### UG Department of Data Science

### BSc’s CO

### FIRST SEMESTER

### Course Title: CORE I – INTRODUCTION TO PYTHON PROGRAMMING

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| **CO1** | To explain the basic concepts of data science and its applications | K1, K2,K3,K4,K5 |
| **CO2** | To explain the Features of PythonTo demonstrate Control Statements and Looping Statements | K1, K2,K3,K4,K5 |
| **CO3** | To understand Python FunctionsTo create and illustrate Numpy LibrariesTo perform Data Manipulation using Pandas. | K1, K2, K3 &K4 |
| **CO4** | To understand the File Concepts Apply Exception Handling Techniques | K1, K2,K3,K4,K5 |
| **CO5** | To Create and manipulate DatabaseTo create Data Visualization using Mat plot lib | K1, K2,K3,K4,K5 |

### SECOND SEMESTER

Course Title: **CORE II-OBJECT ORIENTED PROGRAMMING USING JAVA**

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| **CO1** | Use the syntax and semantics of java programming language and basic concepts of OOP. | K1, K2,K3,K4,K 5 |
| **CO2** | Develop reusable programs using the concepts of inheritance, polymorphism, interfaces, and packages | K1, K2,K3,K4,K 5 |
| **CO3** | Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes. | K1, K2, K3&K4 |
| **CO4** | Design event driven GUI and web related applications which mimic the real word scenarios | K1, K2, K3&K4 |
| **CO5** | Build the internet-based dynamic applications using the concept of applets | K1, K2,K3,K4,K 5 |

### THIRD SEMESTER

Course Title: **CORE III - DATA STRUCTURES AND ALGORITHMS USING PYTHON**

**Course Outcomes: At the end of the Course, the Student will be able to:**

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| **CO1** | * To understand the asymptotic notations and analysis of time and space complexity
* To understand the concepts of Linked List, Stack and Queue.
 | K1,K2,K3,K4,K5 |
| **CO2** | * To understand the Concepts of Trees and Graphs
* Perform traversal operations on Trees and Graphs.
* To enable the applications of Trees and Graphs.
 | K1,K2,K3,K4,K5 |
| **CO3** | * To apply searching and sorting techniques.
 | K1,K2,K3&K4 |
| **CO4** | * To understand the concepts of Greedy Method
* To apply searching techniques.
 | K1,K2,K3&K4 |
| **CO5** | * To understand the concepts of Backtracking Method
* To enable the applications.
 | K1,K2,K3,K4,K5 |

Course Title: **CORE IV- R Programming**

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| **CO1** | Understand the fundamentals, standards of Functions and capabilities of R Language. | K1, K2,K3,K4,K 5 |
| **CO2** |  Learning the basic R-Language Constructs | K1, K2,K3,K4,K 5 |
| **CO3** | To demonstrate Simulation in R-Language, Math functions and files processing. | K1, K2, K3&K4 |
| **CO4** | To know the Principals of Graphics and R- Base Graphics | K1, K2, K3&K4 |
| **CO5** | To develop applications and Performing T-Testing | K1, K2,K3,K4,K 5 |

### FOURTH SEMESTER

Course Title: **CORE V ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS**

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| **CO1** | * Design user interfaces to improve human–AI interaction and real-time decision-making.
* Evaluate the advantages, disadvantages, challenges, andramifications of human–AI augmentation.
 | K1, K2, K3, K4, K5 |
| **CO2** | * Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
 | K1, K2, K3, K4, K5 |
| **CO3** | * Demonstrate awareness and a fundamental understanding of variousapplications of AI techniques in intelligent agents, expert systems, artificial neural networks, and other machine learning

models. | K1, K2, K3& K4 |
| **CO4** | * Extract information from text automatically using concepts and methods from natural language processing (NLP), including stemming, n-grams, POS tagging, and parsing
 | K1, K2, K3, K4, K5 |
| **CO5** | * Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness.
 | K1, K2, K3, K4, K5 |

Course Title: **CORE VI -RDBMS**

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| **CO1** | To demonstrate the characteristics of Database Management Systems. To study about the concepts and models of database.To impart the concepts of System Development Life cycle and E-R Model. | K1,K2,K3, K4,K5 |
| **CO2** | To classify the keys and the concepts of Relational Algebra. To impart the applications of various Normal FormsClassification of Dependency. | K1,K2,K3, K4,K5 |
| **CO3** | To elaborate the different types of Functions and Joins and their applications.Introduction of Views, Sequence, Index and Procedure. | K1,K2,K3&K4 |
| **CO4** | Representation of PL-SQL Structure.To impart the knowledge of Sub Programs, Functions and Procedures. | K1,K2,K3, K4,K5 |
| **CO5** | Representation of Exception and Pre-Defined Exception.To Point out the Importance of Triggers, Implicit and Explicit Cursors. | K1,K2,K3, K4,K5 |

### FIFTH SEMESTER

Course Title: **CORE VII–MACHINE LEARNING**

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| **CO1** | Appreciate the importance of visualization in the data analytics solution | K1,K2,K3, K4,K5 |
| **CO2** | Apply structured thinking to unstructured problems | K1,K2,K3, K4,K5 |
| **CO3** | Understandaverybroadcollectionofmachinelearningalgorithmsandp roblems | K1, K2, K3&K4 |
| **CO4** | Learn algorithmic topic soft machine learning and mathematically deep enough to introduce the required theory | K1,K2,K3, K4,K5 |
| **CO5** | Develop an appreciation for what is involved in learning from data. | K1,K2,K3, K4,K5 |

 Course Title: **CORE VIII –BIG DATA ANALYTICS**

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| **CO1** | Understand Big Data and its analytics in the real world | K1, K2,K3,K4,K 5 |
| **CO2** | Design of Algorithms to solve Data Intensive Problems using Map Reduce Paradigm | K1, K2,K3,K4,K 5 |
| **CO3** | Analyze the Big Data framework like Hadoop and NOSQLto efficiently store and process Big Data to generate analytics | K1, K2, K3&K4 |
| **CO4** | Design and Implementation of Big Data Analytics using pig and spark to solve data intensive problems and to generate analytics | K1, K2,K3,K4,K 5 |
| **CO5** | Implement Big Data Activities using Hive | K1, K2,K3,K4,K 5 |

### SIXTH SEMESTER

Course Title: **CORE IX –IOT AND CLOUD TECHNOLOGIES**

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| **CO1** | Design an IoT system with cloud infrastructure. | K1,K2,K3,K4,K5 |
| **CO2** | Implement the M2M Communication protocols in a prototype | K1,K2,K3, K4,K5 |
| **CO3** | Understand the basic concepts of the main sensors used in electro mechanical systems | K1, K2, K3&K4 |
| **CO4** | Understand/implement computer models of common engineering information types. | K1,K2,K3, K4,K5 |
| **CO5** | Understand storage mechanisms/analysis algorithms for data management in distributed& data intensive applications. | K1,K2,K3, K4,K5 |

Course Title: **CORE X –DEEP LEARNING**

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| **CO1** | Design user interfaces to improve human–AI interaction and real-time decision-making.Evaluate the advantages, disadvantages, challenges, and ramifications of human–AI augmentation. | K1,K2,K3, K4,K5 |
| **CO2** | Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. | K1,K2,K3, K4,K5 |
| **CO3** | Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, artificial neural networks, and other machine learning models. | K1, K2, K3&K4 |
| **CO4** | Extract information from text automatically using concepts and methods from natural language processing (NLP), including stemming, n-grams, POS tagging, and parsing | K1,K2,K3, K4,K5 |
| **CO5** | Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness.Determine the framework in which artificial intelligence and the Internet of things may function, including interactions with people, enterprise functions, and environments. | K1,K2,K3, K4,K5 |

**Course Title: ELECTIVE I – 1.MARKETING ANALYTICS**

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| **CO1** | Criticallyevaluatethekeyanalyticalframeworksandtoolsusedinma rketing.Apply key marketing theories, frameworks, and tools to solve Marketing problems. | K1, K2,K3,K4,K 5 |
| **CO2** | Utilize information of a firm's external and internal marketing environment to identify and prioritize appropriate marketingstrategies. | K1, K2,K3,K4,K 5 |
| **CO3** | Exercise critical judgement through engagement and reflection with existing marketing literature and new developments in the marketing environment | K1, K2, K3&K4 |
| **CO4** | Critically evaluate the marketing function and the role it plays in achieving organizational success both in commercial and non-commercial settings. | K1, K2, K3&K4 |
| **CO5** | Evaluate and act upon the ethical and environmental concerns linked to marketing activities. | K1, K2,K3,K4,K 5 |

**Course Title: ELECTIVE I–2.DATA COMMUNICATION AND COMPUTER NETWORKS**

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| **CO1** | Understand the basics of data communication, networking, internet, and their importance. | K1, K2,K3,K4,K 5 |
| **CO2** | Analyze the services and features of various protocol layers in data networks. | K1, K2,K3,K4,K 5 |
| **CO3** | Differentiate wired and wireless computer networks | K1, K2, K3&K4 |
| **CO4** | Analyze TCP/IP and their protocols. | K1, K2, K3&K4 |
| **CO5** | Recognize the different internet devices and their functions. | K1, K2,K3,K4,K 5 |

**Course Title: ELECTIVE II – 1. NATURAL LANGUAGE PROCESSING**

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| **CO1** | Describe the fundamental concepts and techniques of natural language processing.Explain the advantages and disadvantages of different NLP technologies and their applicability in different business situations. | K1,K2,K3, K4,K5 |
| **CO2** | Distinguish among the various techniques, considering the assumptions, strengths, and weaknesses of each.Use NLP technologies to explore and gain abroad understanding of text data. | K1,K2,K3, K4,K5 |
| **CO3** | Use appropriate descriptions, visualizations and statistics to communicate the problems and their solutions.Use NLP methods to analyze sentiment of a text document. | K1,K2,K3&K4 |
| **CO4** | Analyze large volume text data generated from a range of real- world applications.Use NLP methods to perform topic modelling. | K1,K2,K3, K4,K5 |
| **CO5** | Develop robotic process automation to manage business processes and to increase and monitor their efficiency and effectiveness.Determine the framework in which artificial intelligence and theInternetofthingsmayfunction,includinginteractionswithpeople,e nterprise functions, and environments. | K1,K2,K3, K4,K5 |

**Course Title: ELECTIVE II–2. FINANCIAL ANALYTICS**

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| **CO1** | Interpret and discuss the outputs of given financial models and create their own models. | K1, K2,K3,K4,K 5 |
| **CO2** | Design and create visualizations that clearly communicate financial data insights. | K1, K2,K3,K4,K 5 |
| **CO3** | Gain essential knowledge and hands-on experience in the data analysis process, including data scraping, manipulation, exploratory data analysis. | K1,K2,K3&K4 |
| **CO4** | Be prepared for more advanced applied financial modelling courses | K1,K2,K3&K4 |
| **CO5** | Improve leadership, teamwork and critical thinking skills for financial decision making. | K1, K2,K3,K4,K 5 |