STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

DEPARTMENT OF MATHEMATICS

PROGRAMME – B.Sc. MATHEMATICS

Programme Learning Outcomes

Graduates of a Bachelor's Degree will have a broad and coherent body of knowledge in their disciplines, with a deep understanding of the underlying principles and concepts in one or more disciplines as a basis for independent lifelong learning

PLO.NO.	PROGRAMME LEARNING OUTCOMES At the end of an undergraduate programme students will be able to
1.	Describe and define critical concepts in their discipline
2.	Explain and discuss concepts and ideas pertaining to their discipline
3.	Demonstrate a broad understanding of their discipline
4.	Demonstrate communication skills to present a clear, coherent and independent exposition of knowledge and ideas
5.	Demonstrate understanding of the interconnections of knowledge within and across disciplines
6.	Apply knowledge, theories, methods, and practices in their chosen field of study to address real-world challenges and opportunities
7.	Demonstrate proficiency in experimental techniques and methods of analysis appropriate for their area of specialisation
8.	Generate and analyse data using appropriate quantitative tools
9.	Construct and test hypotheses
10.	Demonstrate cognitive and technical skills to synthesise knowledge in interrelated disciplines
11.	Demonstrate critical thinking and judgement in identifying and solving problems with intellectual independence
12.	Demonstrate the skills needed to be able to function successfully in their field
13.	Show responsibility and understanding of local and global issues
14.	Demonstrate through their actions and speech that they are agents of social justice and change
15.	Practice the discipline's code of ethics in their academic, professional and personal lives
16.	Practice the values of democracy and principles of human rights
17.	Show self-awareness and emotional maturity
18.	Demonstrate career and leadership readiness
19.	Demonstrate intercultural, interracial, interclass, inter-caste, and ethical competency
20.	Exhibit the ability to work in teams
21.	Exhibit a strong sense of professionalism in a range of contexts

22.	Demonstrate sensitivity and readiness to share their knowledge, experience, and capabilities with the marginalised and oppressed in their communities

PSLO NO.	PROGRAMME SPECIFIC LEARNING OUTCOMES On successful completion of the course, students will be able to
1.	Demonstrate proficiency in solving problems using logical thinking
2.	use software to visualize mathematical concepts
3.	interpret problems both physically and geometrically
4.	use software to solve mathematical and Statistical problems
5.	demonstrate understanding of probability, statistical distributions and its applications to sampling theory and statistical tools in-depth at the Allied level
6.	acquire wide range of knowledge from General Electives chosen from different disciplines
7.	demonstrate competency in solving problems in Calculus, Analytical Geometry of 2 and 3 dimensions, Vector Calculus and Vector Analysis
8.	demonstrate proficiency in solving linear programming problems and networking models
9.	solve problems in Laplace Transforms, Fourier Transforms and transforms and to realize the use of these in problem solving
10.	demonstrate the study of various algebraic structures viz., Group, Ring, Fields, Vector Spaces
11.	derive challenging outcomes in both Real and Complex Analysis
12.	demonstrate proficiency in visualising Mechanics in real life problems
13.	visualise Elements of Space Science as an application of mathematics
14.	demonstrate proficiency in solving Numerical Analysis problems using C programming

COURSE TITLE	MAJOR CORE: DIFFERENTIAL CALCULUS		
CODE	19MT/MC/DC14		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	define the basic concepts and principles of differential calculus	PSLO3	R
2.	use derivatives to solve a variety of problems	PSLO7	Ap
3.	develop an appreciation of calculus as a coherent body of knowledge	PSLO3,7	U

COURSE TITLE	MAJOR CORE: ALGEBRA AND TRIGONOMETRY		
CODE	19MT/MC/AT13		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level

1.	simplify, factor, evaluate and perform operations on polynomial equations	PSLO 1	R, U, An, E
2.	exhibit competence in calculating Eigen values and Eigen vectors, and thereby diagonalizing square matrices	PSLO 1	R, U, An, E
3.	demonstrate comprehension involving expansions and expressions of circular and hyperbolic functions	PSLO 1	R, U, An, E

COURSE TITLE	MAJOR CORE: INTEGRAL CALCULUS		
CODE	19MT/MC/IC23		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	understand the concepts of double and triple integration	PSLO7	U
2.	use Beta-Gamma functions as a tool to evaluate integrals	PSLO7	Ap
3.	use numerical integration for approximating the integrals that are difficult or impossible to integrate analytically	PSLO3,7	Ap

COURSE TITLE	MAJOR CORE: ANALYTICAL GEOMETRY		
CODE	19MT/MC/AG24		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	recognize the type of conic sections and understand its properties	PSLO 7	U, Ap
2.	be familiar to planes, straight lines, sphere and cone in three dimensional co-ordinate geometry	PSLO 3, 7	U, R
3.	demonstrate knowledge of geometry and its applications in the real world	PSLO 3, 7	U, Ap

COURSE TITLE	MAJOR CORE: ELEMENTS OF GRAPH THEORY		
CODE	19MT/MC/EG34		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	understand fundamental definitions of graph theory	PSLO 1	R
2.	have learnt a clear perspective of solving real life problems using graph theory	PSLO 3	U, Ap
3.	analyze one way communication problems in networking	PSLO 3	An

4.	use a combination of theoretical knowledge and independent mathematical thinking for creative research in graph theory	PSLO 1,3	R,U,Ap,An

COURSE TITLE	MAJOR CORE: DIFFERENTIAL EQUATIONS		
CODE	19MT/MC/DE34		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	find the solution of ordinary differential equations and system of differential equations	PSLO 1	R,U
2.	use differential equations as a tool to model the real world problems and hence understand the behavior of the dynamical problems	PSLO 4	R,U,Ap
3.	find complete solution of a non-homogeneous partial differential equation as a linear combination of the complementary function and a particular solution	PSLO 1	R,U,An

COURSE TITLE	ALLIED CORE: MATHEMATICAL STATISTICS – I		
CODE	19MT/AC/ST35		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	demonstrate understanding of probability functions and use Baye's theorem for future events	PSLO 5	R,U,Ap,An
2.	compute expectations, moments and correlation coefficients	PSLO 4	R,U,Ap,An
3.	acquire knowledge of discrete and continuous distributions and their properties	PSLO 5	R,U

COURSE TITLE	MAJOR CORE: SEQUENCES AND SERIES		
CODE	19MT/MC/SS44		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	understand countable and uncountable sets of real numbers	PSLO 3,11	R,U, Ap,An
2.	acquire the knowledge of the behavior of the sequence	PSLO 3,11	R,U, Ap,An
3.	develop the techniques of testing the behavior of infinite series of real Numbers	PSLO 3,11	R,U, Ap,An
4.	express periodic functions as infinite series	PSLO 3,11	R,U, Ap,An

COURSE TITLE	MAJOR CORE: DISCRETE MATHEMATICS		
CODE	19MT/MC/DM43		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	acquire the knowledge of reasoning and to reason validity of a statement	PSLO 1, 6	U, R, An
2.	understand ordered relations and apply in Boolean expressions	PSLO 1	U, Ap
3.	gain knowledge of using formal language as tool to convert natural language into machine language	PSLO 1, 6	U, Ap, An

COURSE TITLE	ALLIED CORE: MATHEMATICAL STATISTICS – II		
CODE	19MT/AC/ST45		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	use appropriate sampling distribution for the test of hypothesis	PSLO 5	U,Ap,An,C
2.	construct the interval estimation for different parameters	PSLO 5	U,E
3.	understand the concept of Analysis of Variance	PSLO 4,5	U,Ap,An,E

COURSE TITLE	MAJOR CORE: VECTOR ANALYSIS AND APPLICATIONS		
CODE	19MT/MC/VA53		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	understand the concepts of divergence, curl, and the Laplacian along with their physical and geometrical interpretations	PSLO1, 3, 7,	U, Ap, E
2.	develop the ideas of line, surface and volume integrals and its calculations in rectangular, cylindrical and spherical coordinate systems	PSLO1, 2, 3, 7	U, An, Ap, E
3.	investigate the relation between the line, surface and volume integrals	PSLO2, 3, 7	U, Ap, E

COURSE TITLE	MAJOR CORE: ALGEBRAIC STRUCTURES		
CODE	19MT/MC/AS55		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	have a working knowledge of important mathematical concepts in abstract algebra	PSLO10	U, An
2.	understand the structure and characteristics of groups, rings and fields	PSLO10	U, An
3.	gain experience in proving theorems and solving problems	PSLO10	U, An, Ap

COURSE TITLE	MAJOR CORE: PRINCIPLES OF REAL ANALYSIS		
CODE	19MT/MC/RA55		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	have acquired knowledge of abstract mathematics on the real line	PSLO 3	U, An
2.	have learnt the concepts for understanding and analyzing abstract mathematics on the metric space	PSLO 11	U, An
3.	have the knowledge of real functions, limit of functions and their properties	PSLO 11	U, Ap, An

COURSE TITLE	MAJOR CORE: INTEGRAL TRANSFORMS		
CODE	19MT/MC/IT54		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	understand the different methods of finding transforms of different functions	PSLO 1	R, U, Ap
2.	appreciate the procedure to obtain solution of differential equations involving Laplace transform	PSLO 9	R, U, Ap
3.	visualize the use of Z-transform in solving difference equation	PSLO 9	R, U, Ap

COURSE TITLE	INTERDISCIPLINARY CORE: MATHEMATICS THROUGH SCIENTIFIC SOFTWARE		
CODE	19ID/IC/MS55		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	use software tools for implementing Mathematical and Statistical concepts	PSLO2, 4	U, Ap
2.	understand data and mathematical functions	PSLO1, 2, 4	U, Ap
3.	demonstrate a situation through multimedia	PSLO2, 4	U, Ap, C
4.	develop the ability to build and assess data for further analysis	PSLO1, 4	Ap, E
5.	continue further studies in advanced R programming	PSLO1, 4	An, C, E

COURSE TITLE	MAJOR CORE: VECTOR SPACES AND LINEAR TRANSFORMATIONS
CODE	19MT/MC/VL64

CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	critically analyze and construct mathematical arguments that relate to the study of introductory linear algebra	PSLO3	An, Ap
2.	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	PSLO1, 3	R, U, E
3.	apply the theoretical results developed to obtain the least square curves to fit the data	PSLO1, 3	Ap, E

COURSE TITLE	MAJOR CORE: PRINCIPLES OF COMPLEX ANALYSIS		
CODE	19MT/MC/CA65		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	demonstrate understanding of the basic concepts in complex analysis	PSLO 3	U, Ap
2.	understand the importance of analytic functions in applications to the field of sciences and advanced Engineering	PSLO 3,11	U, An
3.	apply conformal mapping in solving boundary value problems	PSLO1, 11	U
4.	apply the methods of complex analysis to evaluate definite integrals and infinite series	PSLO 1	U, Ap, E

COURSE TITLE	MAJOR CORE: PRINCIPLES OF MECHANICS		
CODE	19MT/MC/PM65		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	understand the concepts of Statics and Dynamics applicable in real life	PSLO 12	U
2.	have acquired wide knowledge of handling problems related to Mechanics	PSLO 1, 12	U, An, Ap
3.	have acquired sufficient knowledge for further studies in Mechanics at a higher level	PSLO 12	U, An

COURSE TITLE	MAJOR ELECTIVE: OPTIMIZATION TECHNIQUES		
CODE	19MT/ME/OT45		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level

1.	develop a general understanding of the Operations Research methodology to decision making	PSLO 1, 8	R,U,Ap,An C, E
2.	identify best techniques to solve a specific problem in linear model of OR	PSLO 1, 8	R,U,Ap,An C, E
3.	gain knowledge to apply CPM and PERT techniques, to plan, schedule, and control project activities.	PSLO 1, 8	R,U,Ap,An C, E

COURSE TITLE	MAJOR ELECTIVE: ELEMENTS OF SPACE SCIENCE		
CODE	19MT/ME/ES45		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	acquire the knowledge of the concepts governed by mathematics to the universe	PSLO 13	U, Ap
2.	visualize the real time application of mathematics in space science	PSLO 13	U
3.	spot the celestial bodies in the sky by naked eye / binoculars / telescopes	PSLO 13	U, Ap

COURSE TITLE	MAJOR ELECTIVE: NUMERICAL METHODS WITH PROGRAMS IN C		
CODE	19MT/ME/NM45		
CLO NO.	COURSE LEARNING OUTCOMES	PSLOs Addressed	Cognitive Level
1.	understand the basic principles of scientific and engineering programming	PSLO 1,2,4	R,U,Ap,C, E
2.	acquire knowledge of developing algorithms for matrix algebra, numerical solution of ordinary differential equations and for finding roots of non-linear equations	PSLO1,2,4, 14	R,U,Ap,C, E
3.	efficiently use the techniques, skills, and computational skills to solve real time numerical problems	PSLO1,2,4, 13	R,U,Ap,C, E