MANONMANIAM SUNDARANAR UNIVERISTY,
TIRUNELVELI-12

SYLLABUS

PG - COURSES – AFFILIATED COLLEGES

Course Structure for M.Sc. Mathematics
(Choice Based Credit System)
(with effect from the academic year 2021-2022 onwards)

Semester-IV				
Part	**Subject Status**	**Subject Title**	**Subject Code**	**Credit**
3	Core	Advanced Algebra II		4
3	Core	Complex Analysis		4
3	Core	Functional Analysis		4
3	Core	Topology II		4
3	Core	Project		4

Total Marks: 100 Internal Exam: 25 marks + External Exam: 75 marks

A. **Scheme for internal Assessment**:
Maximum marks for written test: **15 marks**
3 internal tests, each of **I hour** duration shall be conducted every semester.
To the average of the **best two** written examinations must be added the marks scored in. The **assignment** for 5 marks and Seminar for 5 marks

The break up for internal assessment shall be:
Written test- 15 marks; Assignment -5 marks; Seminar-5 Marks Total - 25 marks

B. Scheme of External Examination
3 hrs. examination at the end of the semester
A – Part : 1 mark question two - from each unit
B – Part : 5 marks question one - from each unit
C – Part : 8 marks question one - from each unit

➢ Conversion of Marks into Grade Points and Letter Grades

S.No.	Percentage of Marks	Letter Grade	Grade Point	Performance
1	90 - 100	O+	10	Outstanding
2	80 - 89	O	9	Excellent
3	70 - 79	A+	8	Very Good
4	60 - 69	A	7	Good
5	55 - 59	B+	6	Above Average
6	50 - 54	B	5	Pass
7	0 - 49	RA	-	ReAppear
8	Absent	AA	-	Absent

➢ Cumulative Grade Point Average (CGPA)

$$\mathbf{CGPA} = \frac{\mathbf{\Sigma\,(GP \times C)}}{\mathbf{\Sigma C}}$$

- **GP** = Grade point, **C** = Credit
- CGPA is calculated only for Part-III courses
- CGPA for a semester is awarded on cumulative basis

➢ Classification

a) First Class with Distinction : CGPA $\geq$ 7.5*****
b) First Class : CGPA $\geq$ 6.0
c) Second Class : CGPA $\geq$ 5.0 and $<$ 6.0
d) Third Class : CGPA $<$ 5.0

ADVANCED ALGEBRA II

Objective: To Gain knowledge in Field theory and Galois Theory.
Pre requisite: Knowledge of Groups, Rings and Elementary properties of Fields.
Outcome: Understand the application of Galois Theory in Theory of Equations and Geometry

Text Book: **Topics in Algebra**, I.N. Herstein (Second edition) Wiley Eastern Limited.

Books for Reference:

1. **A course in Abstract Algebra** (**3**rdEdition) – Vijay.K.Khanna, S.K.Bhambri-Vikas Publishing House-New Delhi.
2. **Modern Algebra-**Surjeetsingh and Qazizameerudin-Vikas Publishing House-New Delhi.
3. **Fields and Rings-** Kaplemsky, Irving (Second Edition)-University of Chicago-Chicago- (1972).

Unit 1: Extension fields: Extension fields
Sections:5.1. Problems:5.1(1-5, 8)

Unit II: Roots of polynomials. More about roots
Sections: 5.3, 5.5. Problems:5.5(1-3)

Unit III: Elements of Galois Theory
Sections:5.6

Unit IV: Finite fields: Finite fields -Wedderburn's theorem (First proof only)
Sections:7.1 ,7.2 (Theorem 7.2.1-First proof only)

Unit V: Some special theorems: A theorem of Frobenius-Integral quaternions and the Four-square theorem. Sections:7.3,7.4.

COMPLEX ANALYSIS

Objective: The aim of the paper is to introduce the concepts of Complex Mappings and Complex Integrations
Prerequisite: Basic knowledge in Complex Analysis.
Outcome: Gained knowledge about Conformal Mapping, Analytic functions, Integral Formula and Complex Integrations.

Text Book:Complex Analysis – Lars V. Ahlfors – Tata McGraw Hill (Third Edition)

Book for Reference:

Foundations of Complex Analysis – S.Ponnusamy – Narosa Publishing House 2015 (Second Edition).

Unit I: Analytic functions:Analytic functions–Polynomials Rational Functions - Power series
Chapter 2: Section 2.1.2 – 2.1.4&Section2.2 .4
Problems: Chapter 2:2.1.2 (1,4,5,7) 2.2.4 (2- 6).

Unit II: Conformal mappings: Linear Transformations–the linear group-The Cross ratio-Symmetry
Chapter 3: Section3.2.3, 3.3.1 – 3.3.3,
Problems: Chapter 3: 3.3.1 (4); 3.3.2 (1,4) 3.3.3 (1,2,4);

Unit III: **Complex Integration:** Line integrals –Line integrals as functions of arc - Cauchy's theorem for a Rectangle -Cauchy's theorem in a disk
Chapter 4: Section4.1.1, 4.1.3 - 4.1.5

Unit IV: **Cauchy's Integral formula**: Index of a point with respect to closed curve– The integral formula - Higher derivatives -Local Properties of Analytical Functions: Removable Singularities -Taylor's Theorem-Zeros and Poles
Chapter 4: Section4.2.1- 4.2.3; 4. 3.1 – 4.3.2
Problems: Chapter 4: 4.2.2 (1-3)
Problems:Chapter 4:4. 2.3 (1), 4.3.2(2 – 4)

Unit V: **The Calculus of Residues**:The Residue theorem-The Argument Principle– Evaluation of definite integrals.
Chapter 4: Section4.5.1 – 4.5.3
Problems:Chapter 4: 4.5.2(1-3) ,4.5.3 (1, 3(a- g))

FUNCTIONAL ANALYSIS

Objective: The aim of the paper is to introduce the algebraic structure in Analysis.
Prerequisite: Basic knowledge in Metric Space, Analysis, Algebra and Topology.
Outcome:After learning this paper the student can understand the notion of Banach Spaces and Hilbert Spaces.

Text Book:Introduction to Topology and Modern Analysis- G.F.IMMONS, Mc Graw-Hill International Editions

Books for Reference:

1. Functional Analysis - Second Edition (2011), TataMcGrawHillEducation Private Ltd. (New Delhi) – WalterRudin.
2. Functional Analysis – K.ChandrasekaraRao, Narosa Publishing House (2009) New Delhi.

Unit I: **BanachSpaces**: Banach Spaces- The definition and someexamples- Continuous linear transformations- The HahnBanach Theorem
Chapter 9:Sections 46, 47, 48.Problems: Section 46(1,2), 47(1,2) 48(1).

Unit II: **Imbedding**: The Natural Imbedding of N in N**- The open mapping theorem
Chapter 9: Sections 49, 50Problems: Section 49 (2,3), 50 (2,3)

Unit III: Hilbert Spaces: Conjugate of an operator -Hilbert Spaces-The Definition and some simple properties- Orthogonal compliments
Chapter 9:Section 51, Chapter 10: Sections 52, 53
Problems: Section 51 (1,3) 52 (4,6), 53 (1-3).

Unit IV: The Conjugate space and adjoint: Orthonormal sets-The conjugate space H*Chapter10:Sections54,55,56. Problems:Section54(1,5) 55(1,2), 56(2-4).

Unit V: Operators: Self adjoint operators- Normal and Unitary operators- projections.
Chapter 10:Sections57,58,59.Problems:Section 57(1,2),58(1,3), 59(1,4).

TOPOLOGY- II

Objective: The aim is to introduce the concepts of Normal and Regular Spaces .
Prerequisite: Basic Knowledge in Set theory, Analysis, Topology and Functions in Topological Spaces
Outcome: Improves the standard of understanding Set theory, Analysis and Topology and pave the way to do Research in these areas.

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

Books for reference:

1. **Introduction to General Topology** – K.D. Joshi Wiley Eastern Limited (1986)
2. **Topology** – K.Chandrasekara Rao Narosa Publishing House 2009 (New Delhi)

Unit I: **Separation axioms**.: The countability axioms – Separation axioms.
Chapter 4: Sections 30, 31.
Problems: Section 30: 2,3 and Section 31: 1-3.

Unit II: The Urysohn lemma:Normal spaces – The Urysohn lemma.
Chapter 4: Sections 32, 33.
Problems: Section 32: 1, 3, 4 and Section 33: 1-2.

Unit III: Urysohn and Tietz extension theorem:The Urysohn metrization theorem – The Tietz extension theorem.
Chapter 4: Sections 34, 35.
Problems: Section 34: 1, 3 and Section 35: 1, 3.

Unit IV: The Tychonoff theorem:TheTychonoff theorem–Local finiteness.
Chapter 5: Sections 37 and Chapter 6: Section 39
ProbleSectionms: Section 37: 1,2 and Section 39: 3,5.

Unit V: **Baire Spaces**:
Chapter 8: Section 48, Problems: Section 48: 1,3,4,6

PROJECT

- Project credit is increased, to enrich the research interest and to create innovative ideas among students.
- Since after Post graduation, the students may pursue research and hence they are expected to participate in seminars, workshops and in conferences.