SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

PG COURSES – AFFILIATED COLLEGES

M.Sc. Mathematics

(Choice Based Credit System)

(with effect from the academic year 2021-2022 onwards)

Semester-I				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
III	Core-1	Algebra-I	ZMAM11	4
III	Core-2	Analysis-I	ZMAM12	4
III	Core-3	Analytic Number Theory	ZMAM13	4
III	Core-4	Operations Research	ZMAM14	4
III	Core-5	Ordinary Differential Equations	ZMAM15	4

ALGEBRA – I

Objective:

The aim of the paper is to introduce the concepts of Algebra.

Prerequisite:

Basic knowledge in Groups

Outcome:

Gained the knowledge of Groups and its properties.

Unit I:

A Counting Principle - Normal Subgroups and Quotient Groups Homomorphisms .

Sections: 2.5 - 2.7.

Unit II:

Automorphisms - Cayley's Theorem-Solvable Groups.

Sections: 2.8, 2.9.

Supplementary Problems: 10-17.

Unit III:

Permutation Groups - Another Counting Principle.

Sections: 2.10, 2.11.

Unit IV:

Sylow's Theorems.

Sections: 2.12.

Unit V:

Direct Products - Finite Abelian Groups.

Sections: 2.13, 2.14.

Text Book:

1. **Topics in Algebra**, I.N. Herstein, 2nd Edition, Wiley India Edition

ANALYSIS- I

Objective:

The aim of the paper is to introduce the concepts of Limits, Convergence, Divergence, Sequences and Series and Differentiation.

Prerequisite:

Basic knowledge in Metric space, Limits and Sequences.

Outcome:

After learning this paper the student can understand the concepts related to Limits and Continuity of Sequences and Series.

Unit I:

Metric Spaces – Compact sets – Perfect sets – Cantor sets – Connected sets.
Chapter 2: Sections 2.15 - 2.47.
Exercise Problems: 5-14, 20.

Unit II:

Convergence sequences – Subsequences – Cauchy sequence – Lower and Upper limits – Some Special Sequences – Series – Series of nonnegative terms, the number
Chapter 3: Sections 3.1 - 3.32.
Exercise Problems: 1-8.

Unit III:

Root Test and Ratio Test – Power series – Summation by parts – Absolute Convergence – Addition and Multiplication of Series.
Chapter 3: Sections 3.33 - 3.51.
Exercise Problems:9, 11 – 13.

Unit IV:

Continuity-Limit of Functions – Continuous Functions–Continuity and Compactness – Continuity and Connectedness –Discontinuous - Monotonic Functions.
Chapter 4: Sections 4.1 - 4.31.
Exercise Problems:1-5, 14,15.

Unit V:

Differentiation – Derivative of a Real Function – Mean Value Theorems - The Continuity of Derivatives – L'Hospital Rule – Derivatives of Higher Order – Taylor's Theorem.

Chapter 5: Sections 5.1 - 5.15.

Exercise Problems:1-5 and 12.

Text Book:

1. **Principles of Mathematical Analysis**, Walter Rudin, Third Edition, McGraw Hill International Book Company.

ANALYTIC NUMBER THEORY

Objective:

The aim of the paper is the basic ideas and techniques of Number Theory with the introduction of special function

Prerequisite:

Basic knowledge in functions and relations.

Outcome:

After learning this paper the student can understand the notion of several Functions and its properties in theory of numbers .

Unit I:

The fundamental Theorem of Arithmetic.

Chapter 1 and Exercise Problems: 1-11.

Unit II:

Arithmetic Functions.

Chapter 2: Sections 2.1 -2.8.

Exercise problems: 1-6.

Unit III:

Multiplicative Functions and Dirichlet Multiplication.

Chapter 2: Sections 2.9 –2.14.

Exercise problems:21-23, 25,26.

Unit IV:

Averages of Arithmetical Functions.

Chapter3: Sections 1-9.

Exercise problems:1-4.

Unit V:

Partial sums of Dirichlet Product, Chebyshev's Functions – Equivalent forms of Prime Number Theorem.

Chapter 3: Sections: 3.10, 3.11, **Chapter4**:Sections 4.1 – 4.5.

Exercise problems: Chapter4: (3,4,5,8,9,10).

Text Book:

Introduction to Analytic Number Theory –Tom M. Apostol -Springer, International Student Edition.

OPERATIONS RESEARCH

Objective:

The aim of the paper is to introduce Linear Programming and Inventory Theory

Prerequisites:

Basic knowledge in Linear Programming and Simplex Method.

Outcome:

Knowledge gained about the concepts of various models and Inventory Theory.

Book for Reference:

Operations Research: Principles and Applications, Second **Edition,** G. Srinivasan, Eastern Economy Edition, PHI

Unit 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.

Unit II:

Network Analysis:

Network Definitions – Minimal Spanning Tree Algorithm – Shortest Route Problem – Maximum Flow Model – CPM – PERT.

Chapter 6:Sections 6.2, 6.3, 6.4, 6.5, 6.7 Exercise problems.

Unit III:

Integer Linear Programming:

Introduction – Applications – Integer Programming Solutions –Algorithms.

Chapter 9: Sections 9.1, 9.2, 9.3 Exercise problems.

Unit 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.

Unit V:

Queuing Theory:

Basic Elements of Queuing Model – Role of Poisson And Exponential Distributions – Pure Birth and Death Models – Specialized Poisson Queues-(M/G/1):GD/∞/∞)-Pollaczek-Khintechine Formula.

Chapter17- Sections 17.2,17.3,17.4,17.6,17.7 Exercise problems.

Text Book: **Operations Research** (Sixth Edition), Hamdy A. Taha, Prentice Hall of India Private Limited, New Delhi.

ORDINARY DIFFERENTIAL EQUATIONS

Objective:

- The aim of the paper is to introduce Differential Equations and how to find its solutions.
- To introduce some special functions and its properties.

Prerequisite:

Basic knowledge in solving Ordinary Differential Equations.

Outcome:

Gained knowledge in finding Power Series Solutions and Linear Systems.
Know about some special functions.

Unit I:

Second Order linear equations:

General solution of the Homogeneous Equations – The use of a known solution to find another – The method of variation of parameters.

Sections: 14 – 16.

Unit II:

Power series solutions:

A review of power series solutions – Series solution of first order equations – Second order equations –Ordinary points.

Sections: 26 – 28.

Unit III:

Regular singular points – Legendre polynomials- Properties of Legendre Polynomials **Sections:** 29, 30, 44, 45.

Unit IV:

Bessel functions – The Gamma functions – Properties of Bessel functions.

Sections: 46, 47.

Unit V:

Linear systems:

Homogeneous linear systems with constant coefficients

Sections: 55, 56

Text Book: Differential Equations with application and Historical Notes,
G.F. Simmons, Second Edition, Tata McGraw Hill.