using R.
4. Use R Graphics and Tables to visualize results of various statistical operations on data.

Course Outcomes (CO)

K3 to K5	**CO1**	Understand the basics in R programming in terms of constructs, control statements, string functions
	CO2	To be able to understand the various data structures available in R programming language and apply them in solving computational problems.
	CO3	Understand the use of R for Big Data analytics.
	CO4	Extract data from files and other sources and perform various data manipulation tasks on them.
	CO5	Apply the R programming from a statistical perspective

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 9: Cryptography and Information Security			
Batch 2023-2024	**Hours / Week** 6/15	**Total Hours** 90	**Credits** 4

Course Objectives

1. To provide deeper understanding into cryptography, its application to network security, Threats/vulnerabilities to networks andcountermeasures.
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)

K1 to K5	**CO1**	Identify basic security attacks and services
	CO2	Use symmetric and asymmetric key algorithms for cryptography
	CO3	Design a security solution for a given application
	CO4	Understanding of Authentication functions the manner in which Message Authentication Codes and Hash Functions works.
	CO5	To examine the issues and structure of Authentication Service and Electronic Mail Security

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 10: Design and Analysis of Algorithms			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To understand and apply the algorithm analysistechniques.
2. To critically analyze the efficiency of alternative algorithmic solutions for the same problem.
3. To understand and implement different algorithm designtechniques.
4. To understand the limitations of Algorithmic power.

Course Outcomes (CO)

K1 to K5	**CO1**	Design algorithms for various computing problems.
	CO2	Analyze the time and space complexity of algorithms.
	CO3	Critically analyze the different algorithm design techniques for a given problem.
	CO4	Modify existing algorithms to improve efficiency
	CO5	Ability to implement techniques in solving real time problems

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 11: Artificial Intelligence and its Applications			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

Course Objectives

1. To learn the concepts of Artificial Intelligence.
2. Create awareness of informed search and exploration methods.
3. To demonstrate AI techniques for knowledge representation, planning and uncertainty Management.
4. Develop general-purpose problem solving agents, logical reasoning agents, and agents that reason under uncertainty.
5. Choose appropriate algorithms for solving given AI problems.

Course Outcomes (CO)

K1 to K5	**CO1**	Understanding the concept of AI
	CO2	Analyzing and evaluate informed search and exploration methods.
	CO3	Applying AI techniques for knowledge representation, planning and uncertainty Management.
	CO4	Analyzing and developing knowledge of decision making and learning methods for real time application
	CO5	Employ AI techniques to solve some of today's real world problems.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Practical 7: Artificial Intelligence and Machine Learning Laboratory			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2024	5/15	75	3

Course Objectives

1. To design and implement different techniques to develop simple autonomous agents that make effective decisions in fully informed, and observable, settings.
2. To apply appropriate algorithms for solving given AI problems.
3. To Design and implement logical reasoningagents
4. To understand the theoretical and practical aspects of probabilistic graphical models.
5. To get practical knowledge on implementing machine learning algorithms in real time problem for getting solutions.

Course Outcomes (CO)

K3 to K5	**CO1**	Implement simple PEAS descriptions for given AI tasks
	CO2	Ability to Implement simple reasoning systems using either backward or forward inference mechanisms
	CO3	Understand the implementation procedures for the machine learning algorithms.
	CO4	Design C/C++/Java/Python/R programs for various Learning algorithms.
	CO5	Identify and apply Machine Learning algorithms to solve real world problems.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 12: Machine Learning			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 4

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)

K1 to K5	**CO1**	Understand the basics of ML
	CO2	Understand various Machine Learning methods and its application
	CO3	Demonstrate various ML techniques using standard packages.
	CO4	Explore knowledge on Machine learning and Data Analytics
	CO5	Apply ML to various real time examples

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Core Paper 13: Database Design and Management			
Batch 2023-2024	**Hours / Week** 4/15	**Total Hours** 60	**Credits** 4

Course Objectives

1. To introduce database development life cycle and conceptual modeling.
2. To learn SQL for data definition, manipulation and querying a database.
3. To learn relational database design using conceptual mapping andnormalization
4. To learn transaction concepts and serializability of schedules.
5. To learn data model and querying in object-relational and No-SQL databases.

Course Outcomes (CO)

K1 to K5	**CO1**	Understand the database development life cycle and apply conceptual modeling
	CO2	Apply SQL and programming in SQL to create, manipulate and query the database
	CO3	Apply the conceptual-to-relational mapping and normalization to design relational database
	CO4	Determine the serializability of any non-serial schedule using concurrency techniques
	CO5	Apply the data model and querying in Object-relational and No-SQL databases

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Project & Viva voce			
Batch 2023-2024	**Hours / Week** 4/15	**Total Hours** 60	**Credits** 5

Course Objectives

1. To acquire the knowledge about selecting the task based on their courseskills.
2. To get the knowledge about analytical skill for solving the selectedtask.
3. To get confidence by implementing the task in a real time projects.

Course Outcomes (CO)

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 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 5

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)

K1 to K5	**CO1**	Understand The Various Concepts, Terminologies and Architecture of IoT Systems
	CO2	Use Sensors and Actuators for Design of IoT.
	CO3	Understand and Apply Various Protocols for Design Of IoT Systems
	CO4	Use Various Techniques of Data Storage And Analytics In IoT
	CO5	Understand Various Applications of IoT

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Major Elective: Software Testing and Quality Assurance			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 5

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)

K1 to K5	**CO1**	Perform functional and non-functional tests in the life cycle of the software product.
	CO2	Understand system testing and test execution process.
	CO3	Identify defect prevention techniques and software quality assurance metrics.
	CO4	To learn the techniques for quality assurance and applying for applications.
	CO5	Apply techniques of quality assurance for typical applications.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Major Elective: Cloud Computing Fundamentals			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 5

Course Objectives

1. To define Cloud Computing.
2. To provide an in-depth and comprehensive knowledge of the Cloud Computing fundamental issues, technologies, applications andimplementations.
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)

K1 to K5	**CO1**	Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing
	CO2	Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
	CO3	Explain the core issues of cloud computing such as security, privacy, and interoperability.
	CO4	Provide the appropriate cloud computing solutions and recommendations according to the applications used.
	CO5	Collaboratively research and write a research paper, and present the research online.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Major Elective: Digital Forensics			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 5

Course Objectives

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

Course Outcomes (CO)

K1 to K5	**CO1**	Analysing the digital evidences and arriving at conclusions
	CO2	Examine the Volatile and Non-volatile Digital Evidence
	CO3	Apply various techniques of digital forensics for the systematic crime investigation
	CO4	Apply the cyber-crime techniques to data acquisition and evidence collection
	CO5	Know how to apply forensic analysis tools to recover important evidence for identifying computer crime.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Major Elective: Natural Language Processing			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 5

Course Objectives

1. To learn the fundamentals of natural language processing.
2. To understand the use of CFG and PCFG in NLP.
3. To understand the role of semantics of sentences and pragmatics.
4. To apply the NLP techniques to IR applications.

Course Outcomes (CO)

K1 to K5	**CO1**	To tag a given text with basic Language features
	CO2	To design an innovative application using NLP components
	CO3	To implement a rule based system to tackle morphology/syntax of a language
	CO4	To design a tag set to be used for statistical processing for real-time applications
	CO5	To compare and contrast the use of different statistical approaches for different types of NLP applications.

Programme Code: 23	**B.Sc. Computer Science with Data Analytics**		
Title of the paper : Major Elective: Deep Learning			
Batch 2023-2024	**Hours / Week** 5/15	**Total Hours** 75	**Credits** 5

Course Objectives

1. To introduce students to the basic concepts and techniques of deepLearning.
2. To get the knowledge about deep learning skill for solving the selected task.
3. To learn the fundamentals of reinforcement learning.

Course Outcomes (CO)

K1 to K5	**CO1**	Understand the basic concepts and techniques of Deep Learning
	CO2	To understand and apply the Machine learning principles
	CO3	To study the deep learning architectures
	CO4	Examine the foundations of neural networks
	CO5	Explore and create deep learning applications with tensor flow

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the paper : Skill Based Subject 1: Cyber Security			
Batch 2023-2024	**Hours / Week** 2/15	**Total Hours** 30	**Credits** 3

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)

K1	**CO1**	To Understand the Concepts of Cybercrime and Cyber Frauds
K2	**CO2**	To Know about Cyber Terrorism and its preventive measures
K3	**CO3**	To Analyze about the Internet, Mobile Phone and E-commerce security issues
K4	**CO4**	To Understand about E-mail and Social Media Issues
K5	**CO5**	To Describe about various legal responses to Cybercrime

Programme Code: 23	Bachelor of Computer Science with Data Analytics		
Title of thePaper: Skill Based Subject 2: Web DesignLaboratory			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2024	2/15	30	3

Course Objectives

1. To design and develop websites using fundamental web languages, technologies, and tools.
2. To implement the concepts in visual design and content structuring.
3. To develop an ability to design and implement static and dynamic website.
4. To develop skills in analyzing the usability of a website.
5. To demonstrate the role of languages like HTML, CSS, JavaScript, PHP and protocols in the workings of the web and web applications.

Course Outcomes (CO)

K3 to K5	**CO1**	Understanding the use of HTML tags.
	CO2	Create web pages using HTML and Cascading Stylesheets and Develop dynamic web pages using JavaScript.
	CO3	Use cascading style sheets to design web pages
	CO4	Use JavaScript and HTML to create web pages with advanced interactivity
	CO5	Understand, analyze and build web applications using PHP and Integrate HTML forms to PHP scripts.

Programme Code: 23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : Skill Based Subject 3: Data Manipulation Using Advanced Excel Laboratory			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2024	2/15	30	3

Course Objectives

1. Provide high level of understanding and practical hands on experience using basic and advanced Excel capabilities, from standard usage, cell formatting, function, charts, and pivot tables and up to the basic usage of Macros.

Course Outcomes (CO)

K3 to K5	**CO1**	Microsoft Excel provides you with the ability to easily search and filter the required information
	CO2	Uses effective tips, techniques and formulas to the individuals that will effectively help them to make the best use of Excel in their organization.
	CO3	Acquiring in-depth knowledge of working with Microsoft Excel functions and formulas will enable us to use Excel efficiently in their daily work life
	CO4	Using advanced formulas to crunch data and analyse it to get simpler answers. Automating repetitive task
	CO5	Interpretation and Analysis of Data and Visual Reporting

Programme Code:23	B.Sc. Computer Science with Data Analytics		
Title of the Paper : EDC: Internet Basics and Advanced Excel Laboratory			
Batch	**Hours / Week**	**Total Hours**	**Credits**
2023-2024	2/15	30	3

Course Objectives

1. Introduce the fundamentals of Internet and the Webfunctions.
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)

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