



Villa Marie Degree College for Women
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 Affiliated to Osmania University, Management Program Approved by AICTE
 Recognised by UGC u/s 2(f), an ISO 9001:2015 Certified Institution
 Accredited by NAAC with B++ Grade

DEPARTMENT OF SCIENCES

**B.Sc (MATHEMATICS, STATISTICS, DATA SCIENCE)
 ACADEMIC YEAR 2025 – 2026**

COURSE OBJECTIVES AND COURSE OUTCOMES - SEMESTER I, II, III, IV

S. No	Course Title	Course Code	Course Objective	Course Outcome
1	Differential Equations	DSC 1	<ul style="list-style-type: none"> ● Introduce the fundamental concepts and methods of solving first-order and higher-order differential equations. ● To provide an understanding of the role of integrating factors. ● To introduce higher-order linear differential equations, their solutions using operator methods. ● To introduce variation of parameters. 	<ul style="list-style-type: none"> ● Solve first order and first-degree differential equations using separable, homogeneous, linear, exact, and reducible forms. ● Apply the concepts of integrating factors and transformations to simplify and solve differential equations. ● Solve higher-order linear differential equations with constant coefficients, both homogeneous and non-homogeneous, using operator methods. ● Solve the method of undetermined coefficients.
2	Descriptive Statistics and Probability	BS-101-T	<ul style="list-style-type: none"> ● To familiarize with Basic Descriptive Statistics. ● To acquaint the computational foundation of Probability theory. ● To understand the procedures of Random Variables and its problems. ● Well trained in concepts of Mathematical Expectations and Generating Functions. 	<ul style="list-style-type: none"> ● Prepare and Analyze the Statistical reports using the descriptives. ● Apply the computational concepts of Probability theory. ● Acquire the Knowledge of Random Variables. ● Evaluate Generating Functions on different Methods.
3	Problem Solving and	BSDS-101T	<ul style="list-style-type: none"> ● To know the basics of Programming for solving a problem with writing an 	Students will be able to

	Python Programming		<p>algorithm and flow charts, python programs with control structures.</p> <ul style="list-style-type: none"> To structure a Python Program as a set of functions To use Python data structures- lists, tuples, dictionaries. To input/output with files in Python, construct Python programs with classes and a set of objects. 	<ul style="list-style-type: none"> Practise computational thinking and develop algorithmic solutions, develop and execute simple Python programs. Structure a Python program into functions. Represent compound data using Python lists, tuples, dictionaries. Create classes and methods to solve problems
4	Real Analysis	DSC 2	<ul style="list-style-type: none"> To introduce students to the concepts of sequences and series To familiarize students with the concept of continuity and its properties and their limits. To teach students the basic properties of derivatives and important theorems in differentiation. To introduce students to the Riemann Integral and its properties. 	<ul style="list-style-type: none"> Apply limit theorems to evaluate limits of sequences and determine convergence of series. To identify and analyze continuous functions and understand the concept of uniform continuity. Compute derivatives using the basic rules of differentiation and apply the Mean Value Theorem to solve problems. evaluate definite integrals using the Fundamental Theorem of Calculus and apply integration techniques in solving problems.
5	Probability Distributions	BS-202-T	<ul style="list-style-type: none"> To Provide Knowledge about divisions of Probability Distributions. Acquaint with the Procedures of Geometric and Negative Binomial distributions. Familiarize with the concept and Procedures of Normal Distribution. Understand the procedures of Probability distributions. 	<ul style="list-style-type: none"> Differentiate Discrete and Continuous Distributions. Acquire the knowledge of Geometric and Negative Binomial Distribution. Resolve applications of Normal Distribution. Acquire the knowledge of Beta and Gamma Distribution.
6	Data Structures & Algorithms	BSDS-202-T	<ul style="list-style-type: none"> Grasp the fundamental concepts of data structures and algorithms Learn to use Recursion in Data Structures Develop an understanding of Trees and Graphs, along with the algorithms developed through them 	<p>Students will be able to</p> <ul style="list-style-type: none"> Analyze the time and space complexities of algorithms, implement stacks Deploy and build Queues and Linked Lists

			<ul style="list-style-type: none"> Gain knowledge on searching and sorting algorithms, with heaps. 	<ul style="list-style-type: none"> Apply Non-Linear Data Structures (Trees and Graphs) in common problems encountered in Data Science Utilize sorting and searching techniques in the data structures learnt above.
7	Differential & Vector Calculus	DSC 3	<ul style="list-style-type: none"> To introduce the concepts of functions of several variables, limits, continuity, and partial differentiation. To develop problem solving skills in handling composite functions, implicit differentiation, and optimization with constraints. To provide a foundation in evaluating line, surface, and volume integrals and their applications. To familiarize students with vector calculus concepts such as gradient, divergence, curl, and fundamental integral theorems. 	<ul style="list-style-type: none"> Understand and compute partial derivatives, limits, continuity, and homogeneous functions of several variables. Apply Taylor's theorem, Lagrange multipliers, and related techniques to solve optimization problems. Evaluate line, surface, and volume integrals in Cartesian and polar coordinates. Apply vector calculus operators and integral theorems to solve mathematical and physical problems.
8	Statistical Inference	BS-303-T	<ul style="list-style-type: none"> To examine the estimator satisfying the criteria of good estimation for standard distributions. To evaluate and estimate the parameter (if exists) for the any standard probability distribution(s) using different estimation methods Framing statistical hypothesis and knowing the statistical test procedure To Identify the suitable large / small sample parametric / non parametric tests among the basic statistical tests. 	<ul style="list-style-type: none"> Gain and understand the criteria of good estimation. Obtaining estimates of the parameter using different estimation methods. Acquire knowledge of Hypothesis Testing. Apply the Parametric and Non-Parametric tests on the datasets.
9	Data Engineering with Python	BSDS - 303-T	<ul style="list-style-type: none"> Handle various file formats (Text, Binary, JSON, XML). Process HTML, natural language text, and use regular expressions. Work with MySQL, MongoDB, and perform numeric operations 	<ul style="list-style-type: none"> Handle various file types and text data Work with relational databases using SQL Utilize data series and data frames (Pandas)

			<ul style="list-style-type: none"> using NumPy. Manipulate data using Pandas and visualize data with PyPlot. 	<ul style="list-style-type: none"> Create visualizations using PyPlot
10	Algebra	DSC 4	<ul style="list-style-type: none"> The course is aimed at exposing the students to learn some basic algebraic structures like groups, rings etc. Acquaint Cayley's theorem along with the properties of isomorphism. Familiarize with cosets and Lagrange's theorem of Group. Knowledge on the properties of cyclic groups and permutations. 	<ul style="list-style-type: none"> Understand algebraic structures that arise in matrix algebra, linear algebra and will be able to apply the skills learnt in understanding various such subjects. Use properties of Isomorphism. Comprehend the concept of permutation groups and their properties. Analyze cyclic groups with their properties.
11	Analysis of Correlation, Regression and Basic Experimental Designs	BS-404-T	<ul style="list-style-type: none"> Identifying the suitable measure of association / correlation for the given data set. Identifying and carry out the complete analysis for the simple & multiple linear regression for the given data set. Identifying the suitable complete block experimental design for the given data. Able to understand and conducting experiment for the given task i.e. designing an experiment and carrying out its analysis. 	<ul style="list-style-type: none"> Identify and compute the suitable measure of association / correlation for the given data set Identify the suitable model and carry out the complete analysis for the simple & multiple linear regression for the given data set. Identify the suitable complete block experimental design and carrying out its analysis for the given data. Design an experiment for the given task and carrying out its analysis.
12	Programming in Java	BSDS - 404 - T	<ul style="list-style-type: none"> To equip with basic OOPs concepts To familiarize with package, multithreading concepts To acquaint with Applets using AWT To make students understand creation applications using Applet. 	<ul style="list-style-type: none"> Write programs using OOP, inheritance concepts Evaluate packages, multithreading Appreciate AWT concepts Write programs using Applets and AWT.