M. O. P. VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)
Chennai – 600 034, India.

DEPARTMENT OF INFORMATION TECHNOLOGY

UNDERGRADUATE PROGRAMME

PROGRAMME OUTCOMES (POs)

PO1:   Apply mathematical foundations and computer science theory in

the modeling and design of software systems.

PO2:   Gain the knowledge of writing algorithms, designing, implementing and testing applications for various domains.

PO3:   Apply conceptual knowledge for complex computing problems and arrive at a solution based on user requirements.

PO4:   Provide analytical skills necessary for arriving at solutions to socio economic problems.

PO5:   Integrate the concepts of networks and security issues in the required fields.

PO6:   Inculcate emerging techniques pertinent to industrial requirements that uphold women student empowerment.

PO7:   Work in multi-disciplinary teams to develop interpersonal skills and project management techniques.

PO8:   Contribute novel ideas to build the nation through research publications.

PO9:   Imply ethical principles in building safe and secure systems being a responsible citizen.

PROGRAMME NAME: B.Sc. DATA SCIENCE

Under Graduate Programme in Science with specialisation in Data Science

PROGRAMME SPECIFIC OUTCOMES (PSOs)

On completion of B.Sc. Data Science programme students will be able to

PSO1	Build foundational understanding of key technologies and tools driving data science to develop machine learning models for businesses at global level.
PSO2	Formulate, solve and analyse complex problems using fundamental principles of Mathematics, Statistics, Machine Learning, Deep Learning and Artificial Intelligence to make strategic business decisions for real datasets.
PSO3	Inculcate research skills, develop novel ideas, and discover insights in diverse domains to develop data-driven solutions for sustainable development.
PSO 4	Apply quantitative modelling techniques and develop skills to present inferences using tools that are adaptable to evolving technologies, laying the foundation for lifelong learning.
PSO5	Integrate professional ethics and intellectual integrity in algorithm development to build secured computing systems, contributing to the effort to transform India into a digitally empowered society and knowledge economy.

COURSE OUTCOMES

On completion of the course students will be able to

COURSE COMPONENT	COURSE	COURSE OUTCOMES
CORE I	BASICS OF DATA SCIENCE (THEORY & PRACTICAL)	**CO1:** Analyse the fundamental concepts of data science, distinguish between various data science methods, algorithms and models used in business applications. **CO2:** Discuss and analyse the salient features of Python language and develop applications using different data types and looping constructs. **CO3:** Integrate functions, modules and packages to develop algorithms using built-in libraries and frameworks. **CO4:** Design and create eco-friendly applications using object-oriented programming concepts

		CO5: Combine Database, GUI and CGI concepts to design real time applications and recommend results using various visualisation techniques.
CORE II	DATABASE MANAGEMENT SYSTEMS (THEORY & PRACTICAL)	**CO1:** Analyse the various DBMS architectures, components and their functions. Evaluate the various data models and database representations for sustainable development. **CO2:** Design and build optimised queries using relational algebra operations and non-procedural query languages. **CO3:** Integrate basic commands, functions, procedures and packages to build and recommend databases and administer the data using joins, cursors and triggers. **CO4:** Formulate and construct databases using various normalisation techniques for real-time applications applying integrity and security policies. **CO5:** Classify and construct database system architectures, network types and organise, retrieve and select data effectively adhere to social and environmental concerns.
ALLIED I	PROBABILITY AND STATISTICS	**CO1:** Apply Bayes theorem to compute posterior probabilities and recognise its significance in machine learning and data science. **CO2:** Evaluate the mathematical expectation of random variables, and model any practical situation using the properties of distribution functions. **CO3:** Estimate the measures of location and dispersion for a real data set and use them as an effective tool for data interpretation. **CO4:** Select appropriate tools of hypothesis testing to analyse data in a global environment and derive strategic decisions to transform India into a digitally empowered country. **CO5:** Measure the degree of relationship between variables using correlation and employ regression analysis to predict the effect of environmental changes for sustainable development.
		CO1: Identify and distinguish the software life cycle models and build environment friendly applications using Object-Oriented principles.

CORE III	OBJECT ORIENTED PROGRAMMING WITH JAVA (THEORY & PRACTICAL)	**CO2:** Integrate Packages and process management concepts to develop sustainable software. **CO3:** Design web and mobile applications using Java utilities and Collection APIs. **CO4:** Compare and contrast various networking models and recommend secured communication model for web applications using Java libraries. **CO5:** Construct and Design GUI based Client/Server applications using AWT, database and Applets Classes.
CORE IV	DATA STRUCTURES AND ANALYSIS OF ALGORITHMS (THEORY & PRACTICAL)	**CO1:** Analyse the complexity of algorithms using asymptotic notation and recommend the ordered list suitable for real-time applications. **CO2:** Develop models and build applications to solve real-time societal problems using linear and nonlinear data structures for sustainable development. **CO3:** Evaluate the various sorting and searching techniques and apply in real-time analytics. **CO4:** Identify and distinguish various methods in greedy and dynamic programming approaches and recommend optimal solutions to a global problem. **CO5:** Evaluate and design various optimisation algorithms for complex problems using backtracking and branch and bound techniquesand recommend all possible feasible and optimal solutions.
ALLIED II	MATHEMATICS FOR DATA SCIENCE (THEORY & PRACTICAL)	**CO1:** Determine eigen values, eigen vectors for matrices, test linear independency/dependency of vectors and recognise their relevance in data science. **CO2:** Analyse the basic notion of vector spaces and linear transformation and employ them in diversified fields. **CO3:** Evaluate integrals using the methods of integration, compute n^{th} derivatives, obtain maxima/minima off(x, y) and implement techniques of calculus in designing machine learning algorithms **CO4:** Estimate the roots of algebraic equations using appropriate numerical methods and integrate domain-specific knowledge with numerical analysis

		CO5: Select suitable techniques of interpolation for analysing data and apply them in data-driven decision-making and forecasting
CORE V	OPERATING SYSTEMS AND SHELL PROGRAMMING (THEORY & PRACTICAL)	**CO1:** Examine the OS Structure and evaluate the performance of various process scheduling algorithms **CO2:** Analyze process synchronization problems and propose solutions **CO3:** Design optimized algorithms for Memory Management **CO4:** Integrate File and I/O System concepts to build Next Gen Secure Operating System **CO5:** Create Shell scripts to execute basic file operations and automate system level tasks
ALLIED III	OPTIMIZATION TECHNIQUES	**CO1:** Understand the concept of optimization and formulate linear programming model for real world problems. **CO2:** Propose solutions for transshipment problems **CO3:** Evaluate the various techniques for scheduling the jobs and deploy in domain specific applications. **CO4:** Propose the best strategy using decision making methods and solve game theory problems **CO5:** Plan, Schedule and Control real time project activities using PERT and CPM techniques
ELECTIVE I	MARKETING ANALYTICS (THEORY & PRACTICAL)	**CO1:** Categorize, apply and propose feasible solutions using various analytics techniques for any real time business applications **CO2:** Explore customer experience and propose algorithms for customer analytics **CO3:** Identify the difference between traditional and digital marketing for creating a successful business strategy **CO4:** Analyze the case study on social media profiles and recommend solutions **CO5:** Develop analytical skills to perform web analytics at global level

CORE VI	ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS (THEORY & PRACTICAL)	**CO1:** Analyze and evaluate the performance of various AI based search techniques **CO2:** Integrate knowledge representation and implement solutions for uncertainty problems **CO3:** Propose representational techniques for real time statistical reasoning problems **CO4:** Examine game planning and NLP to develop AI based domain specific analytics **CO5:** Recommend solutions for complex problems using Expert systems and Fuzzy systems
ALLIED IV	TIME SERIES ANALYSIS AND FORECASTING (THEORY & PRACTICAL)	**CO1:** Evaluate the different time series components and its measurement methods **CO2:** Propose the time series measurement methods for real datasets **CO3:** Recommend new time series model for live dataset using trend and seasonal methods **CO4:** Propose trend estimation and elimination models for datasets using autocorrelation functions **CO5:** Examine ARMA model and make it suitable for real time forecasting problems
CORE VI	MACHINE LEARNING (THEORY & PRACTICAL)	**CO1:** Explore the recent trends in machine learning concepts and recommend the efficient algorithms for problems **CO2:** Develop neural network-based solutions for effective decision making **CO3:** Design algorithms for real world applications applying Bayesian classifiers **CO4:** Propose models for specific domain applying instant based learning techniques. **CO5:** Evaluate existing algorithms and formulate new models with advanced reinforcement learning concepts
CORE VIII	BIG DATA ANALYTICS (THEORY & PRACTICAL)	**CO1:** Examine the Big Data taxonomy and design Java programs for accessing HDFS **CO2:** Develop a map reduce framework for processing data from various sources **CO3:** Implement data processing in Pig and Hive and recommend applications for real time scenarios **CO4:** Design queries for handling unstructured data using MongoDB **CO5:** Evaluate CQLSH and suggest commands for querying system tables

CORE IX	DATA COMMUNICATION AND NETWORK SECURITY	**CO1:** Analyze the different networking protocols and recommend best protocol model for the real time applications **CO2:** Analyse the various error correction and detection codes and evaluate the performance of Data link layer **CO3:** Integrate the functionalities of network and transport layers and build new protocols. **CO4:** Build novel algorithms for implementation of application layer protocols and wireless network communication **CO5:** Build secure systems by applying cryptography/ security policies
CORE X	DATA MINING AND MULTIDIMENSIONAL MODELING (THEORY & PRACTICAL)	**CO1:** Understand the various data preprocessing stages of Data Mining and generate useful insights **CO2:** Design novel classification models for real applications and interpret the results visually **CO3:** Formulate association mining rules to mine real time data **CO4:** Understand the concepts of cluster analysis and recommend the clustering algorithms suitable for real datasets. **CO5:** Develop models for multidimensional data viewing, processing and querying.
ELECTIVE III	ANALYTICS FOR SERVICE INDUSTRY	**CO1:** Understand the basics of Healthcare analytics and examine the EHR to generate useful patterns from medical images. **CO2:** Perform analytics on clinical data and medical images to recommend decisions using computer assisted decision systems **CO3:** Combine the results obtained with visualization models to support HR decisions with real time data **CO4:** Design novel employee performance and promotion patterns by applying performance analytics policies **CO5:** Integrate loyalty analytics, dynamic pricing and customer satisfaction for giving business decisions in tourism industry
	IOT AND CLOUD	**CO1:** Analyze IoT and M2M and to develop IoT systems with NETCONF-YANG **CO2:** Develop IoT based applications with Raspberry Pi

CORE XI	TECHNOLOGIES (THEORY & PRACTICAL)	**CO3:** Understand the functionalities of cloud computing and evaluate its services with respect to various cloud providers **CO4:** Examine data security in cloud services and propose secure mechanism for effective cloud usage **CO5:** Design domain specific IoTs
CORE XII	NATURAL LANGUAGE PROCESSING	**CO1:** Explore the fundamentals of natural language processing and evaluate the syntax and semantics for needed to design any application **CO2:** Propose word level syntax for any real application **CO3:** Select and apply various semantic analysis and discourse processing for new datasets **CO4:** Generate machine translation approaches for any Indian languages **CO5:** Design models and evaluate the various information retrieval methods for lexical resources
CORE XIII	DEEP LEARNING (THEORY & PRACTICAL)	**CO1:** Evaluate the various Deep Learning Hyperparameters for real datasets **CO2:** Analyze various sampling methods and design new convolutional & pooling layers for real datasets **CO3:** Build model using convolutional neural networks for real datasets **CO4:** Integrate RNN and LSTM for building Deep Learning Model **CO5:** Design models for different applications using open source tools like tensorflow, pytorch, keras etc
CORE XIV	FINANCIAL ANALYTICS (THEORY & PRACTICAL)	**CO1:** Understand the basics of financial statements and develop applications on real time data **CO2:** Identify the different sources of finance and manage the risks in real time applications **CO3:** Make financial analysis as applied to modeling trend and forecast sales for real time data **CO4:** Test data using visualisation tools in tableau and predict results **CO5:** Develop models and create dashboards for finance statements of real datasets