MANONMANIAM SUNDARANAR UNIVERSITY -TIRUNELVELI

PG **PROGRAMMES**

OPEN AND DISTANCE LEARNING (ODL) PROGRAMMES

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

M.Sc. Mathematics			
Semester	**Course**	**Title of the Course**	**Course Code**
III	Core VII	Complex Analysis	SMAM31
	Core VIII	Probability Theory	SMAM32
	Core IX	Topology	SMAM33
	Core X	Calculus of Variations and Integral Equations	SMAM34
	Elective - V	Mechanics	SMAE31
	Skill Enhancement Course - II	Programming in C++	SMAS31
	Internship		SMAT31

Complex Analysis

Unit	Details
I	**Analytic functions:** Analytic functions- Polynomials-Rational functions-Power Series Chapter 2: Section 2.1.2-2.1.4, 2.2.4 Problems: Chapter 2: 2.1.2 (1,4,5,7), 2.2.4(2-6)
II	**Cauchy's Integral Formula:** The Index of a point with respect to a closed curve – The Integral formula – Higher derivatives. Local Properties of analytic Functions: Removable Singularities-Taylor's Theorem – Zeros and poles – The local Mapping – The Maximum Principle. Chapter 4: Section 2 : 4.2.1 to 4.2.3,Chapter 4 : Section 3 : 4.3.1 to4. 3.4
III	**The general form of Cauchy's Theorem :** Chains and cycles- Simple Continuity - Homology - The General statement of Cauchy's Theorem - Proof of Cauchy's theorem - Multiply connected regions - Residue theorem - The argument principle. Chapter 4 : Section 4 : 4.4.1 to 4.4.7(except 4.4.6), Chapter 4 : Section 5: 4.5.1 and 4.5.2
IV	**Evaluation of Definite Integrals and Harmonic Functions** Evaluation of definite integrals - Definition of Harmonic function and basic properties - Mean value property - Poisson formula. Chapter 4 : Section 5 : 4.5.3, Chapter 4 : Sections 6 : 4.6.1 to 4.6.3
V	**Harmonic Functions and Power Series Expansions:** Schwarz theorem - The Reflection principle - Weierstrass theorem – Taylor's Series – Laurent series . Chapter 4 : Sections 6.4.6.4 and 4.6.5, Chapter 5 : Sections 4.6.1 to 4.6.3

Text Books
Lars V. Ahlfors, Complex Analysis, (3rd edition) McGraw Hill Co., New York, 1979

Probability Theory

Unit	Details
I	**Random Events and Random Variables:** Random events – Probability axioms – Combinatorial formulae – conditional probability – Bayes Theorem – Independent events – Random Variables – Distribution Function – Joint Distribution – Marginal Distribution – Conditional Distribution – Independent random variables – Functions of random variables. Chapter 1: Sections 1.2 to 1.7 Chapter 2 : Sections 2.1 to 2.9
II	**Parameters of the Distribution :** Expectation Moments –The Chebyshev Inequality – Absolute moments – Order parameters –Moments of random vectors – Regression of the first and second types. Chapter 3 : Sections 3.1 to 3.8
III	**Characteristic functions :** Properties of characteristic functions – Characteristic functions and moments – semi-invariants – characteristic function of the sum of the independent random variables – Determination of distribution function by the Characteristic function – Characteristic function of multidimensional random vectors – Probability generating functions. Chapter 4 : Sections 4.1 to 4.7
IV	**Some Probability distributions:** One point , two point , Binomial – Polya – Hypergeometric – Poisson (discrete) distributions – Uniform – Normal - Gamma – Beta – Cauchy and Laplace (continuous) distributions. Chapter 5 : Section 5.1 to 5.10 (Except 5.3)
V	**Limit Theorems :** Stochastic convergence – Bernaulli law of large numbers – Convergence of sequence of distribution functions – de Moivre-Laplace Theorem– Lindberg Theorem – Lapunov Theroem - Poisson, Chebyshev, Khintchine Weak law of large numbers Chapter 6 : Sections 6.1 to 6.4, 6.7, 6.8 and 6.11

Text Books
M. Fisz, Probability Theory and Mathematical Statistics, John Wileyand Sons, New York, 1963.

TOPOLOGY

Unit	Details
I	**Topological spaces :** Topological spaces – Basis for a topology – The order topology – The product topology on X x Y – The subspace topology – Closed sets and limit points. Chapter 2 : Sections 12 to 17
II	**Continuous functions:** Continuous functions – the product topology – The metric topology. Chapter 2 : Sections 18 to 21
III	**Connectedness:** Connected spaces- Components and Local Connectedness Chapter 3 : Sections 23& 25.
IV	**Compactness** : Compact spaces – Limit Point Compactness – Local Compactness. Chapter 3 : Sections 26 to 29(except 27)
V	**Countability and Separation Axiom:** The Countability Axioms – The separation Axioms – Normal spaces – The Urysohn Lemma – The Urysohn Metrization Theorem Chapter 4 : Sections 30 to 34.

Text Books
James R. Munkres, Topology (2nd Edition) Pearson Education Pvt.Ltd., New Delhi-2002(Third Edition Reprint)

CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

Unit	Details
I	Calculus of Variations and Applications Maxima and Minima – The simplest case –Illustrative examples-The variational notation-the more general case.
II	Constraints and Lagrange's Multipliers – Variable endpoints - Sturm Liouville problems-Hamilton's principles - Lagrange equations
III	Integral Equations – Introduction –Relation between differential and integral equations – The Green's function - Alternative definition of Green's function
IV	Linear Equations in cause and effect - The influence function – Fredholm equations with separable kernels – Ilustrative Examples.
V	Hilbert Schmidt theory – Iterative methods for solving equations of second kind-Fredholm theory

Text Books
Methods of Applied Mathematics, Francis B. Hildebrand, sections 2.1to 2.11,3.1 to 3.9 and 3.11.

Mechanics

Unit	Details
I	Mechanical Systems : The Mechanical system- Generalised coordinates – Constraints - Virtual work - Energy and Momentum Chapter 1 : Sections 1.1 to 1.5
II	Lagrange's Equations: Derivation of Lagrange's equationsExamples- Integrals of motion. Chapter 2 : Sections 2.1 to 2.3
III	Hamilton's Equations : Hamilton's Principle - Hamilton's Equation - Other variational principle. Chapter 4 : Sections 4.1 to 4.3
IV	Hamilton-Jacobi Theory : Hamilton Principle function – Hamilton-Jacobi Equation - Separability Chapter 5 : Sections 5.1 to 5.3
V	Canonical Transformation : Differential forms and generating functions – Special Transformations– Lagrange and Poisson brackets. Chapter 6 : Sections 6.1, 6.2 and 6.3

Text Books
D. Greenwood, Classical Dynamics, Prentice Hall of India, New Delhi, 1985

Programming In C++

Unit	Details
I	Structure of C++ program – Tokens – Keywords –Identifies and constants- all data types – Constants – all variables – All operators- Manipulator. Chapter 2 : Sec : 2.6 Chapter 3 : Sec : 3.1 – 3.18
II	All Expressions – Conversion – Operator overloading – Operator Precedence – Control Structures- Functions in C++ - Introduction – Main Function – Function Prototyping- Return by reference Chapter 3, Sec: 3.19 -3.24 Chapter 4, Sec : 4.1 – 4.5
III	Inline Functions – arguments – Function overloading – all functions classes and Objects. Chapter 4 , Sec: 4.6 -4.11 Chapter 5, Sec: 5.1 – 5.5
IV	Nesting of member functions – Private member function – Arrays with in a class and Objects – Friendly function – Returning Objects – Pointers to members – Local Classes Chapter 5, Sec 5.7 – 5.19
V	Constructors and Destructors – Operator over loading and Type conversions. Chapter 6 & 7.

Text Books
1.E.Balagurusamy, Object Oriented Programming with C++ , 4th Edition, The McGraw- Hill Company, New Delhi, 2008.