MANONMANIAM SUNDARANAR UNIVERSITY -TIRUNELVELI

PG **PROGRAMMES**

OPEN AND DISTANCE LEARNING (ODL) PROGRAMMES

(FOR THOSE WHO JOINED THE PROGRAMMES FROM THE ACADEMIC YEAR 2023–2024)

M.Sc. Mathematics

Semester	Course	Title of the Course	Course Code
II	Core IV	Advanced Algebra	SMAM21
	Core V	Real Analysis – II	SMAM22
	Core VI	Partial Differential Equations	SMAM23
	Elective - III	Mathematical Statistics	SMAE21
	Elective – IV	Operations Research	SMAE22
	Skill Enhancement	Mathematical Documentation using LaTex	SMAS21

ADVANCED ALGEBRA

UNIT	DETAILS
I	Extension fields – Transcendence of e. Chapter 5: Section 5.1 and 5.2
II	Roots of Polynomials.- More about roots Chapter 5: Sections 5.3 and 5.5
III	Elements of Galois theory. Chapter 5 : Section 5.6
IV	Finite fields -Wedderburn's theorem on finite divisionrings. Chapter 7: Sections 7.1 and 7.2 (Theorem 7.2.1 only)
V	Solvability by radicals - A theorem of Frobenius - IntegralQuaternion's and the Four - Square theorem. Chapter 5: Section 5.7 (omit Lemma 5.7.1, Lemma 5.7.2 and Theorem 5.7.1), Chapter 7 : Sections 7.3 and 7.4
Recommended Text	
1	I.N. Herstein. Topics in Algebra (II Edition) Wiley Eastern Limited, New Delhi, 1975.

REAL ANALYSIS - II

UNIT	DETAILS
I	**Measure on the Real line** - Lebesgue Outer Measure - Measurable sets - Regularity - Measurable Functions - Borel and Lebesgue Measurability Chapter - 2 Sec 2.1 to 2.5 (de Barra)
II	**Integration of Functions of a Real variable** - Integration of Non- negative functions - The General Integral - Riemann and Lebesgue Integrals Chapter - 3 Sec 3.1,3.2 and 3.4 (de Barra)
III	**Fourier Series and Fourier Integrals** - Introduction - Orthogonal system of functions - The theorem on best approximation - The Fourier series of a function relative to an orthonormal system - Properties of Fourier Coefficients - The Riesz-Fischer Theorem - The convergence and representation problems in for trigonometric series - The Riemann - Lebesgue Lemma - The Dirichlet Integrals - An integral representation for the partial sums of Fourier series - Riemann's localization theorem - Sufficient conditions for convergence of a Fourierseries at a particular point –Cesaro Summability of Fourier series- Consequences of Fejes's theorem - The Weierstrass approximation theorem Chapter 11 : Sections 11.1 to 11.15 (Apostol)
IV	**Multivariable Differential Calculus** - Introduction - The Directional derivative - Directional derivative and continuity - The total derivative - The total derivative expressed in terms of partial derivatives - The matrix of linear function - The Jacobian matrix - The chain rule - Matrix form of chain rule - The mean - value theorem for differentiable functions - A sufficient condition for differentiability - A sufficientcondition for equality of mixed partial derivatives - Taylor's theorem for functions of R^n to R^1 Chapter 12 : Section 12.1 to 12.14 (Apostol)
V	**Implicit Functions and Extremum Problems :** Functions with non-zero Jacobian determinants – The inverse function theorem-The Implicit function theorem-Extrema of real valued functions of several variables-Extremum problems with side conditions. Chapter 13 : Sections 13.1 to 13.7 (Apostol)
Recommended Text	
1	G. de Barra, *Measure Theory and Integration*, Wiley Eastern Ltd., New Delhi, 1981. (for Units I and II)
2	Tom M.Apostol : *Mathematical Analysis*, 2nd Edition, Addison-Wesley Publishing Company Inc. New York, 1974. (for Units III, IV and V)

PARTIAL DIFFERENTIAL EQUATIONS

UNIT	DETAILS
I	**Mathematical Models and Classification of second order equation :** Classical equations-Vibrating string – Vibrating membrane – waves in elastic medium – Conduction of heat in solids – Gravitational potential – Second order equations in two independent variables – canonical forms – equations with constant coefficients – general solutionChapter 2 : Sections 2.1 to 2.6 Chapter 3 : Sections 3.1 to 3.4 (Omit 3.5)
II	**Cauchy Problem :** The Cauchy problem –Cauchy- Kowalewsky theorem – Homogeneous wave equation – Initial Boundary value problem- Non-homogeneous boundary conditions – Finite string with fixed ends – Non-homogeneous wave equation – Riemann method – Goursat problem – spherical wave equation – cylindrical wave equation. Chapter 4 : Sections 4.1 to 4.11
III	**Method of separation of variables:** Separation of variable- Vibrating string problem – Existence and uniqueness of solution ofvibrating string problem - Heat conduction problem – Existence and uniqueness of solution of heat conduction problem – Laplace and beam equations Chapter 6 : Sections 6.1 to 6.6 (Omit section 6.7)
IV	**Boundary Value Problems :** Boundary value problems – Maximum and minimum principles – Uniqueness and continuity theorem – Dirichlet Problem for a circle , a circular annulus, a rectangle – Dirichlet problem involving Poisson equation – Neumann problem for a circle and a rectangle. Chapter 8 : Sections 8.1 to 8.9
V	**Green's Function:** The Delta function – Green's function – Method of Green's function – Dirichlet Problem for the Laplace and Helmholtz operators – Method of images and eigen functions – Higher dimensional problem – Neumann Problem. Chapter 10 : Section 10.1 to 10.9
Recommended Text	
1	TynMyint-U and Lokenath Debnath, *Partial Differential Equations for Scientists and Engineers* (Third Edition), North Holland, New York, 1987.

MATHEMATICAL STATISTICS

UNIT	DETAILS
I	The probability set function – Random Variables – Probability density function – Distribution function – Mathematical expectation – Special mathematical expectations – Chebyshev's Inequality.
II	Conditional probability – Marginal and conditional distributions – Stochastic independence Some special distributions: The Binomial, Trinomial and Multinomial distributions – The Poisson distribution
III	The Gamma and chi-square distributions –The normal distribution – The Bivariate normal distribution. Distributions of functions of random variables –Sampling theory – Transformations of variables of the discrete type – Transformations of variables of the discrete type – Transformations of variables of the continuous type.
IV	The β, t and F distributions – Distributions of order statistics – The moment generating function technique. The distributions of χ^2 and nS^2/σ^2 – Expectations of functions of random variables.
V	Limiting distributions -Stochastic convergence – Limiting moment generating functions – The central limit theorem – Sometheorems on limiting distributions.
Recommended Text	
1	Robert V. Hogg and Allen T. Craig, *Introduction to Mathematical Statistics* (fourth edition) Chapter 1,2 (except 1.1,1.2,1.3,1.8 & 2.3), Chapter 3,4 (except 4.5) and Chapter 5.

OPERATIONS RESEARCH

UNIT	DETAILS
I	Transportation Models and its Variants: Definition of the Transportation Model – Non-Traditional Transportation Model– Transportation Algorithm – The Assignment Model. Chapter 5: Sections 5.1, 5.2, 5.3, 5.4. Exercise problems.
II	Network Analysis: Network Definitions – Minimal Spanning Tree Algorithm – Shortest Route Problem – MaximumFlow Model – CPM –PERT. Chapter 6: Sections 6.2, 6.3, 6.4, 6.5, 6.7. Exercise problems.
III	Integer Linear Programming: Introduction – Applications –Integer Programming Solutions – Algorithms. Chapter 9: Sections 9.1, 9.2, 9.3. Exercise problems.
IV	Inventory Theory: Basic Elements of an Inventory Model –Deterministic Models: Single Item Stock Model With And Without Price Breaks –Multiple Items Stock Model With Storage Limitations – Probabilistic Models:Continuous Review Model-Single Period Models. Chapter 11 – Sections 11.1, 11.2, 11.3, Chapter 16 –Sections 16.1, 16.2, 16.3, Exercise problems.
V	Queuing Theory: Basic Elements of Queuing Model – Role of Poisson and Exponential Distributions – Pure Birth and Death Models – Specialised Poisson Queues - (M/G/1):GD/∞/∞)-Pollaczek - Khintechine Formula. Chapter 17: Sections 17.2, 17.3, 17.4, 17.6, 17.7. Exercise problems.
Recommended Text	
1	*Operations Research* (Sixth Edition), Hamdy A. Taha, Prentice Hall of India Private Limited, New Delhi.

MATHEMATICAL DOCUMENTATION USING LaTex

UNIT	DETAILS
I	Introduction - Basics of a Latex file- Text, Symbols and Commands: Command names and arguments – Environments–Declarations – Lengths – Special characters
II	Document Layout and Organization: Document class – Page style – Parts of the document – Table of contents
III	Displayed Text: Changing font style – Centering and indenting – Lists – Generalized lists Theorem like-declarations
IV	Text in Boxes: Boxes - Footnotes and marginal notes. Tables: Tabular stops – Tables
V	Mathematical Formulas: Mathematical Environment – Main elements of math mode – Mathematical symbols – Additional Elements.
Recommended Text	
1	*Guide to LaTeX*, Helmut Kopka and Patrick W.Daly, Fourth Edition,Addison – Wesley, Pearson Education, 2004.