	Programme :	B.Sc- Computer Science, Mathematics,Statistics (CMS)		
	COMPUTER SCIENCE			
	PO Code	Programme Outcomes		
	PO1	Gain theoretical and practical knowledge in the core areas of Computer Science including open source software, application packages and other resources, apply them effectively to design and develop solutions to diverse problems.		
	PO2	Inculcate life-long learning, work in teams effectively, equip with moral values and professional ethics to take-up responsibilities and reach out to the societal needs.		

Semester	CourseCode	CourseName	CO Code	Course Outcomes
I	COM1CFPC	Computer Fundamentals and Problem Solving	CO1	Understand the fundamentals of Computers and apply the principles of number system, binary codes, Boolean algebra to minimize logic expressions
			CO2	Understand the working of Flip-Flops , Decoders, Encoders, Multiplexers, Adders, Registers and Counters
			CO3	Analyze the problem and design efficient algorithms using problem solving techniques
			CO4	Analyze control structures and functions to solve the given problem
			CO5	Understand and implement different Operations on arrays, pointers, structures and unions

			CO6	Work collaboratively with peers and instructors to acquire mathematical understanding and to formulate and solve problems and present solutions (Collaborative Skills).
II	COM2DSC	Data Structures	CO1	Understand fundamental concepts of data structures, space and time complexity
			CO2	Design algorithms for various operations (creation, insertion, deletion and traversal) on linear data structures
			CO3	Design algorithms for various operations (creation, insertion, deletion and traversal) on non-linear data structures
			CO4	Explain the applications of data structures
			CO5	Implement various searching and sorting techniques
			CO6	Implement the data structures using a programming language
III	COM3OSUPA	Operating Systems and Unix Programming	CO1	Understand the structure and functionalities of an Operating System and use system calls to perform process operations in UNIX.
			CO2	Understand CPU Scheduling algorithms.
			CO3	Describe different memory management techniques.
			CO4	Describe different disk space allocation methods and free space management techniques.
			CO5	Learn basic UNIX commands and apply to manage file processing operations, filters and system administration.
			CO6	Write and execute shell scripts to perform different tasks.
IV	COM4SDA	Software Engineering and Database Masnagement Systems	CO1	Understand software characteristics and process models
			CO2	Explore different phases of Software Development Life Cycle
			CO3	Understand and apply software testing methods on simple applications
			CO4	Understand DBMS architecture and data models
			CO5	Gain knowledge of relational data base concepts and build normalized databases
			CO6	Design DML, DCL,TCL queries to extract information from the databases
V	COM5OOPCA	Object Oriented Programming Concepts using Java	CO1	Understand object oriented principles and analyze language fundamentals
			CO2	Apply the principles of Object oriented programming and write simple java programs, debug and execute them
			CO3	Handle exceptions efficiently and apply threading techniques to improve program efficiency

			CO4	Understand the hierarchy of I/O streams and write programs to handle file operations
			CO5	Design dynamic and interactive applets and implement event handling mechanism
			CO6	Design and develop applications with Graphical User Interface
	COM5WPA	Web Programming	CO1	Design and develop web pages using HTML, Javascript, DHTML and XML
			CO2	Understanding the .net architecture and apply Object Oriented programming concepts to model real world objects
			CO3	Understand C# concepts
			CO4	Getting introduced to ASP.net techniques and controls
			CO5	Gain knowledge of state management and data binding
VI	COM6CGA	Computer Graphics	CO1	Familiarize with graphics display devices and its applications
			CO2	Understand OpenGL application programming interface to build graphics applications
			CO3	Learn basic graphics algorithms to build simple objects and apply geometric transformations on 2D & 3D objects
			CO4	Understand clipping algorithms and apply it for line, point and text clipping
			CO5	Comprehend graphics visualization techniques in 3D scenes
			CO6	Learn various graphics interactive programming techniques to create animations
	COM6ECNC	Computer Networks	CO1	Understand the evolution of computer networks through OSI model and protocols
			CO2	Know the physical layer and procedures involved in data transmission, signal encoding, multiplexing and switching mechanisms
			CO3	Familiarize the role of Media Access Control(MAC) Sub layer, IEEE standards for LANs and Error Detection and Correction of codes through the Data Link Layer
			CO4	Understand the importance of Routing Algorithms, Congestion Control and elements of Internet transfer protocols in the transport layer
			CO5	Understand the purpose of DNS, Cryptography and Firewalls to demonstrate security and authentication
	MATHEMATICS			

	PO Code	Programme Outcomes		
	PO1	Enables the students to take up advanced studies in the core subjects and enable them to find opportunities in careers in Science and Technology and Management where a high level of competence and dependence on many of the science subjects is demanded.		
	PO 2	Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.		
	PO 3	Formulate and develop mathematical arguments in a logical manner.		
	PO 4	Acquire good knowledge and understanding in advanced areas of		

		mathematics and statistics, chosen by the student from the given courses.		
	PO 5	Understand, formulate and use quantitative models arising in physical sciences, business and other contexts.		
Semester	**CourseCode**	**CourseName**	**CO Code**	**Course Outcomes**
I	MAT1MAIB	Mathematical Analysis-I	CO1	Define and recognize the basic properties of the field of real numbers. Define and recognize the basic properties of the field of real numbers
			CO2	Have the knowledge of the series of real numbers and convergence..
			CO3	Shown the ability of working independently and with groups.
			CO4	. Studying Leibnitz theorem – Roll's theorem, Langrange's Mean Value theorem, Taylor's theorem Maclarurin's expansion Theorem and Cauchy criteria.
			CO5	Skill of solving integral calculus like reduction formulae.
			CO6	Application of Integral Calculus by solving the problem of standard curves
II	MAT2MAIIA	Mathematical Analysis-II	CO1	. Define and recognize the differentiability of real functions and its related theorems
			CO2	Have the knowledge of real functions-limits of functions and their properties. Interpret how to Know the differentiability and related theorems.
			CO3	Define and recognize the basic topological properties of R Define and recognize the continuity of real functions
			CO4	Interpret how to Know the continuity using the internet.
			CO5	Studying the differentiability of real functions and related theorems .
			CO6	Skill of solving problems on Fourier series.

III	MAT3DE	Differential Equations	CO1	Apply the concepts of Ordinary Differential Equations and Partial Differential Equations for their resolution and developed the knowledge to solve problems in higher order ordinary linear differential equations, Methods of finding Complementary function and Particular integral.
			CO2	Understand the difficulty of solving problems analytically and capable to formulate and solve problems in concepts like simultaneous differential equations, Legendre's linear differential equation and Cauchy's linear differential equation
			CO3	Recognize and work with problems in Second Order Ordinary Differential Equations with variable coefficient with various methods and developed skills to understand concepts like Special functions.
			CO4	Able to work and apply concepts in Second order linear partial differential equations, canonical form for parabolic, elliptic and hyperbolic equations.
			CO5	Use computational tools to formulate and solve problems of one-dimensional heat and wave equation and two-dimensional Laplace equation using Fourier series
			CO6	Analyze real world problems and recognize when partial differential equations are appropriate, formulate problems about them, creatively model these (using technology, if appropriate) to solve the problems using multiple approaches, judge if the results are reasonable, and then interpret and clearly communicate the results.
IV	MAT4AGR	Algebra - Groups and Rings	CO1	Assess properties implied by the definitions of groups and rings.
			CO2	Use various canonical types of groups (including cyclic groups) and canonical types of rings (including Quotient rings).
			CO3	Analyze and demonstrate examples and theorems of subgroups, normal subgroups and quotient groups.
			CO4	Analyze and demonstrate examples of Subring, Integral domains, Ideals, Maximal Ideals and quotient rings.
			CO5	Use the concepts of isomorphism and homomorphism for groups and rings.
			CO6	Produce rigorous proofs of propositions arising in Fundamental theorem of homomorphism in groups and rings.
			CO7	Apply problem-solving using advanced algebraic techniques applied to diverse situations in

				physics, engineering and other mathematical contexts.
V	MAT5CAD	Complex Analysis	CO1	The student realizes the imporatnace of fundamental concepts of complex analysis and their role in modern mathematics and applied contexts
			CO2	The student will be able to analyze the ideas of complex differentiation and complex integration in a coherent and meaningful manner and use appropriate techniques for solving related problems and for establishing theoretical results.
			CO3	The student gains knowledge about Complex Number System and understands the relation to other existing number systems
			CO4	The student will develop the critical thinikng ability by proving mathematical conjectures and establishing theorems
			CO5	The student gains competence to understand the operations with complex numbers, use the complex derivatives function, use and operate analytic functions, demonstrate knowledge of integration in the complex plane, use the Cauchy integral theorem and Cauchy integral formula, manipulate and use power series, understand residues and their use in integration, demonstrate the understanding of conformal mappings
			CO6	The student will be able to appreciate the significance of differentiability for complex functions and be familiar with the Cauchy-Riemann equations
			CO7	The student will be able to apply problem-solving using complex analysis techniques applied to diverse situations in physics, engineering and other mathematical contexts.
	MAT5LAA	Linear Algebra	CO1	Use computational techniques and algebraic skills essential for the study of systems of linear equations, matrix algebra, vector spaces, Eigenvalues and eigenvectors, orthogonality and diagonalization. (Computational and Algebraic Skills).
			CO2	Use visualization, spatial reasoning, as well as geometric properties and strategies to model, solve problems, and view solutions, especially in R2 and R3 , as well as conceptually extend these results to higher dimensions. (Geometric Skills).
			CO3	Critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra. (Proof and Reasoning).

			CO4	Use technology, where appropriate, to enhance and facilitate mathematical understanding, as well as an aid in solving problems and presenting solutions (Technological Skills).
			CO5	Communicate and understand mathematical statements, ideas and results, both verbally and in writing, with the correct use of mathematical definitions, terminology and symbolism (Communication Skills).
			CO6	Work collaboratively with peers and instructors to acquire mathematical understanding and to formulate and solve problems and present solutions (Collaborative Skills).
VI	MAT6EOTC	Optimization Techniques	CO1	Understand the importance of optimization of industrial process management
			CO2	Apply basic concepts of mathematics to formulate an optimization problem
			CO3	Analyze and appreciate variety of performance measures for various optimization problems
			CO4	Develop and promote research interest in applying optimization techniques in problems of Engineering and Technology
			CO5	Solve a multi-objective problem through weighted and constrained methods
	MAT6NAA	Numerical Analysis	CO1	Understand the importance of computers and the role of approximations and errors in the implementation and development of numerical methods.
			CO2	Gain sufficient information to successfully approach a wide variety of problems dealing with roots of equations
			CO3	Solve problems involving linear algebraic equations and appreciate the application of these equations in many fields.
			CO4	Approach a wide variety of engineering problems dealing with optimization.
			CO5	Enhance their capability to fit curves to data.
			CO6	Solve ordinary differential equations and eigenvalue problems.
	STATISTICS			
	PO Code	**Programme Outcomes**		
	PO1	Acquire the ability to bring together and flexibly apply knowledge to characterise, analyse		

	PO2	Recognize and appreciate the connections between theory and applications		
	PO3	Independently read statistical literature of various types, including survey articles, scholarly books and online sources		
	PO4	Have the versatility to work effectively in a broad range of analytic, scientific, government, financial, health, technical and other positions		
	PO5	Choose appropriate statistical methods and demonstrate their ability to apply various concepts in exploratory data analysis		
	PO6	Use different statistical software to carry out data analysis		
	PO7	Have the intellectual curiosity and flexibility to grow with developing technology and new methods		
Semester	CourseCode	CourseName	CO Code	Course Outcomes
I	STA1DPA	Descriptive Statistics and Probability	CO1	Explain, recognise and identify different data types.
			CO2	Calculate and interpret the various descriptive measures for centrality and dispersion; asses which methods are appropriate for a given data set.
			CO3	Describe how outliers affect various numerical summaries.
			CO4	Find and interpret the sample correlation and regression coefficients.
			CO5	Identify and understand from a probability scenario different kinds of events.
II	STA2DAB		CO1	

		and solve a wide range of problems		

		Discrete Distributions and Applied Statistics		To understand different probability functions with respect to univariate and bivariate discrete random variables.
			CO2	To learn and derive the properties of theoretical discrete distributions like Bernoulli, binomial, Poisson, hypergeometric, geometric and negative binomial.
			CO3	To understand and appreciate the role of official statistics, NSSO and CSO in governance.
			CO4	Demonstrate knowledge and understanding of index numbers theory and methods and be able to provide practical solutions to general aggregation problems.
			CO5	To understand and apply the elementary concepts and methods to measure trend and seasonal variations underlying a time series data.
			CO6	To analyse and interpret basic demographic measures.
III	STA3CDA	Continuous Distributions	CO1	To understand different probability functions with respect to univariate and bivariate continuous random variables.
			CO2	To be able to determine the appropriate areas under a normal probability curve and to prove important properties of normal distribution.
			CO3	To learn and derive the properties of other theoretical continuous distributions like uniform, exponential, beta and gamma.
			CO4	To describe the abstract idea of a sampling distribution and how it reflects the sample to sample variability of a statistic.
			CO5	To derive chi-square, t and F distributions from normal distribution, their important properties and inter-relationships.
			CO6	Apply the Central Limit Theorem to problems involving sums and averages of variables from arbitrary distributions.
IV	STA4SIA	Statistical Inference	CO1	To understand the need for statistical inference and point estimation of the parameters, properties of the point estimates.
			CO2	Discussion of method of maximum likelihood function and method of moments of obtaining point estimators.
			CO3	To identify the appropriate null and alternative hypotheses in different scenarios.
			CO4	Discussion of the Neyman-Pearson lemma and its utility in the construction of most powerful tests; construction of uniformly most powerful and likelihood ratio tests.
			CO5	To understand the informal and formal explanations of any confidence interval and the different factors that influence it.

			CO6	Construction of the pivotal quantity and use it to derive intervals for common population parameters involving means and proportions.
V	STA5STNTA	Sampling Theory and Nonparametric Tests	CO1	To understand the need for sampling, difference between non probability and probability sampling; to understand different non-probability sampling methods.
			CO2	To distinguish between sampling and non-sampling errors.
			CO3	To learn about a variety of sampling methods like simple random, stratified and systematic sampling; estimates of the parameters and their standard error.
			CO4	To appreciate that estimation procedures depend on the sample design.
			CO5	To compare and contrast parametric and nonparametric tests; identify multiple applications where nonparametric approaches are appropriate.
			CO6	To perform and interpret important non parametric test procedures.
	STA5TSDEB	Tests of Significance and Design of Experiments	CO1	To derive test statistics for common tests of significance.
			CO2	To understand the concept of p-value and its role in a test of significance.
			CO3	To recognize the situation in which the analysis of variance (ANOVA) is appropriate and be able to perform one-way and two-way ANOVA.
			CO4	To understand the importance of statistical design of experiments.
			CO5	To learn the statistical analyses of CRD, RBD and LSD.
			CO6	To understand the difference between simple and factorial experiments. The need for a factorial experiment, analyses of a 22 and 23 factorial experiments and confounded 23 factorial experiments.
VI	STA6ORB	Operations Research	CO1	To formulate and solve a linear programming problem (LLP) by graphical and simplex methods and to understand the different types of solutions that can be obtained while solving a LLP.
			CO2	To discuss the basic structure of a transportation problems and assignment problems and methods of solving them
			CO3	Solve simple decision problems and game problems using different techniques.
			CO4	To construct a simple network diagram; Critical path calculation and PERT.
			CO5	To describe an inventory system, simple inventory models-mathematical solutions.

			CO6	To understand a queueing system and its different components; characteristics of a single server queue.
	STA6ISA	Industrial Statistics	CO1	To understand the aims and objectives of Statistical Quality Control, the different quality tools and quality standards.
			CO2	To construct control charts for variables and attributes.
			CO3	To understand the meaning of product control; role of sampling plans.
			CO4	To be able to interpret the results of process capability studies.
			CO5	To learn the reliability concepts and calculate failure rate assuming different probability distributions.
			CO6	To generate observations from different probability distributions.