STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 86

M.Sc. DEGREE BRANCH - I : MATHEMATICS

COURSES OF STUDY

(Effective from the academic year 2011 - 2012)

CHOICE BASED CREDIT SYSTEM

Subject Code	Title of Course	Credits	Total Teaching Hours			Exam Hours	Continuous Assessment	End Semester	Maximum Marks
			Lecture Hours	Tutorial Hours	Practical Hours / Self Learning				
Semester - I									
11MT/PC/MA14	Modern Algebra	4	4	1	0	3	50	50	100
11MT/PC/RA14	Real Analysis	4	4	1	0	3	50	50	100
11MT/PC/ME14	Mechanics	4	4	1	0	3	50	50	100
11MT/PC/OD14	Ordinary Differential Equations	4	4	1	0	3	50	50	100
11MT/PE/AP14	Algorithm and Programming	4	3	0	2	3	50	50	100
11MT/PE/NC14	Number Theory and Cryptography	4	3	1	0	3	50	50	100
11MT/PA/WA12	Welfare of the Aged	2	2	0	0	-	50	-	100
Semester - II									
11MT/PC/LA24	Linear Algebra	4	4	1	0	3	50	50	100
11MT/PC/MI24	Measure Theory and Integration	4	4	1	0	3	50	50	100
11MT/PC/TO24	Topology	4	4	1	0	3	50	50	100
11MT/PE/TS24	Tensor Analysis and Special Theory of Relativity	4	3	1	0	3	50	50	100
11MT/PE/FT24	Fuzzy Set Theory	4	3	1	0	3	50	50	100
11MT/PN/SI22	Summer Internship	2	-	-	-	-	-	50	100
11MT/PK/SS22	Soft Skills	2	2	0	0	-	50	-	100
Semester - III									
11MT/PC/CA34	Complex Analysis	4	4	1	0	3	50	50	100
11MT/PC/MS34	Mathematical Statistics	4	4	1	0	3	50	50	100
11MT/PC/GT34	Graph Theory	4	4	1	0	3	50	50	100
11MT/PC/CM34	Continuum Mechanics	4	4	1	0	3	50	50	100
Semester - IV									
11MT/PC/FA44	Functional Analysis	4	4	1	0	3	50	50	100
11MT/PC/PD44	Partial Differential Equations	4	4	1	0	3	50	50	100
11MT/PC/DG44	Differential Geometry	4	4	1	0	3	50	50	100
11MT/PC/DI44	Dissertation	4	2	0	6	-	-	50	100
11MT/PE/FD44	Fluid Dynamics	4	3	1	0	3	50	50	100
11MT/PE/MM44	Mathematical Modeling	4	3	1	0	3	50	50	100
Offered to Other Departments									
11MT/PE/BM24	Basic Mathematical Methods	4	3	1	0	3	50	50	100
11MT/PE/QM24	Quantitative Techniques for Management	4	3	1	0	3	50	50	100
11MT/PE/DM34	Discrete Mathematics	4	3	1	0	3	50	50	100
11MT/PE/OR34	Operations Research	4	3	1	0	3	50	50	100
11MT/PE/RS34	Research in Statistics	4	3	1	0	3	50	50	100
Independent Study Course									
11MT/PI/PR24	Probability and Random Processes	4	-	-	-	3	-	50	100

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I - MATHEMATICS

SYLLABUS

MODERN ALGEBRA

CODE : 11MT/PC/MA 14 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce the general concepts in Abstract Algebra
- To give a foundation in various algebraic structures
- To lay the foundation for a variety of courses

Unit 1 **(16hrs)**

Group Theory

Another Counting Principle – Cauchy's theorem (statement only) - Sylow's Theorem (second proof only) – Direct products – Finite abelian groups.

Unit 2 **(10 hrs)**

Ring Theory

Euclidean Rings - Definition- Properties- Unique Factorization Theorem- A Particular Euclidean ring- Fermat's Theorem.

Unit 3 **(10 hrs)**

Ring Theory (contd.)

Polynomial Rings - Polynomials over the rational field.

Unit 4 **(14 hrs)**

Fields

Extension Fields – Roots of Polynomials.

Unit 5 **(15 hrs)**

Fields (contd.)

More about roots - The elements of Galois Theory.

BOOK FOR STUDY

Herstein, I. N. Topics in Algebra 2nd Ed. New Delhi : Wiley Eastern Limited, 2007.

Chapter 2	Sections	2.11 – 2.14 (Omitting Lemma 2.11.3, Theorem 2.12.1, Lemma 2.12.1, Lemma 2.12.2)
Chapter 3	Section	3.7, 3.8, 3.9, 3.10
Chapter 5	Sections	5.1, 5.3, 5.5, 5.6.

BOOKS FOR REFERENCE

Fraleigh J.B. A First course in Abstract Algebra. 2nd ed. London : Addison – Wesley Publishing Company, 1975.

Lang Serge, Algebra 3rd Revised ed. New Delhi : Springer International Edition, 2004.

Santiago, M.L. Modern Algebra. New Delhi : Tata McGraw-Hill Publishing Company Limited, 2002.

Vasistha A.R., and A.K. Vasistha.. Modern Algebra. Meerut : Krishna Prakashan Media (P) Ltd., 2006.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit)

Section B: $5 \times 6 = 30$ (Seven questions to be set, selecting atleast one question per unit).

Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

MECHANICS

CODE :11MT/PC/ME 14 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce various principles in dynamical systems
- To teach the techniques involved in calculus of variations
- To formulate equations of motion using different principles

Unit 1 **(13 hrs)**

Elementary Principles of Mechanics, Variational Principles and Lagrange's Equations

Mechanics of a Particle – Mechanics of a system of particles – Constraints – D'Alembert's Principle and Lagrange's equations – Simple applications of the Lagrangian formulation – Hamilton's Principle .

Unit 2 **(12 hrs)**

Calculus of Variations

Some techniques of the Calculus of Variations – Derivation of Lagrange's equations from Hamilton's Principle – Extension of Hamilton's Principle to non-holonomic systems – Cyclic coordinates – General conservation theorem relating to cyclic coordinates.

Unit 3 **(14 hrs)**

The Kinematics and Equations of Motion of a Rigid Body

Independent coordinates of a rigid body – Euler angles – Euler's theorem on the motion of a rigid body – Rate of change of a vector – Coriolis force – Angular momentum and kinetic energy of motion about a point – Dyadics – Inertia tensor and moment of inertia – Eigen values of inertia tensor and principal axes transformation – Euler's equations of motion.

Unit 4 **(13 hrs)**

The Hamilton Equations of Motion

Legendre transformations and the Hamilton equations of motion - Routh's procedure - Derivation of Hamilton's equations from a variational principle - principle of Least Action.

Unit 5 **(13 hrs)**

Canonical Transformations

Equation of canonical transformations - Examples of canonical transformations - Symplectic approach to canonical transformations - Poisson brackets and other canonical invariants.

BOOK FOR STUDY

Goldstein H., Classical Mechanics (Reprint 2001), London: Addison – Wesley Publishing Company, 1980.

Chapter 1	Sections 1.1 to 1.4, 1.6.
Chapter 2	Sections 2.1 to 2.4, 2.6
Chapter 4	Sections 4.1, 4.4, 4.6, 4.9, 4.10.
Chapter 5	Sections 5.1 to 5.5.
Chapter 8	Sections 8.1, 8.3, 8.5, 8.6
Chapter 9	Sections 9.1 to 9.4

BOOKS FOR REFERENCE

Corben, H.C., Stehle Philip, Classical Mechanics, (II Edition), New York: Robert E. Krieger Publishing Co., 1960.

Greenwood Donald, T., Classical Dynamics**,** New Delhi: Prentice Hall of India, 1979.

Starzhinskii, V.M., An Advanced Course of Theoretical Mechanics, Moscow: MIR Publishers, 1982.

Synge John, L., Byron Griffith, A., Principles of Mechanics**,** (III Edition), New York: McGraw Hill Book Co., 1970.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS
SYLLABUS

REAL ANALYSIS

CODE : 11MT/PC/RA 14 **CREDIT : 4**
L T P : 4 1 0
TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce the general concepts of Analysis in the Euclidean space $\Re^n$
- To lay the foundation for a variety of courses
- To impart knowledge on the concepts of double sequences and double series
- To impart knowledge on the concepts of Infinite Series and Infinite Products

Unit 1 **(14 hrs)**

Elements of point set Topology

Euclidean space $\Re^n$ - Open balls and open sets in $\Re^n$ – Structure of open sets in $\Re^1$ – Closed sets – Adherent and Accumulation points – Bolzano-Weierstrass Theorem – Cantor intersection theorem – Lindelöf covering theorem – Heine–Borel covering theorem - Compactness in $\Re^n$.

Unit 2 **(10 hrs)**

Infinite Series and Infinite Products

Double sequences – Double series – rearrangement theorem for double series – sufficient condition for equality of iterated series – Multiplication of series – Cesaro summability – Infinite products.

Unit 3 **(13 hrs)**

Sequences and series of Functions

Pointwise convergence – uniform convergence – Examples - uniform convergence and continuity – Cauchy condition for uniform convergence – Uniform convergence of infinite series of functions - Uniform convergence and double sequences - Taylor's series generated by a function – Bernstein's theorem.

Unit 4 **(14 hrs)**

Multivariable Differential Calculus

The directional derivative – Directional derivative and continuity – Total derivative – Total derivative expressed in terms of partial derivatives – Jacobian matrix – Chain rule – Matrix form – Mean value theorem – Sufficient condition for differentiability – Equality of mixed partial derivatives – Taylor's formula for functions from $\Re^n$ to $\Re^1$.

Unit 5 **(14 hrs)**

Implicit functions and Extremum Problems

Implicit functions and Extremum problems - Functions with non - zero Jacobian determinant – The inverse function theorem – Implicit function theorem – Extrema of real valued functions of one variable – Extrema of real valued functions of several variables.

BOOK FOR STUDY

Apostol, Tom M., Mathematical Analysis 2nd ed. New Delhi: Addison – Wesley / Narosa Indian Student Edition, 1974.

Chapter 3,	Sections	3.1 – 3.16.
Chapter 8,	Sections	8.20 – 8.23, 8.26.
Chapter 9,	Sections	9.1 - 9.6, 9.12, 9.19, 9.20.
Chapter 12,	Sections	12.1 - 12.5, 12.7 - 12.14.
Chapter 13,	Sections	13.1 - 13.6.

BOOKS FOR REFERENCE

Ganapathy, Iyer V. Mathematical Analysis. New York: Tata McGraw Hill Publishing House, 1977.

Malik, S.C. and Savitha Arora, Mathematical Analysis. 2nd ed. New Delhi: Wiley Eastern Limited, 1991.

Rudin, W. Principles of Mathematical Analysis. 2nd ed. New York: McGraw Hill Publishing Company, 1964.

Simmons, G.F. Introduction to Topology and Modern Analysis. New York, McGraw Hill Publishing Company, 1963.

PATTERN OF EVALUATION (End Semester Examination – 3 Hours)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS
SYLLABUS

ORDINARY DIFFERENTIAL EQUATIONS

CODE : 11MT/PC/OD 14

CREDIT : 4
L T P : 4 1 0
TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce mathematical methods for solving higher order differential equations
- To apply the various methods to dynamical problems of practical interest

Unit 1 **(15 hrs)**

Linear Differential Equations of higher Order

Introduction – Linear dependence and Wronskian – Basic Theory for Linear equations – Method of variation of parameters .

Unit 2 **(12 hrs)**

Linear Differential Equations with constants coefficients.

Two useful formulae – Homogenous linear equations with constant coefficients.

Unit 3 **(9 hrs)**

Power Series Solutions and Special Functions

Introduction – Series solutions of first order equations – Second order linear equations – Ordinary points – Regular Singular points

Unit 4 **(13 hrs)**

Some special functions of Mathematical Physics

Legendre polynomials - Properties of Legendre Polynomials - Bessel functions – Gamma function – Properties of Bessel functions.

Unit 5 **(16 hrs)**

Boundary Value Problems

Introduction – Sturm-Liouville problem – Green's functions – Non-existence of solutions – Picard's theorem.

Stability of Non – linear Systems

Introduction – Stability of Quasi-linear systems.

BOOKS FOR STUDY

Deo, S. G. and Ragavendra V. Ordinary Differential Equations and Stability Theory. New Delhi: Tate McGraw – Hill Publishing Company Limited, 1980

Chapter 2	Section 2.1 – 2.6
Chapter 7	Section 7.1 – 7.5
Chapter 9	Section 9.1 – 9.2

Simmons George F., and Robertson John S., Differential Equations with Applications and Historical notes, New Delhi: Tata McGraw – Hill Publishing Company Ltd., 1991

Chapter 5	Sections 26 – 30
Chapter 8	Sections 44 – 47

BOOKS FOR REFERENCE

Ahmed Shair and M. Rao Rama Mohana. Theory of Ordinary Differential Equations with Applications in Biology and Engineering. New Delhi: Affiliated East – West Press Pvt. Ltd.,1999

Coddington, Earl A. An Introduction to Ordinary Differential Equations. New Delhi: Prentice – Hall of India Pvt. Ltd., 1998

Chorlton, Frank. Ordinary Differential and Difference Equations, Theory and Applications, London: D. Van Nostrand Co.Ltd., 1965

Iyengar, N. Ch. S. N. Differential Equations. New Delhi: Anmol Pub. Pvt. Ltd., 2000.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I - MATHEMATICS

SYLLABUS

ALGORITHMS AND PROGRAMMING
(Theory and Practical)
(Skill development Course)

CODE : 11MT/PE/AP 14 **CREDIT : 4**

L T P : 3 0 2

TOTAL TEACHING HOURS : 65
(32+33)

ELIGIBILITY CRITERION

- Offered to those who have a knowledge of C – programming language

OBJECTIVES OF THE COURSE

- To introduce different methods to solve problems in an abstract setup
- To translate the algorithms under study into a programme code

Unit 1 **(8 hrs)**

Algorithm – Introduction – Priority Queues. Divide and Conquer : General Method.

Unit 2 **(6 hrs)**

Divide and Conquer : Binary search – Finding the maximum and minimum – MERGE SORT.

Unit 3 **(6 hrs)**

Divide and Conquer: QUICKSORT – Selections. The Greedy Method: The General Method – Knapsack problem

Unit 4 **(6 hrs)**

The Greedy Method: Job sequencing with Deadlines – Minimum Cost Spanning trees.

Unit 5 **(6 hrs)**

Back tracking: The General Method – The 8 queens problem – sum of subsets – Graph colouring – Hamiltonian cycles.

Practical **(33 hrs.)**

Priority Queues – Binary search – Finding the maximum and minimum – MERGE SORT – QUICKSORT – Knapsack problem – The 8 queens problem – Sum of subsets – Graph colouring

BOOK FOR STUDY

Horowitz Ellis, Sahni Sartaj and Rajasekaran Sanguthevar. Fundamentals of Computer Algorithms. 2nd ed. New Delhi: Galgotia Publciation Pvt. Ltd., 2007.

Chapter 1	Section 1.1, 1.2
Chapter 2	Section 2.4
Chapter 3	Section 3.1 – 3.6 (Omit 3.2, 3.6.1, 3.6.2, 3.7.1, 3.7.2)
Chapter 4	Section 4.1, 4.3, 4.5 & 4.6 (Omit 4.6.3.)
Chapter 7	Section 7.1 – 7.5

BOOKS FOR REFERENCE

Goodman and Hedetniemi. Introduction to the Design and Analysis of Algorithms. New Delhi: McGraw-Hill International Editions, 1997.

Loudon, Kyle. Mastering Algorithms with C. Mumbai: Shroff Publishers & Distributors Pvt. Ltd., 1999.

McConnell, Jefferey J. Analysis of Algorithms: An Active Learning Approach**.** New Delhi: Narosa Publishing House, 2002.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : Theory $30 \times 1 = 30$ (Computer Assisted Testing)

$5 \times 8 = 40$ (Eight questions to be set without omitting any unit).

Section B : Practical $2 \times 15 = 30$ (Three questions to be set).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

NUMBER THEORY AND CRYPTOGRAPHY

CODE :11MT/PE/NC 14 **CREDIT : 4**

L T P : 3 1 0

TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To provide an introductory course in Number theory.
- To introduce the fast growing and relevant topic of cryptography as an application of Number theory.

Unit 1 **(8 hrs)**

Elementary Number Theory

Time estimates for doing arithmetic – Divisibility and the Euclidean algorithm

Unit 2 **(8 hrs)**

Elementary Number Theory (contd…)

Congruences – Some applications to factoring.

Unit 3 **(12 hrs)**

Finite Fields and Quadratic Residues

Finite fields – Quadratic residues and reciprocity

Unit 4 **(12 hrs)**

Cryptography

Some simple cryptosystems – Enciphering matrices

Unit 5 **(12 hrs)**

Public Key

Public key cryptography – RSA

BOOK FOR STUDY

Koblitz, Neal. A Course in Number Theory and Cryptography 2nd ed. New York: Springer – Verlag, 2002.

Chapter 1	Sections 1 – 4
Chapter 2	Sections 1, 2
Chapter 3	Sections 1, 2
Chapter 4	Sections 1, 2

BOOKS FOR REFERENCE

Apostal, Tom M. Introduction to Analytic Number Theory.New York: Springer International Student Edition, 1998.

Ireland K., and Michael Rosen. A Classical Introduction to Modern Number Theory. 2nd ed. New York: Springer Verlag, 2004.

Niven Ivan, Herbert S. Zuckerman. An Introduction to Theory of Numbers. 3rd ed**.** New Delhi: Wiley Eastern University Edition, 1989.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

LINEAR ALGEBRA

CODE : 11MT/PC/LA 24 **CREDITS : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce the concepts and methods in the study of Linear Transformations on vector spaces
- To lay the foundation for a variety of courses

Unit 1

Elementary Canonical Forms (15hrs)

Characteristic values - Annihilating polynomials - Invariant subspaces - Simultaneous Triangulation; simultaneous Diagonalization.

Unit 2

Modules (10 hrs)

Definition and examples - Direct sum – fundamental theorem on finitely generated modules.

Unit 3

(15 hrs)

Linear Transformations

Canonical Forms: Nilpotent Transformations – Canonical Forms: A Decomposition of V: Jordan Form

Unit 4

(10 hrs)

Linear Transformations (contd…)

Canonical Forms: Rational Canonical Form

Unit 5

Inner Product Spaces (15 hrs)

Inner products- -Linear functionals and adjoints-Unitary operators-Normal operators. Forms on Inner product spaces.

BOOKS FOR STUDY

Herstein . I.N. Topics in Algebra. 2nd Ed.. New Delhi : Wiley Eastern limited, 1994.

Chapter 4	Section	4.5.
Chapter 6	Sections	6.5 – 6.7

Hoffman, Kenneth and Ray Kunze. Linear Algebra.2nd ed.New Delhi : Prentice-Hall of India. Private Ltd., 1971.

Chapter 6	Sections 6.2 - 6.5
Chapter 8	Sections 8.3 - 8.5
Chapter 9	Sections 9.1 - 9.2

BOOKS FOR REFERENCE

Artin Michel, Algebra. New Delhi : Prentice Hall of India Private Ltd., 1994.

Noble Ben, Daniel James W. Applied Linear algebra , India : Prentice-Hall of India, 1969.

Lang Serge, Algebra 3rd Revised Ed. New Delhi : Springer International Edition, 2004.

Sahai Vivek, and Vikas Bist. Linear Algebra. New Delhi : Narosa Publishing House, 2002.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit)

Section B : $5 \times 6 = 30$ (Seven questions to be set, selecting atleast one question per unit).

Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

MEASURE THEORY AND INTEGRATION

CODE :11MT/PC/ MI 24 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To develop the theory of integration via: measure, the knowledge of which is essential for working in most branches of modern Analysis
- To introduce a study of inequalities and the L^p-spaces
- To introduce the concept signed measures and decomposition theorems

Unit 1 **(13 Hrs)**

Measure on the Real Line

Lebesgue outer measure, Measurable sets, Regularity, Measurable functions, Borel and Lebesgue Measurability.

Unit 2 **(13 Hrs)**

Integration of Functions of a Real Variable

Integration of non-negative functions - the general integral - Riemann and Lebesgue integrals.

Unit 3 **(13 Hrs)**

Abstract Measure Spaces

Measures and outer measures – Completion of a measure - Measure spaces – Integration with respect to a measure.

L^P Spaces

L^P Spaces - Completeness of L^P

Unit 4 **(13Hrs)**

Signed measures and their derivatives

Signed measures - Hahn, Jordan Decompositions - The Radon Nikodym theorem - some applications of the Radon Nikodym Theorem

Unit 5 **(13 Hrs)**

Measure and Integration in a Product Space

Measurability in a product space – The Product Measure and Fubini's theorem – Lebegue measure in Euclidean space.

BOOK FOR STUDY

G. de Barra. Measure Theory and Integration. New Delhi : New Age International (P) Limited, 1981.

Chapter 2	Sections	2.1 – 2.5
Chapter 3	Section	3.1, 3.2, 3.4
Chapter 5	Section	5.1, 5.4 – 5.6
Chapter 6	Sections	6.1, 6.5
Chapter 8	Section	8.1 - 8.4
Chapter 10	Section	10.1 – 10.3 (omit Proof of Theorems 10 & 11)

BOOKS FOR REFERENCE

Ganapathy Iyer, V., Mathematical Analysis, New Delhi : Tata McGraw Hill Publishing Company Ltd., 1977.

Munroe, M.E. Introduction to Measure and Integration**,** (Second Printing), USA : Addison Wesley, Publishing Company, Inc., 1959.

Natanson, I.P., Theory of functions of a Real Variable, Vol. I & II Revised edition, Leo. F., Boron, translator New York :, Ungar, 1960.

Rana, I.k., An introduction to Measure and Integration**,** New Delhi : Narosa Publishing House, 1997.

Royden, H.L. Real Analysis. 3rd ed. Ninth Indian Reprint. New Delhi: Prentice- Hall of India private Limited, 2003.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

TOPOLOGY

CODE : 11MT/PC/TO 24 **CREDIT : 4**
L T P : 4 1 0
TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce the structural study of Topology.
- To introduce the concepts of compactness, connectedness and separation axioms in a topological space.

Unit 1 **(10hrs)**

Metric spaces

Convergence, Completeness and Baire's Theorem – Continuous mappings

Unit 2 **(10hrs)**

Topological spaces

Definition and examples – elementary concepts – Open bases and open sub bases

Unit 3 **(15hrs)**

Compactness

Compact spaces – product of spaces – Tychonoff theorem and locally compact spaces – compactness for metric spaces.

Unit 4 **(15hrs)**

Separation

T_1-spaces and Hausdorff spaces – Completely regular spaces and normal spaces – Urysohn's Lemma and Tietze extension theorem – The Urysohn's imbedding theorem.

Unit 5 **(15 hrs)**

Connectedness

Connected spaces – components of a space – totally disconnected spaces – locally connected spaces.

BOOK FOR STUDY

Simmons, G.F. Introduction to Topology and Modern Analysis. New-York : McGraw Hill Book Co. Inc., (6^{th} Reprint 2006) 1963.

Chapter II	Sections 12 – 13
Chapter III	Sections 16 – 18
Chapter IV	Sections 21 – 24
Chapter V	Sections 26 – 29
Chapter VI	Sections 31 – 34

BOOKS FOR REFERENCE

Baum, John, D. Elements of pointset topology**.** New York : Prentice Hall Inc., Englewood Cliffs, 1964.

Dugundji, James Topology. New Delhi : Prentice Hall of India Private Limited, 1975.

Munkres James R. Topology a First Course. New Delhi : Prentice Hall of India Private Limited, 1991.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
M.Sc. DEGREE : BRANCH I – MATHEMATICS
SYLLABUS

FUZZY SET THEORY

CODE : 11MT/PE/FT 24
CREDIT : 4

L T P : 3 1 0
TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To introduce the concept of Fuzzy Mathematics
- To cite the applications of Fuzzy Mathematics in various fields

Unit 1 **(11hrs)**

Fuzzy sets – Basic concepts – Characteristics and Significance of the paradigm shift - Operations on fuzzy sets – types of fuzzy sets - Properties of α – cuts.

Unit 2 **(10 hrs)**

Extension Principle for fuzzy sets - Crisp and fuzzy Relations – Binary Relations – Fuzzy relational equations.

Unit 3 **(10hrs)**

Fuzzy complements – fuzzy union – fuzzy intersection – combination of operations.

Unit 4 **(10 hrs)**

Fuzzy numbers – Linguistic variables - Arithmetic operation of Fuzzy intervals – Arithmetic operation of fuzzy numbers – Fuzzy Equations.

Unit 5 **(11 hrs)**

Concept of fuzzy logic – Fuzzy Controllers - Application of Fuzzy logic to Engineering, Medicine, Industry and Electronics.

BOOKS FOR STUDY

UNITS : 1 - 4

Klir George J. and Yuan Bo, Fuzzy Sets & Fuzzy Logic Theory and Applications**,** New Delhi : Prentice Hall India, 2002.

Chapter 1	1.3 – 1.5
Chapter 2	2.1, 2.3
Chapter 4	4.1 – 4.4, 4.6

Klir George J. and Folger Tina A., Fuzzy Sets, Uncertainty and Information**,** New Delhi : Prentice Hall India, 2004.

Chapter 2 2.2 – 2.5
Chapter 3 3.1, 3.3, 3.8

UNIT 5

Terano Toshiro Asai Kiyoji, Sugeno Michio, Applied Fuzzy Systems**,** New York : A.P. Professional, 1994.

Ahmad M. Ibrahim, Introduction to Applied Fuzzy Electronics**,** New Delhi : Prentice Hall India, 1997.

BOOKS FOR REFERENCE

Bart Kosko, Neural Networks and fuzzy systems, New Delhi : Prentice-Hall of India, (2003).

John N. Mordeson, Premchand S. Nair**,** Fuzzy Mathematics: An Introduction for Engineers and Scientists, Second Edition, Physica-Verlag Heidelberg (2001) ISBN: 3790814202 | 324 pages | PDF | 6,6 MB. e - book

Kaufmann Arnold, Gupta Madan M., Introduction to Fuzzy Arithmetic, Theory and Applications**,** London: International Thomson Computer Press, 1991.

Lotfi A.Zadeh, Fuzzy Sets and Their Applications to Cognitive and Decision Processes, New York, Academic Press, 1975

Zimmermann, Fuzzy set theory and its Applications, Kluwer: Academic Publishers, 1975

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE: BRANCH I – MATHEMATICS
SYLLABUS

TENSOR ANALYSIS AND SPECIAL THEORY OF RELATIVITY

CODE: 11MT/PE/TS 24 **CREDIT: 4**
L T P: 3 1 0
TOTAL TEACHING HOURS: 52

ELIGIBILITY CRITERION

- Offered to those who have a good knowledge of Mechanics

OBJECTIVE OF THE COURSE

- To introduce the concept of tensor product in Mechanics
- To introduce the concept of special theory of relativity and the transformations related.

Unit 1 **(11 hrs)**

Tensor Analysis

Physical laws – Spaces of N dimensions – Co-ordinate transformations – Summation convention – contra variant, covariant and mixed tensors – Kronecker Delta – Tensors of rank greater than two – Scalars or invariants – Tensor fields – Symmetric and skew symmetric tensors – Fundamental operations with tensors – associated problems.

Unit 2

Tensor Analysis (Contd….) **(11 hrs)**

The line element and metric tensor – Conjugate or reciprocal tensors – Associated Tensors – Length of a vector, angle between vectors – Physical components – Christoffel's symbols – Transformation laws of Christoffel's symbols – Geodesics – Covariant derivative – Permutation symbols and tensors – Tensor form of gradient, divergence, curl – Intrinsic or absolute derivative – Relative and absolute tensors – associated problems.

Unit 3 **(8 hrs)**

Simple Application of Tensors in Physics

Tensors in dynamics of a Particle- work and energy - Lagrange's equations – Tensors in elasticity: Strain, stress and Hooke's law

Unit 4 **(11 hrs)**

Special theory of Relativity

Frames of reference, coordinate systems and coordinate transformations: Coordinate transformations not involving time – Coordinate transformations involving time.

Classical Mechanics

The law of inertia, inertial systems – Gallilean transformations – The force law and its transformation properties.

Unit 5 **(11 hrs)**

The Lorentz transformation

The relative character of simultaneity – The length of scales – The rate of clocks – The Lorentz transformation – The "kinematic" effects of the Lorentz transformation – The proper time interval – The relativistic law of the addition of velocities – The proper time of a material body – Simple Problems.

BOOKS FOR STUDY

Murray R. Spiegel, Vector Analysis and an Introduction to Tensor Analysis**,** New York McGraw – Schaum Publishing Company,. (1974).

UNITS 1 & 2: Chapter 8

Satya Prakash, Mathematical Physics with classical Mechanics, New Delhi Sultan Chand & Sons Publishing Company,. (2004)

UNIT 3: Section 3.38(Tensor in rigid body)

Peter Gabriel Bergmann, Introduction to the Theory of Relativity**,** New Delhi Prentice of India Private Limited,. (1976).

UNITS 4- 5: Chapter I, II, and IV

BOOKS FOR REFERENCE

Rindler W. Special Relativity. Edinburgh: Oliver and Boyd edition, 1972.

Robert Resnick. Introduction to Special Relativity. New Delhi: Wiley Eastern Pvt., Ltd., 1968.

Sokolnikoff, L.S. Tensor Analysis. 2nd ed. Canada: John Wiley and Sons,1964,

Synge L. John, and Griffith A. Byron. Principles of Mechanics. New York: McGraw Hill Book Company, Inc. 1970.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

Post Elective Course offered by the Department of Mathematics for M.A / M.Sc / M.Com. Degree Programmes

SYLLABUS

BASIC MATHEMATICAL METHODS

CODE: 11MT/PE/ BM24 **CREDITS : 4**
L T P : 3 1 0

TOTAL TEACHING HOURS : 52

OBJECTIVE OF THE COURSE

To understand and implement various mathematical techniques that are being applied for analyzing biological data.

Unit 1 **(10 Hrs)**

Algebra

Matrix – Basic Operations – Transpose – square matrices – non singular matrices – inverse of a matrix – determinants – Elementary applications. Characteristic Equation of a matrix – Cayley-Hamilton theorem (without proof) –Finding inverse of matrix using Cayley-Hamilton theorem –Simple problems

Unit 2 **(12 Hrs)**

Differential Calculus

Relation and Functions –Differentiation of standard forms (no derivation) – Rules of differentiation – Differentiation of inverse, hyperbolic and inverse hyperbolic functions – Logarithmic differentiation – Differentiation of implict functions – Parametric differentiation - successive differentiation – Formation of equations involving derivatives - simple problems only – meaning of the sign of the differential coefficient – maxima and minima - tangent and normal – Partial differentiation – Homogeneous functions - Euler's theorem (statement only) - simple problems.

Unit 3 **(12 Hrs)**

Integral Calculus

Methods of Integration – Properties of definite integral– Simple problems
Finite differences – Forward difference table – Interpolation methods: Newton's formula – Newton's backward formula(without proof) – Lagrange's method - Simple problems.

Unit 4 **(10 Hrs)**

Series

Arithmetic progression – Geometric progressions –.Simple problems. Expansions: exponential series – logarithmic series (without proof) – simple problems. Fourier series – Simple problems.

Unit 5 **(8 H**rs)

Differential Equations

First order ordinary differential equations – Second order ordinary differential equations with constant co-efficient – Simple problems

TEXT BOOKS

Narayanan S. and T. K. Manicavachagam Pillay, Calculus – Volume I. Chennai: S. Viswanathan Printers and Publishers, 2000

Chapter II : Sections 2.1-2.6,3.1-3.14,4.1,4.2,5,6.
Chapter III : Sections 1.1,1.6.
Chapter IV : Section 2.2
Chapter V : Section 1.5
Chapter VIII : Sections 1.1,1.2,1.6
Chapter IX : Section 1.2

Narayanan S. and T. K. Manicavachagam Pillay. Ancillary Mathematics-Book II. Chennai: S. Viswanathan Printers and Publishers, 2002.

Differential Equations
Chapter 2 Section 1 -4
Chapter 3 Section 1 -4

Rasheed, Abdul A. Allied Mathematics. Chennai: Vijay Nicole Imprints Private Limited, 2008.

Chapter 4 Section 4.2, 4.3
Chapter 7 Sections 7.1 -7.4, 7.6
Chapter 9 Section 9.1

Vittal, P.R. Business Mathematics. Chennai: Margham Publications, 2001

Chapter 1 : Page 37-49
Chapter 7 : Page 118 - 172
Chapter 10 : Page 276 -291
Chapter 14 : Page 595-644

REFERENCE BOOKS

Narayanan, S. and Manicavachagam Pillay, T. K. Calculus - Vol. II, Chennai: S. Viswanathan Printers & Publishers,2006.

Narayanan, S. and Manicavachagam Pillay, T. K. Calculus - Vol. III, Chennai: S. Viswanathan Printers & Publishers,2006.

Singaravelu, A. Differential Equations, Fourier Series And Laplace Transforms. Chennai: Meenakshi Traders, 2002

Vittal, P.R. Allied Mathematics**.** Chennai: Margham Publishers, 2001

End Semester Examination – 3 Hrs.

PATTERN OF EVALUATION

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086Post Elective Course Offered by Department of Mathematics for students of M A. / M.Sc. / M.Com. Degree Programme

SYLLABUS

QUANTITATIVE TECHNIQUES FOR MANAGEMENT

CODE : 11MT/PE/QM 24 **CREDIT : 4**

L T P : 3 1 0

TOTAL TEACHING HOURS : 52

OBJECTIVE OF THE COURSE

To provide quantitative basis to decision-making problem and simple mathematical technique for management problem.

Unit 1 **(8 hrs)**

Decision Analysis

Introduction – Decision-making problem – Decision-making Process – Decision-making Environment – Decisions Under Uncertainty – Decisions Under Risk – Decision-Tree Analysis.

Unit 2 **(7 hrs)**

Replacement Problem

Introduction – Replacement of Equipment/Asset that Deteriorates Gradually – Replacement of Equipment that Fails Suddenly – Recruitment and Promotion Problem.

Unit 3 **(14 hrs)**

Inventory Control – I

Introduction – Types of Inventories – Reasons for Carrying Inventories – The Inventory Decisions – Objectives of Scientific Inventory Control – Costs Associated with Inventories – Factors Affecting Inventory Control – An Inventory ontrol Problem – The Concept of EOQ – Deterministic Inventory Problems with and without Shortages – Problems of EOQ with Price Breaks – Multi-item Deterministic Problems.

Inventory Control – II

Inventory Problems with Uncertain Demand – Systems of Inventory control.

Unit 4 **(14 hrs)**

Queueing Theory

Introduction – Queueing System – Elements of a Queueing System – Operating Characteristics of a Queueing System – Deterministic Queueing System – Probability Distributions in Queueing Systems – Classification of Queueing Models – Definition of Transient and Steady States – Poisson Queueing Systems – Model-I{(M/M/I):(∞/FIFO)}, Model-III {(M/M/I: (N/FIFO), Model - IV (Generalized Model: Birth- Death Process), Model V {(M/M/C) : (∞/FIFO), Model VI {(M/M/C) : (N /FIFO)}.

Unit 5 **(9 hrs)**

Simulation

Introduction – Definition of simulation – process of simulation – simulation models – Event-Type Simulation – Generation of Random Numbers – Monte-Carlo Simulation – Simulation of Inventory Problems – Simulation of a Queueing System.

BOOK FOR STUDY

Swarup Kanti, Gupta P.K., Man Mohan,) Operations Research, (Thirteenth Edition), New Delhi: Sultan Chand & Sons, Educational Publishers, 2008.

Chapter	16	16.1 – 16.7	(Derivation of Formulae are not required)
Chapter	18	18.1 – 18.4	(Derivation of Formulae are not required)
Chapter	19	19.1 – 19.13	(Derivation of Formulae are not required)
Chapter	20	20.1 – 20.3	(Derivation of Formulae are not required)
Chapter	21	21.1 – 21.9	(Derivation of Formulae are not required)
Chapter	22	22.1 – 22.9	(Derivation of Formulae are not required)

BOOKS FOR REFERENCE

Gupta Prem Kumar, Hira D.S, Operations Research, New Delhi : S.Chand and Co., 2008.

Kapoor V.K., Operations Research, New Delhi : Sultan Chand, 1985.

Sundaresan V., Subramanian Ganapathy K.S., Ganesan K., Resource Management Techniques, Tamil Nadu: A.R. Publications, 2007

Taha A. Hamdy, Operations Research – An Introduction, VI Edition, New Delhi : Prentice Hall of India, 1998.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $2 \times 5 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
M.Sc. DEGREE: BRANCH I – MATHEMATICS
SYLLABUS
SUMMER INTERNSHIP

CODE :11MT/PN/SI 22 **CREDIT : 2**

OBJECTIVE OF THE COURSE

- To provide the necessary tools for research experience.
- To provide opportunity to gain experience in various fields.

Unit 1 **(13hrs)**

Research Methodology

Introduction, Motivation, Formulating a Research Problem, Data Collection, Analysing and Processing, Report Writing – Content – Format – Text Layout – Style – Packaging and Presentation, Characteristics of Good Reporting, Suggestions and Recommendations.

Unit 2 **(3Wks)**

Field Work

Summer Internship : a minimum period of three weeks during the summer holidays between the second and third semesters.

BOOKS FOR STUDY AND REFERENCE

Gopal Lal Jain, Research Methodology, Jaipur, India.: Mangaldeep Publications, 1998.

Lee Barry, Introducing Systems Analysis and Design, New Delhi : Galgotia Book Source, 1978.

Leslie Lamport, LaTeX : A Documentation Preparation System User's Guide and Reference Manual **,** Mass : Addison Wesley, 1994.

Steven G. Krantz, Mathematical Publishing, USA : AMS Publication, 2005.

EVALUATION:

INTERNAL TESTING : 20 Marks (Unit 1)
SUMMER INTERSHIP : 80 Marks (Unit 2 - Mathematical work (30) + Presentation (30) + Report (20))

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

COMPLEX ANALYSIS

CODE: 11MT/PC/CA 34 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To Introduce a modern treatment to classical Complex Analysis
- To develop clear thinking and analyzing capacity for research.

Unit 1 **(15 hrs)**

Complex Integration

Fundamental Theorems: Line integrals as functions of arcs – Cauchy's theorem for a rectangle – Cauchy's theorem in a disc.

Cauchy's Integral formula : the index of a point with respect to a closed curve – the integral formula.

General Form of Cauchy's Theorem: Chains and cycles – simple connectivity – homology – general statement of Cauchy's theorem.

Unit 2 **(14 hrs)**

Complex Integration (continued)

Harmonic Functions: Definition and basic properties – the mean value property - Poisson's formula – Schwarz's theorem – the reflection principle.

Series and Product Development

Partial fractions and factorization : Partial fractions – infinite products – canonical products - Gamma function

Entire functions: Jensen's formula

Unit 3 **(10 hrs)**

Series and Product Development (continued)

The Riemann Zeta Function: The product development – extension of $\zeta(z)$ to the whole plane – the functional equation – the zeros of the zeta function.

Unit 4 **(14 hrs)**

Series and Product Development (continued)

Normal Families**:** Equicontinuity – normality and compactness – Arzela's theorem – families of analytic functions.

Unit 5 **(12 hrs)**

Conformal mapping

The Riemann mapping theorem: statement and proof – Boundary behavior – use of the Reflection principle – Analytic Arcs.
Conformal mapping of polygons: The behavior at an angle – The Schwarz Christoffel formula.

BOOK FOR STUDY

Ahlfors, Lars V. Complex Analysis, An Introduction to the Theory of Analytic Functions of One Complex Variable. 3rd ed. International Series in Pure and Applied Mathematics. New Delhi: McGraw Hill International Book Co., 1979.

Chapter 4	Section 1 : 1.3 - 1.5
	Section 2 : 2.1,2.2
	Section 4 : 4.1- 4.4
	Section 6 : 6.1 - 6.5
Chapter 5	Section 2 : 2.1 – 2.4
	Section 3 : 3.1
	Section 4 : 4.1 – 4.4
	Section 5 : 5.1 – 5.4
Chapter 6	Section 1 : 1.1 – 1.4
	Section 2 : 2.1, 2.2.

BOOKS FOR REFERENCE

Conway John B., Functions of one complex variable, New Delhi. : Narosa Publishing House, 1978

Nehari Zeev., Conformal Mapping, (II Edition) New Delhi: Tata McGraw Hill Publishing Co., 1975

Ramanathan A., Mathematical Analysis – Part V – Functions of a complex variable**,** Madras : Sri Ramaprasad Press, 1967

RudinWalter, Real and Complex Analysis (II Edition), New Delhi : Tata McGraw Hill Publishing Co., 1974

Ruel V. Churchill and James Ward Brown, Complex Variables and Applications, Fifth Edition. New York: Mcgraw-Hill International editions, Mathematics Series, 1990

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

CONTINUUM MECHANICS

CODE :11MT/PC/CM 34 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce the concept of stress and strain analysis
- To introduce the laws involved in the motion of flow.

Unit 1 **(15 hrs)**

Analysis of stress

Continuum concept – Homogeneity, Isotropy - Mass - Density – Body forces, Surface forces – Cauchy's stress principle, the stress vector – State of stress at a point, Stress tensor – The stress tensor – Stress vector relationship – Force and moment equilibrium, Stress tensor symmetry – Stress transformation laws – Stress quadric of Cauchy – Principal stresses, Stress invariants, Stress ellipsoid – Deviator and Spherical stress tensors.

Unit 2 **(9 hrs)**

Deformation and Strain

Particles and points – Continuum configuration, Deformation and Flow concepts – Position vector, displacement vector – Lagrangian and Eulerian descriptions – Deformation gradients, Displacement gradients – Deformation tensors.

Unit 3 **(14 hrs)**

Strain Tensors, Motion and Flow

Finite strain tensors – Small deformation theory, Infinitesimal strain tensors – Relative displacements, Linear rotation tensor, Rotation vector – Principal strains, Strain invariants, Cubical dilatation - Spherical and Deviator strain tensors - Motion, Flow, Material derivative – Velocity, Acceleration, Instantaneous velocity field – Path lines, Stream lines, Steady motion.

.

Unit 4 **(16 hrs)**

Fundamental Laws of Continuum Mechanics

Rate of deformation – vorticity – natural strain – increments, physical interpretation of rate of deformation and vorticity tensors – material derivatives of volume, area and line elements - Conservation of mass, Continuity equation – Linear momentum principle, Equations of motion, Equilibrium equations – Angular momentum principle.

Unit 5 **(11 hrs)**

Linear Elasticity

Generalized Hooke's Law, Strain energy function - Isotropy, Anisotropy, Elastic symmetry - Isotropic media, Elastic Constraints.

BOOK FOR STUDY

Masc George E., Theory and Problems of Continuum Mechanics. U.S.A: Schaum's Outline Series, McGraw Hill Book Company, 1970.

Chapter 2	Sections 2.1 - 2.10, 2.14
Chapter 3	Sections 3.1 - 3.8, 3.13, 3.14
Chapter 4	Sections 4.1 - 4.6
Chapter 5	Sections 5.1 - 5.3
Chapter 6	Sections 6.1 - 6.3

BOOKS FOR REFERENCE

Chandrasekharaiah D.S. and Debnath Lakenath, ,Continuum Mechanics**,** Bangalore: Prism Books Pvt. Ltd., 1994.

Chung T.J.,Continuum Mechanics., New York: Prentice – Hall International Inc.,. 1988

Chatterjee Rabindranath, Mathematical Theory of Continuum Mechanics, Chennai: Narosa Publishing House, 1999

Raymond J. Roark. Formulas for Stress and Strain, New York: McGraw-Hill Book Company Inc., 1954

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

GRAPH THEORY

CODE :11MT/PC/GT 34 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce basic concepts in Graph Theory
- To introduce concepts of Interconnection Networks and Network Topology

Unit 1 **(16 hrs)**

Graphs, Subgraphs and Trees

Graphs and simple graphs – Graph isomorphism – Incidence and adjacency matrices – Subgraphs – Vertex degrees – Paths and connection – Cycles – shortest path problem – Dijkstras algorithm – Trees – Cut edges and bonds – Cut vertices.

Unit 2 **(12 hrs)**

Connectivity, Matching, Independent sets and Domination number

Connectivity – blocks – Matching – covering – Independent sets – Dominating sets.

Unit 3 **(15 hrs)**

Euler Tours and Hamilton Cycles and Vertex Colourings

Euler tours – Hamilton cycles – Chromatic number – Brooks' theorem – Chromatic polynomials.

Unit 4 **(12hrs)**

Planar Graphs

Plane and planar graphs – Euler's formula – Kuratowski's theorem - Five-colour theorem – Directed graphs.

Unit 5 **(10hrs)**

Interconnection Networks

Interconnection Networks– basic principles of Network design – Hypercube Networks – de Bruijn Networks – Kautz Networks – Circulant Networks – Embedding problem .

BOOKS FOR STUDY

Bondy J.A., Murty U.S.R. Graph Theory with Application. London: The Macmillan Press Ltd., 1976.

Chapter 1	Sections 1.1 to 1.8
Chapter 2	Sections 2.1 to 2.3
Chapter 3	Sections 3.1, 3.2
Chapter 4	Sections 4.1 to 4.2 (upto Theorem 4.3 only)
Chapter 5	Sections 5.1 to 5.2
Chapter 7	Section 7.1
Chapter 8	Sections 8.1, 8.2, 8.4
Chapter 9	Sections 9.1, 9.3, 9.5 (Theorem 9.10statement only and Omit Lemma 9.10.1 to 9.10.4), 9.6 (Omit Theorem 9.12)
Chapter 10	Sections 10.1

Xu Junming, Topological Structure and Analysis of Interconnection Networks. U.S.A.: Kluwer Academic Publishers, 2001.

Chapter 1 Sections 1.1.2, 1.2.4, 1.3.1 to 1.3.2, 1.4.1 (definitions only), 1.6.1 to 1.6.2

Chapter 3 Sections 3.1.1 to 3.1.2, 3.2.1, 3.2.6, 3.3.1, 3.4.5 (Theorem 3.4.12 statement only), (Omit Theorem 3.2.1, 3.2.14, 3.3.1, 3.4.13)

BOOKS FOR REFERENCE

Aldous Joan M. and Robin J. Wilson. Graphs and Applications. An Introductory Approach, Springer International Edition , 2007.

Arumugam. S, and S. Ramachandran. Invitation to Graph Theory. New Gamma Publishing House, 1994.

Deo Narsingh. Graph Theory and Applications. New Delhi: Prentice Hall of India, 1990.

Diestel Reinhard. Graph Theory. New York: Springer, 2006.

Harary F. Graph Theory. London: Addison Wesley Publishing Company, 1969.

Parthasarathy, K.R. Basic Graph Theory. New Delhi: Tata McGraw Hill Book Publishing Company, 1994.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

MATHEMATICAL STATISTICS

CODE :11MT/PC/MS 34 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To impart extended knowledge of characteristic function and its properties in the theoretical statistical distributions.
- To introduce advanced concepts of estimation theory.
- To introduce essential concepts of convergence for statistical distributions.

Unit 1 **(10hrs)**

Characteristic functions

Properties of Characteristic functions, Characteristic functions of moments, characteristic function of sum of independent random variables, determination of the distribution function by characteristic function.

Unit 2 **(10hrs)**

Probability Distributions

One point and Two point distribution, Polya distribution, Gamma distribution, Beta distribution, Cauchy & Laplace distribution.

Unit 3 **(16 hrs)**

Limit theorems

Stochastic convergence, Bernoulli's Law of large numbers, Convergence of sequence of distribution function. Levy Cramer Theorem, De-Moviers Laplace Theorem, Lindberg Levy Theorem, Poisson, Chebyshev and Khintchin Law of large Numbers.

Unit 4 **(16 hrs)**

Sample Moments and Significance test

Notions of sample, statistic - distribution of arithmetic mean, chi-square distribution, Distribution of ($\overline{X}$,S), Students – t distribution, Fisher's Z distribution, concept of statistical test, parametric test – for small and large sample, Chi-square test, Independence of test by contingency table.

Unit 5 **(13 hrs)**

Theory of Estimation

Point estimation, consistent estimates, un-biassed estimates, the sufficiency of an estimate, efficiency of an estimate, Rao-Cramer Inequality, Asymptotically most efficient estimation, Methods of finding estimate, Confidence Interval.

BOOK FOR STUDY

Fisz Marek. Probability Theory and Mathematical Statistics. 3rd ed. New York: John Wiley and Sons. Inc., 1963.

Chapter IV	Section 4.1, 4.2, 4.4, 4.5
Chapter V	Section 5.1, 5.4, 5.8, 5.9, 5.10
Chapter VI	Section 6.2 – 6.4, 6.6 – 6.8 & 6.11
Chapter IX	Section 9.1 – 9.7 (Omit 9.6E.)
Chapter XII	Section 12.1 – 12.4 & 12.7
Chapter XIII	Section 13.2 – 13.8 (Omit 13.7 C & D, 13.8B)

BOOKS FOR REFERENCE

Bhat B.R., Modern Probability Theory**,** New Delhi: Wiley Eastern Ltd., 1981.

Freund. E. John, Mathematical Statistics (II Edition), New Jersey: Prentice Hall Inc., 1971.

Mood A.M., Graybill, F.A. and Boes, D.C., Introduction to the Theory of Statistics. 3rd ed. New Delhi: McGraw Hill Book Co. 1974

Rao, C.R. Linear Statistical Inference and its application. 2nd ed. New Delhi: Wiley Eastern Pvt Ltd., 1974.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C: $3 \times 20 = 60$ (Four questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

Post Elective Course Offered by Department of Mathematics to students for M. A. / M. Sc. / M.Com. Degree Programmes

SYLLABUS

DISCRETE MATHEMATICS

CODE : 11MT/PE/DM 34 **CREDITS: 4**
L T P : 3 1 0
TOTAL TEACHING HOURS : 52

- Offered to those who studied Mathematics or Business mathematics in their secondary level of Education.
- Not offered to the students who have done Discrete Mathematics in their under graduation.

OBJECTIVES OF THE COURSE

- To augment knowledge in mathematical structures that are functionally discrete
- To introduce automata theory.

Unit 1 **(10 Hrs)**

Logic and Propositional Calculus

Introduction to Logic and Algebra of Propositions – Arguments – Logical Implication – Propositional Functions, Quantifiers – Negation of Quantified Statements.

Unit 2 **(10 Hrs)**

Ordered Sets

Introduction – Ordered sets – Hasse diagrams of Partially ordered sets – Consistent enumeration – Supremum and Infimum – Isomorphic ordered sets – Well ordered sets.

Unit 3 **(10 Hrs)**

Lattices

Lattices – Bounded lattices – Distributive lattices – Complements, Complemented lattices.

Unit 4 **(11 Hrs)**

Boolean Algebra

Introduction – Basic definitions – Duality – Basic theorems – Boolean Algebras as Lattices – Representation theorem – Sum-of-Products form for sets – Sum-of-Products form for Boolean Algebras – Minimal Boolean expression, Prime Implicants – Logic gates and circuits – Truth tables, Boolean functions.

Unit 5 **(11 Hrs)**

Languages, Grammars, Machines

Introduction – Alphabet, Words, Free semigroup – Languages – Regular expressions, regular languages – Finite state automata – Grammers – Finite state machines – Godel numbers – Turing Machines – Computable functions.

BOOK FOR STUDY

Lipschutz Seymour, and Marc Lars Lipson. Schaum's outline of Theory and Problems of Discrete Mathematics. 2nd ed. Eleventh reprint 2002, New Delhi: Tata McGraw-Hill Publishing Company Limited, 1999.

Chapter 4	Sections 4.9 – 4.12
Chapter 14	Sections 14.1 – 14.11
Chapter 15	Sections 15.1 – 15.11
Chapter 13	Sections 13.1 – 13.10

BOOKS FOR REFERENCE

Raju Solai, Chandrasekar, Krishnamoorthy and Ganesh. Discrete Mathematical Structures. Kumbakonam: Anuradha Agencies, 2003.

Sharma. Discrete Mathematics. Chennai: Macmillan India Ltd., 2003.

Biggs, Norman. L. Discrete Mathematics. 2nd ed. India: Oxford University Press, 2003.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

Post Elective Course Offered by Department of Mathematics to students for M. A. / M. Sc. / M.Com. Degree Programmes

SYLLABUS

OPERATIONS RESEARCH

CODE :11MT/PE/OR 34 **CREDIT : 4**

L T P : 3 1 0

TOTAL TEACHING HOURS : 52

ELIGIBILITY CRITERION

- Offered to those who have not done Operations Research in their under graduate degree course.

OBJECTIVES OF THE COURSE

- To provide few simple mathematical models and hence to develop logical skill to problem solving.

Unit 1 **(3 hrs)**

Introduction to Operations Research

The art and science of operations Research – Art of modeling – types of models – phases of or study.

Unit 2 **(12 hrs)**

Linear Programming

Introduction-Formulation of linear programming models-Graphic solution of linear programming models-maximization with less than or equal constraint.

Unit 3 **(12 hrs)**

Transportation model

Solution of the transportation problem – the transportation technique – determination of the starting solution.

Assignment method

Definition – Hungarian method for solving assignment problem.

Unit 4 **(12hrs)**

Branch and bound method

Introduction- Branch and bound algorithm for assignment problem.

Sequencing problem

Introduction- Two machine sequencing problem.

Unit 5 **(13 hrs)**

PERT and CPM

Introduction – PERT network – Time estimates for activities – earliest expected completion time of events – latest allowable event completion time – event slack rimes – critical path probability of completing events on schedule.

BOOK FOR STUDY

Hamdy A Taha**,** Operations research. New Delhi: Prentice Hall of India private limited.

Chapter 1 : 1.1, 1.3, 1.4, 1.7
Chapter 6 : 6.2, 6.2.1 A, 6.2.2 A, B, 6.3

Billy, E Gillett. Introduction to Operations Research. Tata McGraw Hill Publishing company

Chapter 3 : 3.1 - 3.4
Chapter 5 : 5.1 - 5.2
Chapter 7: 7.1 – 7.2
Chapter 12 : 12.1 – 12.8

BOOKS FOR REFERENCE

Don. T. Phillips, Operations Research-Principles and Practice, New York: John Wiley & Sons, 1987

Gupta Premkumar and Hira D.S. Operations Research**,** New Delhi: S.Chand & Company Pvt., Ltd., 2007

Paul Loomba, N., (1996), Linear Programming, McGraw-Hill Company Inc, New Delhi.

Shenoy G.V, (1989), Linear Programming_Methods and Applications, Wiley Eastern, New Delhi.

Swarup Kanti, Gupta P.K., Man Mohan, Operations Research, New Delhi: Sultan Chand & Sons, 2009

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI - 600 086

Post Elective Course Offered by Department of Mathematics to students for M. A. / M. Sc. / M.Com. Degree Programmes

SYLLABUS
RESEARCH IN STATISTICS

CODE : 11MT/PE/RS 34 **CREDIT : 4**
L T P : 3 1 0
TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To understand and learn research techniques and methodologies
- To acquire basic skills for designing and implementing research projects in areas of Public Relations.

Unit 1 **(10 hrs)**

Research Methodology

An Introduction - Meaning of Research - Defining a research Problem - Research Design

Unit 2 **(10 hrs)**

Sampling Design

Implications of a Sample - Characteristics of a Good Sampling Design - Different Types of sampling Designs - Probability and non-Probability sampling - Sampling Error – Advantages and disadvantages of sampling

Unit 3 **(10 hrs)**

Tools for Research & Reporting

Methods of Data Collection - Processing and analysis of Data - Report writing: Chapter outlines, style and formatting

Unit 4 **(10 hrs)**

Descriptive Statistics

Frequency Distribution - Measures of Central Tendency - Measures of Dispersion - Normal Distribution - Graphical Representation

Unit 5 **(12 hrs)**

Testing of Hypothesis

Testing of hypothesis - Confidence Intervals - Chi- Square Tests

BOOKS FOR STUDY

Arora P.N and Arora S., Statistics for Management, New Delhi: S. Chand & Company Ltd, 2008

Chakraworthy, K., Research Methodology, New Delhi: Sumit Enterprises, 2006

Kothari.C.R. Research Methodology ,New DelhiWILEY Eastern Limited, 1985

BOOKS FOR REFERENCE

Arya, P.P. and Yesh Pal, Research Methodology in Management: Theory and Case Studies, New Delhi: Deep and Deep Publications Pvt. Ltd., 2004.
Blalock, Jr. Hubert M., Social Statistics, Second Edition Washington: McGraw-Hill Series, 1972.

Borse, M. N, Handbook of Research Methodology, Jaipur: Shree Nivas Publication, 2005.

Campbell. T.D and Russo, Jean, Social Measurement, London: Sage Publications, 2001.

Edwards, Allen L., Experimental Design in Psychological Research, Third Edition, New York: Amerind Publishing Co. Pvt. Ltd., 1968.

Federer, W.T., Experimental Design: Theory and Application, New Delhi: Oxford & IBH Publishing Co., 1967.

Giri, A.K (ed.), Creative Social Research, New Delhi: Vistaar Publication, 2004.

Hewson, Claire et.al, Internet Research Methods, London: Sage Publications, 2003.

Holliday, A, Doing and Writing Qualitative Research, London: Sage Publications, 2002.

Hunt, Merton., Profiles of Social Research: The Scientific Study of Human Interactions, Bombay: Popular Prakasham, 1989.

Jain, G.L, Research Methodology, Jaipur: Mangal Deep Publications, 1998.

Kerlinger, N. Fred, Foundations of Behavioral Research, Second Edition, New York: Holt, Rinehart and Winston, Inc., 1970.

King, G. et.al, Designing Social Inquiry, New Jersey: Princeton University Press, 1994.

McCall, B. Robert., Fundamental Statistics for Psychology, Second Edition, New York: Harcourt Brace Jovanovich Inc., 1975.

Oppenheim, A.N, Questionnaire Design and Attitude Measurement, London: Heinemann, 1966.

Shajahan. S. Dr., Research Methods for Management, Revised Edition, Mumbai: Rashmi Printers., 2004.

Sharma, K.R., Research Methodology**,** Jaipur: National Publishing House, 2002.

Singleton, R. and Straits, B., Approaches to Social Research**,** New York: OUP, 1998.

Somekh Bridget and Cathy Lewin (ed.), Research Methods in the Social Sciences**,** New Delhi: Vistaar Publications India Pvt. Ltd., 2005.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : 5×2 = 10 (One question to be set from each unit).
Section B : 5×6 = 30 (Seven questions to be set, without omitting any unit).
Section C : 3×20 = 60 (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I - MATHEMATICS

SYLLABUS
(Effective from the academic year 2011 – 2012)

SOFT SKILLS

CODE : 11MT/SK/SS 42 **CREDITS : 2**

L T P : 2 0 0

TOTAL TEACHING HOURS : 26

OBJECTIVES OF THE COURSE

- To empower and create opportunities for self development
- To instill confidence and face challenges.

Unit 1 **(6 hrs)**

Behavioural Traits

1.1 Self Awareness
1.2 Communication Skills – Verbal and Non Verbal
1.3 Leadership Qualities
1.4 Etiquette and mannerisms
1.5 Experiential Learning – Based on activities

Unit 2 **(5 hrs)**

Team Work

2.1 Interpersonal Skills
2.2 People Management
2.3 Creative Thinking
2.4 Critical Thinking
2.5 Experiential Learning – Based on activities

Unit 3 **(5 hrs)**

Time Management

3.1 Importance of time management
3.2 Planning and Prioritizing
3.3 Organizing skills
3.4 Action Plan
3.5 Experiential Learning – Based on activities

Unit 4 **(5 hrs)**

Conflict Resolution

4.1 Reasons for conflict
4.2 Consequences of conflict
4.3 Managing emotions

4.4 Methods of resolving conflicts
4.5 Experiential Learning – Based on activities

Unit 5 **(5 hrs)**

Career Mapping

5.1 Goal setting
5.2 Career Planning
5.3 Resume writing
5.4 Handling Interviews
5.5 Experiential Learning – Based on activities

BOOKS FOR REFERENCE

Khera, Shiv, (2002), **You Can Win,** Macmillan India Ltd., Delhi.

Mishra, Rajiv K., (2004), **Personality Development : Transform Yourself,** Rupa and Co., New Delhi.

Newstrom, John W. and Scannell, Edward E., (1980), **Games Trainers Play: Experiential Learning,** Tata McGraw Hill, New Delhi.

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

DIFFERENTIAL GEOMETRY

CODE : 11MT/PC/DG 44 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce advanced concepts in differential geometry of space curves
- To introduce the fundamental forms
- To lay the foundation for study of surfaces leading to advanced courses in Geometry

Unit 1 **(14 hrs)**

Curves in the plane and in Space

Curve – Arc-length – Reparametrization

Curvature – Plane Curves – Space Curves

Unit 2 **(12 hrs)**

Surfaces in Three Dimensions

Surface – Smooth Surface – Tangents, Normal and Orientability – Examples of Surfaces

Unit 3 **(15 hrs)**

The First Fundamental Form

Lengths of Curves on Surfaces – Isometrics of Surfaces – Conformal Mappings of Surfaces – Surface Area

Unit 4 **(15 hrs)**

Curvature of Surfaces

The Second Fundamental Form – The Curvatures of Curves on a Surface – The Normal and Principle Curvatures

Unit 5 **(9 hrs)**

Gaussian Curvature

The Gaussian and Mean Curvatures

Gauss's Theorema Egregium

Gauss's Remarkable Theorem

BOOK FOR STUDY

Pressley, Andrew. Elementary Differential Geometry. London : Springer – Verlag, 2001.

Chapter 1	Sections	1.1 – 1.3
Chapter 2	Sections	2.1 – 2.3
Chapter 4	Sections	4.1 – 4.4
Chapter 5	Sections	5.1 – 5.4
Chapter 6	Sections	6.1 – 6.3
Chapter 7	Section	7.1
Chapter 10	Section	10.1

BOOKS FOR REFERENCE

Ethan D. Bloch. A First Course in Geometric Topology and Differential Geometry, Boston : Birkhäuser,1997.

Struik, Dirk J. Lectures on Classical Differential Geometry**,** II Edition, London : Addison – Wisely Publishing Co.,1961.

Wardle, K.L. Differential Geometry**,** London : Routledge and Kegan Paul, 1965.

Weatherburn, C.E. Differential Geometry of Three Dimensions, London : The Syndics of the Cambridge University Press, 1971.

Willmore, T.J. An Introduction to Differential Geometry**,** London : Oxford University Press, 1972.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
M.Sc. DEGREE : BRANCH I – MATHEMATICS
SYLLABUS

DISSERTATION

CODE :11MT/PC/DI 44 **CREDIT : 4**

Unit 1 **(18 hrs)**

Practical Application

Mathematical Software – **MATHCAD**

Unit 2 **(60 hrs)**

Preparation of Dissertation

The Dissertation shall contain at least 35 pages and shall be typed with double spacing. The format for the thesis is as follows:

1. Cover page shall contain
   a) Title of the dissertation
   b) Dissertation submitted at the major level for the M.Sc degree course in the IV semester.
   c) Name of the Candidate
   d) Department of Mathematics
      Stella Maris College (Autonomous), Chennai – 86
   e) Month, Year
2. The dissertation shall contain
   a) Contents page
   b) i. Certificate page
      ii. Acknowledgement page
   c) At least 3 Chapters including an introductory chapter (comprising motivation, basic concepts needed / used in the thesis and outline of the thesis)
   d) Conclusions / interpretations arrived at may be given at the end of each problem / each chapter concerned.
   e) List of figures / list of abbreviations (if needed) shall be given as an appendix
   f) Bibliography shall be given in alphabetical / chronological order at the end.
3. Each candidate may prepare 3 copies of the thesis using a Scientific Word or Word, one copy for her and submit 2 copies to the Head of the department 15 days before the commencement of the fourth semester examination.
4. The candidate may be advised that the dissertation will be valued and given credit on the criteria of
   a) Motivation towards the chosen area / formulation of the problem
   b) Methodology, Analysis, logic and reasoning
   c) Capacity to interpret the results obtained

5. The Controller of Examination is requested to arrange for the valuation of the Dissertation as well as the conduct of the Viva – Voce at the college where the candidates take examinations, within two weeks of the last date of examination for M.Sc. Degree. The panel of examiners will consist of an external examiner and the guide. The guidelines for the Viva-Voce examiners would be that a) They will satisfy themselves that this is a work of the candidate as certified by the department b) The thesis is in the given form and c) The candidate has clear understanding of the concepts, discussed in the thesis.

The Department should certify as follows :
This is to certify that the dissertation in the broad area _____ titled _____ is submitted by _____- at the major level for the degree of Master of Science (Mathematics) during the year_____

sd/ sd/
Head of the Department Guide

6. A) Guidelines for evaluation

The maximum mark for the dissertation is 75 divided into four components

i.	Style, format and neatness in presentation	10
ii	Chapterisation, logic and reasoning	10
iii	Methodology – Analysis and interpretation	30
iv	Viva	25

B) There will be double valuation for the dissertation by the guide and an External examiner who will conduct the viva – voce. The norms for evaluation will be same as applicable for theory papers.

BOOKS FOR STUDY AND REFERENCE

Harper Brain D., Meriam J.L., Kraige L.G., Solving Dynamics problems in Mathcad – Engineering Mechanics Dynamics, (sixth edition), New Jersey: John Wiley & Sons Inc., 2007.

Larsen Ronald W., Introduction to Mathcad 13, New Jersey: Pearson Prentice Hall Pearson Education Inc., 2007

Steven G. Krantz, Mathematical Publishing, USA : AMS Publication, 2005.

Evaluation:

Internal Testing : 25 marks
External Testing :
Dissertation : 50 marks
Viva : 25 marks

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

FUNCTIONAL ANALYSIS

CODE:11 MT/PC/FA 44 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce an abstract approach to analysis
- To highlight the interplay between algebraic structures and distance structures.
- To introduce Operators theory and its application to finite dimensional spectral Theory.
- To introduce the concept of Banach Algebra

Unit 1 **(15 hrs)**

Banach spaces

The Definition and some examples – Continuous linear transformations – The Hahn – Banach theorem - The natural embedding of N in N^{**} (concept of weak and strong topology not included) – The open mapping theorem – Conjugate of an operator.

Unit 2 **(15hrs)**

Hilbert Spaces

The definition and some simple properties - Orthogonal complement - Orthonormal sets - The conjugate space H^{*} **.**

Unit 3 **(13 hrs)**

Operator Theory

The adjoint of an Operator - Self - Adjoint Operators - Normal and Unitary Operators - Projections.

Unit 4 **(12hrs)**

Finite - Dimensional spectral theory

Matrices - Determinants and the spectrum of an operator - Spectral theorem.

Unit 5 **(10 hrs)**

Banach Algebras

The definition and some examples - Regular and singular elements - Topological divisors of zero

BOOK FOR STUDY

Simmons, G.F. Introduction to Topology and Modern Analysis. New York: McGraw Hill Book Co. Inc., 1963.

Chapter	9	Sections 46 – 51
Chapter	10	Sections 52 – 59
Chapter	11	Sections 60 – 62
Chapter	12	Sections 64 – 66

BOOKS FOR REFERENCE

Kreyszig, Erwin Introductory Functional Analysis with Applications. New York: John Wiley and sons, 1978

Siddiqi, A.H. Functional Analysis with Applications**.** New Delhi: Tata McGraw Hill Publishing Company Limited, 1989.

Somasundaram, D. Functional Analysis. Madras: S. Viswanathan Pvt., Ltd., 1994.

Vasishtha, A.R. and Sharma J.N. Functional Analysis. Meerut: Krishna Prakasham Media (P) Ltd., 1995-96.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

PARTIAL DIFFERENTIAL EQUATIONS

CODE : 11MT/PC/PD 44 **CREDIT : 4**

L T P : 4 1 0

TOTAL TEACHING HOURS : 65

OBJECTIVES OF THE COURSE

- To introduce mathematical techniques for analyzing and solving partial differential equations.
- To apply various methods to dynamical problems of practical interest

Unit 1 **(15 hrs)**

First Order Partial Differential Equations

Introduction – Partial differential equations of first order in two independent variables – Formulation of first order partial differential equations – Solution of linear first order partial differential equations(Lagrange's Method) – Integral Surfaces passing through a given curve – Surfaces orthogonal to a given system of surfaces – Compatibility – Classification of the solutions – Solution of non-linear partial differential equations of first order – Charpit's Method – Jacobi's Method – Special types of first order equations – Cauchy's Method of Characteristics

Unit 2 **(13 hrs)**

Second Order Partial Differential Equations

Origin of second order partial differential equations – Linear partial differential equations with constant coefficients – Method of solving linear partial differential equations – Solution of reducible equations – Solution of irreducible equations with constant coefficients – Rules for finding complementary functions – Rules for finding particular integrals – Classification of second order partial differential equations – Canonical forms

Unit 3 **(13 hrs)**

Elliptic Differential Equaitons

Occurrence of the Laplace and Poisson equations – Derivation of Laplace equation – Derivation of Poisson equation – Boundary value problems – Separation of variables method – Laplace equation in cylindrical coordinates – Laplace equation in Spherical coordinates – Interior Dirichlet problem for a circle – Exterior Dirichlet problem for a circle – Interior Neumann problem for a circle

Unit 4 **(13 hrs)**

Parabolic Differential Equations

Occurrence of the diffusion equation – Boundary conditions – Separation of variables method – Diffusion equations in cylindrical coordinates – Diffusion equations in Spherical coordinates – Transmission line problems – Maximum-Minimum Principle – Uniqueness theorem

Unit 5 **(11 hrs)**

Hyperbolic Differential Equations

Occurrence of the wave equation – Derivation of one-dimensional wave equation – Reduction of one-dimensional wave equation to canonical form and its solution – D'Alemberts solution of one-dimensional wave equation – Separation of variable method.

BOOKS FOR STUDY

Sharma, J.N. and Kehar Singh. Partial Differential Equations for Engineers and Scientists. New Delhi: Narosa Publishing House, 2000

Chapter 1	Sections 1.1. – 1.9
Chapter 2	Sections 2.1. – 2.4.
Chapter 3	Sections 3.1. – 3.8.
Chapter 4	Sections 4.1. – 4.8.
Chapter 5	Sections 5.1. – 5.5.

BOOKS FOR REFERENCE

Donald Greenspan, Introduction to Partial Differential Equations, New Delhi: Tata McGraw – Hill Publishing Co. Ltd., 1961

Raisinghania M.D. Advanced differential equations, New Delhi: S.Chand & Co. Ltd., Ramnagar,. 2000

Sneddon Ian N. Elements of Partial Differential Equations**,** International Student Edition, New Delhi: McGraw – Hill Book Co. Inc. 1957

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

FLUID DYNAMICS

CODE :11MT/PE/FD 44 **CREDIT : 4**

L T P : 3 1 0

TOTAL TEACHING HOURS : 52

OBJECTIVE OF THE COURSE

To introduce the concept of fluids in motion, equation of motion of a fluid, two dimensional flow, three dimensional flow and viscous flow.

Unit 1 **(9 hrs)**

The Kinematics of Fluids in motion

Real fluids and Ideal fluids – Velocity of a fluid at a point - Stream lines and path lines – Velocity potential – Vorticity – Local and particle rates of change – Equation of continuity – Acceleration of a fluid – conditions at a rigid boundary.

Unit 2 **(9 hrs)**

Equations of Motion of a fluid

Pressure at a point in a fluid at rest – pressure at a point in a moving fluid – conditions at a boundary of two inviscid Immiscible fluids – Euler's equation of Motion – Bernoulli's equation – Steady motion under conservative body forces – Kelvin's Circulation theorem.

Unit 3 **(9 hrs)**

Some Two and Three – Dimensional Flows

Sources, Sinks and doublets – Meaning of two-dimensional flows – stream function – complex potential for two dimensional irrotational incompressible flow.

Unit 4 **(9 hrs)**

Complex Velocity Potential

Complex velocity potential for standard two dimensional flows - Milni – Thomson Circle theorem – Extension of the circle theorem – theorem of Blasius.

Unit 5 **(16 hrs)**

Viscous Flow

Stress Components in a real fluid – coefficient of viscosity and Laminar flow – Navier – Stokes equation of motion of a viscous fluid – some solvable problems in viscous flow – steady viscous flow in tubes of uniform cross-section.

BOOK FOR STUDY

Chorlton.F. Text book of Fluid Dynamics**.** 1st ed. New Delhi: B.S. Publishers & Distributors, Shadara, 1985.

Chapter 2	Sections 2.1 to 2.10;
Chapter 3	Sections 3.1 to 3.7, 3.12,
Chapter 4	Sections 4.1, 4.2.
Chapter 5	Sections 5.1 to 5.6, 5.8, 5.9,
Chapter 8	Sections 8.8 to 8.11.

BOOKS FOR REFERENCE

Duncan W.J., Thom. A.S. and Young A.D., Mechanics of Fluids**,** Great Britain : The English Language book society, 1975.

Rutherford, Fluid Dynamics**,** Great Britain : Oliver and Boyd Publishers, Edition 1959.

Thomson Milne L.M., Theoretical Hydro Dynamics**,** (IV Edition), New York. : Macmillan and Co., 1960.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (One question to be set from each unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set, without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086
M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

MATHEMATICAL MODELING

CODE : 11MT/PE/MM 44 **CREDIT : 4**
L T P : 3 1 0
TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To translate real life situations into mathematical models
- To solve problems through mathematical tools

Unit 1 **(10 hrs)**

Mathematical Modeling and Dimensional Analysis

Need for Mathematical Modeling – Principles of Mathematical Modeling – Some methods of Mathematical Modeling – Dimensions and units – Dimensional Homogeneity – dimensional analysis – determining dimensional analysis – Systems of units – Problems.

Unit 2 **(10 hrs)**

Scale

Abstraction and scale – Size and shape: Geometric scaling – Size and function I: Birds and flight – Consequences of choosing a scale – Problems.

Unit 3 **(12 hrs)**

Traffic Flow Models

Freeway Traffic – Macroscopic traffic flow models – Microscopic traffic models – Problems.

Unit 4 **(10 hrs)**

Modeling Free Vibration(linear model)

The freely-Vibrating Pendulum – I: Formulating a model – The freely-Vibrating Pendulum – II: The linear model – Stability of a Two-mass pendulum

Unit 5 **(10 hrs)**

Modeling Free Vibration(Nonlinear model)

The freely-Vibrating Pendulum – III: The Nonlinear model – Modeling the Population growth of Coupled Species – Problems.

BOOK FOR STUDY

Dym, Clive L. Principles of Mathematical Modeling. 2nd ed. USA : Academic Press, 2006.

Chapter 1	Sections 1.1 to 1.3
Chapter 2	Sections 2.1 to 2.5, 2.8
Chapter 3	Sections 3.1 to 3.3, 3.6, 3.9
Chapter 6	Sections 6.1 to 6.3, 6.6
Chapter 7	Sections 7.1, 7.2, 7.4 to 7.6, 7.9

BOOKS FOR REFERENCE

Gershenfeld Neil, The Nature of Mathematical Modeling, New York : Cambridge University Press, 1999

Kapur, J. N., Mathematical Modeling, New York : John Wiley & Sons, 1988.

Temam Roger M. and Miranville Alain M. Mathematical Modeling in Continuum Mechanics. 2nd ed. New York : Cambridge University Press, 2005.

.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).

STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI – 600 086

M.Sc. DEGREE : BRANCH I – MATHEMATICS

SYLLABUS

PROBABILITY AND RANDOM PROCESS

CODE : 11MT/PI/PR 44 **CREDIT : 4**

L T P : 3 1 0

TOTAL TEACHING HOURS : 52

OBJECTIVES OF THE COURSE

- To introduce the different techniques of stochastic process and Markov chains.
- To introduce standard concepts and methods of stochastic modeling
- To provide new perspective, methodology, models and intuition and aid in other mathematical and statistical studies

Unit 1 **(12hours)**

Random Variables

Definition, discrete, continuous- distribution function, p.d.f, pm.f- Expectation, moments-Special probability distributions- Binomial, Geometric, Poisson, Uniform, Exponential, Erlang, Normal.

Unit 2 **(12hours)**

Multiple Random Variables

Joint cdf- properties-conditional distributions-conditional mean- covariance-correlation function

Unit 3 **(12hours)**

Introduction to Random Processes

Definition, Classification, Characterizing a random process- Cross- correlation, cross-covariance functions- Stationary random process- Ergodic process- power spectral density- discrete –time random process

Unit 4 **(12hours)**

Models of Random Processes-

Bernoulli Process- Random walk- Gaussian Process- Poisson Process

Unit 5 **(4hours)**

Markov Process

Discrete time Markov Chain- Continuous time Markov Chain

BOOK FOR STUDY

Oliver, C Ibe. Fundamentals of Applied Probability and Random Processes. Elsevier: First Indian Reprint 2007

Chapter 2.
Chapter3: 3.1 to 3.4
Chapter 4: 4.3, 4.4, 4.7 to 4.11
Chapter5: 5.1 to 5.7
Chapter 8
Chapter 10.

BOOKS FOR REFERENCE

Kannan D. An Introduction to Stochastic Processes. New York : North Holland, 1979.

Karlin, S., and H.M. Taylor. A First Course in Stochastic Processes. 2nd ed. New York : Academic Press, 1975.

Medhi, J. Stochastic Process**.** New York : Wiley Eastern Limited, 1984.

Resnick, Sidney I. Adventures in Stochastic Processes. Boston : Birkhauser, 2002.

Taylor H.W., and S. Karlin. An Introduction to Stochastic Modeling. 3rd ed. New York : Academic Press, 1998.

PATTERN OF EVALUATION (End Semester Examination – 3 Hrs.)

Section A : $5 \times 2 = 10$ (Five questions to be set, selecting one question per unit).
Section B : $5 \times 6 = 30$ (Seven questions to be set without omitting any unit).
Section C : $3 \times 20 = 60$ (Five questions to be set without omitting any unit).