SYLLABUS

MANONMANIAM SUNDARANAR UNIVERISTY, TIRUNELVELI-12

PG - COURSES – AFFILIATED COLLEGES

Course Structure for

M.Sc Mathematics

(Choice Based Credit System)

(with effect from the academic year 2017- 2018 onwards)

Semester-III				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
	Core - 11	Measure and Integration	PMAM31	4
	Core - 12	Topology – I	PMAM32	4
	Core - 13	Advanced Algebra - I	PMAM33	4
	Core - 14	Operations Research	PMAM34	4
	Core - 15	Research Methodology	PMAM35	4
	Elective – 2	Calculus of Variation and Integral Equations	PMAE32	3

MEASURE AND INTEGRATION

Objective:

- Gain the knowledge of measure spaces and measure interruption
- Understanding the concept of lesbeague measure ,lesbeague integration and signed measure
- To provide the understanding of general measure spaces

Prerequisite:

Basic knowledge of differentiation, integration and continuity of real functions

Outcome:

Knowledge gained about lesbeague theory and general measure spaces and their properties and construction.

Unit I:

LebesgueMeasure:

Lebesgue Measure – Lebesgue Outer Measure – The □ - Algebra of Lebesgue Measurable sets – Outer and Inner Approximation of Lebesgue Measurable sets – Countable Additivity, Continuity and the Borel – Cantelli Lemma.
Chapter 2 : Sec 2.1 – 2.5
Problems : Chapter 2 : 1 – 12 and 17

Unit II:

Lebesgue Measurable functions&Sequential pointwise Limits and related Theorems:
Lebesgue Measurable functions – Sums, Products and Compositions. Sequential pointwise Limits and Simple Approximation – Littlewood's Three Principles, Egoroff's Theorem and Lusin's Theorem
Chapter 3 : Sec 3.1 - 3.3 and
Problems :Chapter 3 : 1 – 3

Unit III:

LebesgueIntegration :
Lebesgue Integration – The Riemann Integral – The Lebesgue Integral of a bounded Measurable function over a set of finite Measure – The Lebesgue Integral of a Measurable non – negative function.
Chapter 4 : Sec 4.1 – 4.3

Unit IV:

Lebesgue Integral &Differentiablility:
The general Lebesgue Integral – Countable Additivity and Continuity of Integration. Differentiation and Integration – Continuity of monotone functions – Differentiability of monotone function: Lebesgue's theorem – Functions of bounded variations: Jordan's theorem.
Chapter 4 :Sec 4.4 & 4.5
Chapter 6 : Sec 6.1 - 6.3

Unit V:

Absolutely continuous functions &Signed Measures:
Absolutely continuous functions – Integrating Derivatives : Differentiating Indefinite Integrals. Measure and Integration – Measures and Measurable sets – Signed Measures : The Hahn and Jordan Decompositions – The Caratheodory measure induced by an outer measure – The construction of outer measure
Chapter 6 : Sec 6.4 & 6.5
Chapter 17 : Sec : 17.1 - 17.4

Text Book:

Real Analysis, Fourth Edition, H.L.Royden, P.M.Fitzpatrick, PHI Learning Private Ltd.

Book for Reference:

Real Analysis Third Edition (PHI)-H.L.Royden Prentice hall of india private limited –New Delhi (2006).

TOPOLOGY I

Objectives:

- To distinguish space by means of Simple Topological invariants
- Gain the knowledge of constructing spaces by giving and to prove that in certain case, that the result is homeomorphic to standard spaces.

Prerequisite:

- Basic knowledge in Set Theory and Analysis at Undergraduate level.

Outcome:

Knowledge gained about Topological Spaces and the theories based on these spaces.

Unit I:

Topological spaces :

Topological spaces – Basis for a topology – The order topology – The subspace topology- Closed sets and limit points.

Chapter 2: Sections: 12-14 and 16,17.

Problems: Section 13: 1, 4 and Section 16: 4, 6. Section 17: 1,11-13

Unit II:

Product topology

The product topology on $X \times Y$ – Continuous functions – Product topology

Chapter 2: Section 15, 18,19.

Problems: Section 18: 2,3 and Section 19: 1-3.

Unit III:

Metric Topology :Metric Topology

Chapter 2: Section 20, 21

Problems: Section 20:1-3 and section 21:1, 2.

Unit IV:

Some spaces in topological spaces:Connected spaces – Compact spaces.

Chapter 3: Sections: 23,26

Problems: Section 23: 2-4 and Section 26: 3, 6.

Unit V:

Compactness :Limit point compactness – Local compactness.

Chapter 3: Section 28, 29.

Problems: Section 29: 2,3.

Text Book:

Topology (Second edition), James R. Munkres, Printice – Hall of India

Books for Reference:

1. Introduction to general Topology – K.D Joshi Willey Eastern Limited (1986)
2. Topology – K.ChandrasekaraRaoNarosa Publishing House New Delhi (2009)

ADVANCED ALGEBRA I

Objective:

The aim of the paper is to introduce some of the most fundamental algebraic structures like inner product space, Determinants, etc.

Prerequisites:

Basic knowledge in set theory and Matrix theory

Outcome:

After learning this paper the student can understand,

- The notion of Dual Spaces.
- The algebra of Linear transformations.

Unit I:

Vector spaces:Dual spaces – Inner product spaces.
Sections: 4.3 and 4.4.

Unit II:

Linear transformations:The Algebra of linear transformations – Characteristic roots – Matrices.
Sections: 6.1 – 6.3.

Unit III:

Canonical Forms:
Triangular form – Nilpotent form – Jordan form.
Sections: 6.4 - 6.6.

Unit IV:

Matrices:Trace and transpose – Determinants.
Sections: 6.8-6.9

Unit V:

Transformations:
Hermitian, unitary and normal transformations.
Sections: 6.10(Up to Lemma 6.10.11)

Text Book:

Topics in Algebra(Second edition) Wiley Eastern Limited – I.N. Herstein

Book for Reference:

1. A course in Abstract algebra (3rd edition)-Vijay.K.Khanna,S.K.Bhambri –Vikas Publishing House –Newdelhi.
2. Fields and Rings –Kaplemsky ,Irving (Second edition)-University of Chicago- Chicago -(1972).

OPERATIONS RESEARCH

Objectives:

- To modify rual life into Standard Mathematical Models
- To learn different optimization techniques.
- To know classification of different structured problems.

Prerequisite:

Basic computing knowledge and techniques at undergraduate level.

Outcome:

- Identification of actual problems and its equivalent mathematical models.
- Application to different optimization techniques in real life situations.
- Knowledge gained in utilization of Optimum Resources.

Unit I:

Transportation Models And Its Variants:

Definition Of The Transportation Model – Nontraditional Transportation Model – Transportation Algorithm – The Assignment Model.

Chapter 5 – Sections 5.1, 5.2, 5.3, 5.4 and 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 and Exercise problems.

Unit III:

Integer Linear Programming:

Introduction – Applications – Integer Programming Solutions – Algorithms.

Chapter 9 – Sections 9.1, 9.2, 9.3 and 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.

Chapter 11 – Sections 11.1, 11.2, 11.3, Chapter 16 – Sections 16.1, 16.2 and Exercise problems.

Unit V:

Queuing Theory:

Basic Elements Of Queuing Model – Role Of Poisson And Exponential Distributions – Pure Birth And Death Models – Specialised Poisson Queues

Chapter 17 – Sections 17.2, 17.3, 17.4, 17.6(upto 17.6.3) and Exercise

problems.

Text Book:

Operations Research(Sixth Edition) , Hamdy A. Taha, Prentice Hall Of India Private Limited, New Delhi.

Books for Reference:

1. Introduction to Operations Research – Fredrick, Shiller, GenraldJ.Literman – MC Graw Hill (2017)
2. Operations Research – KantiSwarup, P.K. Gupta, Man Mohan – Sultan Chand and sons. (2016)
3. Operations Research (Fifth edition) J.N Sharma, McMillian Publications (2013)

RESEARCH METHODOLOGY

Objectives:

- To understand the Basic aspects in research
- To learn Mathematical and Statistical technique for research
- To acquire basic knowledge about various instruments and techniques in Mathematical research.

Prerequisite:

Basic knowledge in Statistics and related information to be useful for research.

Outcome:

- Training and participating in active research activities for their academic and professional levels.
- Creation of novel ideas and simple technique useful to society(R/D)
- Acquire background knowledge in research publication and thesis writing.

Unit I :

Research Project :

Research Project – Difference between a dissertation and a thesis– Basic requirements of a research degree –Writing a proposal –Ethical considerations

Chapter 5 :Sec: 5.1, 5.2, 5.3,5.6,5.13 in Text Book 1.

Unit II :

Components of a Research Project:

Different components of a research project–Literature review – Methodology – Results / data – Conclusions – Bibliography - Appendices.

Chapter 6 : Sec: 6.1-6.6,6.7,6.8.1, 6.9.1,6.11, 6.12, 6.13 in Text Book 1.

Unit III :

Some Special Distributions :

The Gamma and Chi – Square distribution – The normal distribution.

Chapter 3: Sec: 3.3, 3.4 in Text Book 2.

Exercise Problems:Chapter 3: 3.28 – 3.33, 3.40 – 3.46.

Unit IV :

Sampling Theory :

Transformation of variables – t & F distributions.

Chapter 4:Sec : 4.1 – 4.4 in Text Book 2.

Exercise Problems:Chapter 4: 4.1 – 4.8, 4.14 – 4.17, 4.20 – 4.25, 4.34 – 4.41.

Unit V :

Random variables:The MGF technique – Distributions of X and 2
Expectations of functions of random variables-The Central Limit Theorem.
Chapter 4:Sec : 4.7 – 4.9 in Book 2. **Chapter** 5: Sec 5.4 in Text Book 2
Exercise Problems: Chapter 4 :4.68 – 4.74, 4.83 – 4.93.
Exercise Problems:Chapter 5:, 5.20 – 5.22, 5.25 – 5.27.

Text Book:

1. Writing up your University Assignments and Research Projects – A Practical handbook, Neil Murray and Geraldine Hughes, McGraw Hill Open University Press.
2. Introduction to Mathematical Statistics, Fourth Edition, Robert V. Hogg and Allen T.Craig, Pearson Education Asia.

Books for Reference:

1. Research Methodology(2nd revised methods and techniques edition)-C.R.Kothari, New Age International Publications, New Delhi.
2. Fundamentals of Mathematics statistics-S.C.Gupta, V.K.Kapoor, Eleventh edition 2002,Sultanchand& sons Publishers, New Delhi.

CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

Objective:

The objective of this paper is to place at the disposal of the student, the basis of an intelligent working knowledge of a number of facts and techniques which are useful in varied fields of application.

Prerequisite:

Basic knowledge in Elementary Matrix Theory, Quadratic forms, Coordinate Transformations.

Outcome:

Gain knowledge in maxima minima techniques and solution of certain types of Integral equations.

Unit I:

Maxima and Minima :

Calculus of Variations and Applications – Maxima and Minima – The simplest case – Illustrative examples.

Exercises problems: Chapter 2(2, 6, 8 and 18)

Sections: 2.1-2.4

Unit II:

Lagrange's Multipliers:

Thevariational notations – The more general case – Constraints and Lagrange'sMultipliers – Variable end points.

Exercises problems: Chapter 2(19, 20 and 21)

Sections: 2.5-2.8

Unit III:

Integral Equations:

Integral Equations – Introduction –Relation between differential and integral equations – The Green's function.

Exercises problems: Chapter 3(1,9, 11)

Sections: 3.1-3.3

Unit IV:

Fredholm equations:

Linear Equations in cause and effect- The influence function -Fredholm equations with separable kernels – Illustrative Examples.

Exercises problems: Chapter 3(40 and 43)

Sections: 3.5-3.7

Unit V:

Hilbert Schmidt theory:

Hilbert Schmidt theory – Iterative methods for solving equations of second kind.

Exercises problems: Chapter 3(52 and 53)

Sections: 3.8-3.9

Text Book:

Methods of Applied Mathematics, Francis B. Hilde brand, Prentice Hall of India, New Delhi.Sections: 2.1 to 2.8 and 3.1 to 3.3, 3.5-3.9

Book for Reference:

Problems and Exercises in integral equations – M.Krarnov, A.Kiselev and G.Makarenko – Mir Publishers, Moscow (1971).