



CMR UNIVERSITY

Private University Established in Karnataka State by Act No. 45 of 2013

School of Science and Computer Studies

**MASTER OF SCIENCE IT in Data Science
(MSc IT in DS)**

**Course Outcomes(COs)
Batch [2024-26]**



First Semester

8STAT5041: PROBABILITY AND STATISTICS

CO1: Represent data, apply/formulate the concepts and theories of measures of central tendency and Dispersion in the functional areas of business and research. (L3)

CO2: To forecast the data based on past data, to analyze the relationship and the degree of association between two variables.(L4)

CO3: Calculate probabilities by applying probability laws and theoretical results.(L3)

CO4: To understand the role of sampling techniques when large amounts of data are involved.(L2)

CO5: Explain the role of probability in hypothesis testing and describe issues related to interpreting statistical significance.(L3)

8CSDS5221: PRINCIPLES OF DATA SCIENCE

CO1: Apply the fundamental concepts of data science(L3)

CO2: Apply Data analysis techniques for applications handling large data(L4)

CO3: Understand various machine learning algorithms used in data science process(L2)

CO4: Visualize and present the inference using various tools (L3)

CO5: Create ethics surrounding privacy, data sharing and algorithmic decision making (L4)

8CSG5591: RELATIONAL DATABASE MANAGEMENT SYSTEM WITH PL/SQL

CO1: Design three levels of Database Architecture and Relational database management system.(L3)

CO2: Apply Integrity rules, Aggregation, generalization and Specification with Normalization (L3)

CO3: Design ER- Model and Transfer to physical database (L4)

CO4: Write simple SQL queries, create PL/SQL blocks, create procedures, functions, cursor, trigger (L2)

CO5: Design Transaction Management system with concurrency problems (L4)

CO6: Analyze Concurrency and recovery system of the database (L4)

8CSPL5461: PYTHON AND R PROGRAMMING

- CO1:** Write python programs for different problems (L2)
CO2: Analyze the real-life problems and solve using python programming (L4)
CO3: Apply data visualization for real time problems in python (L4)
CO4: Write R programs and for different real life problems (L4)
CO5: Create programs for appropriate problems using data visualization with R (L4)

8CSGC6741 : COMPUTER NETWORKS AND SECURITY

- CO1:** Explain principles of application layer protocols (L2)
CO2: Recognize transport layer services and infer UDP and TCP protocols (L2)
CO3: Classify routers, IP and Routing Algorithms in network layer (L3)
CO4: Understand the Wireless and Mobile Networks covering IEEE 802.11 Standard(L4)
CO5: Describe Multimedia Networking and Network Management(L4)

8CSGC5751 : DISTRIBUTED COMPUTING

- CO1:** To understand the evolution of distributed computing from its early beginnings as multi-processor and multi-computer systems.(L2)
CO2: To know the design goals of distributed computing systems.(L2)
CO3: To understand some commonly applied architectural styles toward organizing distributed computing systems.(L3)
CO4: To know basic principles of the RPC model and problems with achieving distribution transparency.(L4)
CO5: To discuss the use of publish-subscribe systems for coordination in distributed event matching. (L4)

8CSGC5281: ADVANCED ALGORITHMS

- CO1:** Analyze various algorithms using different techniques. (L4)
CO2: Apply various string-matching algorithms.(L3)
CO3: Understand various mathematical algorithms and Huffman's algorithms for data compression (L2)
CO4: Understand various graph algorithms and polynomials. (L2)
CO5: Apply Probabilistic and Randomized Algorithms. (L3)

8CSGC5231 : OBJECT-ORIENTED MODELING AND DESIGN**CO1:** Develop a Class model for the given application.(L 6)**CO2:** Produce State, Sequence, Use case, Activity, Component and Deployment models for real world applications.(L6)**CO3:** Describe stages in system development and the process involved in Domain and Application analysis.(L 2)**CO4:** Recognize various aspects to be considered during design and implementation phases of software development.(L 2)**CO5:** Choose and apply appropriate design pattern for the given problem.(L 3)**Communicative Skills in Digital Era – (PG-All Schools)****Course Code: GPSBD1111****Batch:2024**

CO1: Identify the differences in Listening and Hearing. (L1)

CO2: Express themselves in different professional settings. (L2)

CO3: Use the different methods of reading and share their reading experience (L3)

CO4: Draft letters, E-mails using appropriate tone and structure. (L3)

CO5: Express ideas clearly and concisely within paragraphs, avoiding unnecessary repetition or ambiguity. (L3)

GPSBD1171: Career Essentials

- CO1: Assess personal strengths, weaknesses, and interests to construct a viable career plan. (L5)
- CO2: Analyse the importance of social and emotional intelligence to facilitate successful relationships. (L4)
- CO3: Understand the implications of digital footprints on personal and professional life. (L2)
- CO4: Construct a professional resume and customise it for various job applications / internship applications. (L3)
- CO5: Build awareness on thoughtfulness, develop honesty, discipline and decisiveness. (L3)

Preparing for Aptitude Tests [PG-1/2]

- O1: Understand to use of calculation techniques for quick calculations and manipulation of numbers. [Level-1]
- O2: Understand the concepts of percentages, exponents, ratios, proportions, and averages for computing simple, compound interests and calculating class /set relationships. [Level-1]
- O3: Understand the theory of linear and quadratic equations using methods of equation formation. [Level-1]
- O3: Understand the concepts of averages, mixture, and alligations to calculate class /set relationships. [Level-1]
- O4: Understand how to solve problems of various arrangements (Circular and Linear). [Level-1]
- O4: Understand how to analyze the sufficiency of data and interpret its specific components by solving problems. [Level-1]
- O4: Understand the four types of logical statements to solve puzzles based on syllogisms and apply the concepts of Venn diagrams to solve puzzles using set theory. [Level-1]
- O5: Understand and improve their grasp of English grammar to understand problems relating to verbal ability. [Level-1]

SECOND SEMESTER

8CSDS5231: Big Data Analytics using Hadoop
CO1: Apply the Big Data concepts in real time scenario (L3) CO2: Understand the architecture of Hadoop with practical (L3) CO3: Apply map reduce concept to implement in cloud (L4) CO4: Develop Big Data Solutions using Hadoop ecosystem (L4)

8CSAI6131:ARTIFICIAL INTELLIGENCE AND LAB
CO1: Gain knowledge on task domains and problem spaces (L2,L3) CO2: Analyze problems and solve using searching techniques (L4, L6) CO3: Build problem solving agents and evaluate performance (L5,L6) CO4: Gain knowledge on various learning systems and apply best suited one to real world problems (L3,L4,L5) CO5: Gain knowledge on expert systems and design solutions for real life problems (L2,L6)

8CSAI6141: INTERNET OF THINGS AND LAB
CO1: Explain about IoT and its network architecture.(L2) CO2: Explain IoT things and various access technologies.(L2) CO3: Analyze and optimize the IP for IoT.(L4) CO4: Apply the data analytics tools for analyzing the IoT data. (L3) CO5: Explain and analyze the risk factors of IoT. (L4)

8CSGC6241: SOFTWARE PROJECT MANAGEMENT

CO1: Identify and plan project management activities and develop Statement of Work. (L3,L4)

CO2: Estimate software costs, schedule projects and evaluate project metrics (L 3,L 4,L 5)

CO3: Identify risks, manage software configurations, use software tools for project management(L3,L4)

CO4: Analyze the staff requirements of project, motivation, safety, professional and ethical concerns(L3,L4)
CO5: Analyze project performance, identify concerns, evaluate and control the projects(L 4,L 5)

8CSGC6432 : ADVANCED OPTIMIZATION TECHNIQUES

CO 1 Recall the theoretical foundations of various issues related to linear programming modeling to formulate real-world problems as a L P model Explain the theoretical workings of the graphical, simplex and analytical methods for making effective decisions on variables so as to optimize the objective function.

CO 2 Identify appropriate optimization methods to solve complex problems involved in various industries.

CO 3 Find the appropriate algorithm for allocation of resources to optimize the process of assignment. Explain the theoretical workings of sequencing techniques for effective scheduling of jobs on machines.

CO 4 Identifies appropriate equipment replacement techniques to be adopted to minimize maintenance cost by eliminating equipment break-down. Apply the knowledge of game theory concepts to articulate real-world competitive situations to identify strategic decisions to counter the consequences.

CO 5 Demonstrate the various selective inventory control models to analyze and optimize inventory systems. Explain the theoretical workings of dynamic programming methods to find the shortest path for a given network.

8CSDS6291: MultiVariate Data Analysis

- CO1** : Distinguish between dependence and interdependence techniques L2
- CO2**: Fit the various regression models and predict the results L3
- CO3**: Perform the dimension reduction techniques and interpret the results L4
- CO4**: Discriminate and classify the given objects by using target variable L4
- CO5**: Form the groups by using suitable clustering techniques L4

8CSDS5251: DEEP LEARNING

- CO1**: Understand the basic concepts of Deep Learning. (L2)
- CO2**: Know the basics of Neural networks, how to train them and challenges in training. (L2)
- CO3**: Understand various Deep learning architectures like CNN, RNN, Sequence model (L3)
- CO4**: Discuss the practical application of Deep Learning and where it fits in Industry (L4)
- CO5**: Analyze the real world problem and suggest solution to implement using Deep Learning (L4)

8CSGC6771 : DATA MINING

- CO1**: Differentiate different types of data to be mined. (L2)
- CO2**: Categorize the scenario for applying different data mining techniques. (L3)
- CO3**: Evaluate different models used for classification and Clustering.(L3)
- CO4**: Focus towards research and innovation.(L4)