



MANONMANIAM SUNDARANAR UNIVERSITY,
TIRUNELVELI-12

SYLLABUS

UG - COURSES – AFFILIATED COLLEGES

Course Structure for B. Sc. Mathematics

(Choice Based Credit System)

(with effect from the academic year 2026-2027 onwards)



Semester-V				
Part	Subject Status	Subject Title	Subject Code	Credit
III	CORE	ABSTRACT ALGEBRA	FCMA51	4
III	CORE	REAL ANALYSIS	FCMA52	4
III	CORE	MATHEMATICAL MODELING	FCMA53	4
III	CORE	PROJECT WITH VIVA-VOCE	FCMA5P	4
III	ELECTIVE	1. OPERATIONS RESEARCH I	FEMA51	3
III	ELECTIVE	4. FUZZY SETS AND APPLICATIONS	FEMA54	3
IV	NAAN MUDHALVAN	(SUBSTITUTE COURSE: STATISTICS WITH EXCEL PROGRAMMING)		2
IV		INTERNSHIP / INDUSTRIAL TRAINING / FIELD VISIT / KNOWLEDGE UPDATING ACTIVITY**	FIFK51	1



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

A. Scheme for internal Assessment:

Maximum marks for written test: **20 marks**

3 internal tests, each of **1 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.

The break up for internal assessment shall be:

Written test- 20 marks; Assignment -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	Marks	Letter Grade	Grade point (GP)	Performance
1	90-100	O	9-10	Outstanding
2	80-89	A+	8-8.9	Excellent
3	70-79	A	7-7.9	Very Good
4	60-69	B+	6-6.9	Good
5	50-59	B	5-5.9	Above Average
6	40-49	C	4-4.9	Pass
7	0-39	RA	-	Reappear
8	0	AA	-	Absent

➤ **Cumulative Grade Point Average (CGPA)**

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

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

➤ **Classification**

- First Class with Distinction : $CGPA \geq 7.5^*$
- First Class : $CGPA \geq 6.0$
- Second Class : $CGPA \geq 5.0$ and < 6.0
- Third Class : $CGPA < 5.0$



ABSTRACT ALGEBRA

Objectives of the Course

- Concepts of Sets, Groups and Rings.
- Construction, characteristics and applications of the abstract algebraic structures

UNIT I

Groups: Definition and Examples – Properties – Permutation Groups – Subgroups – Cyclic Groups. (Chapter 3: Sections-3.1, 3.2, 3.4 to 3.6)

UNIT II

Order of an element – Cosets and Lagrange's Theorem – Normal subgroups and Quotient groups. (Chapter 3: Sections-3.7 to 3.9)

UNIT III

Isomorphism – Cayley's Theorem – Homomorphisms – Fundamental Theorem. (Chapter 3: Sections-3.10 and 3.11)

UNIT IV

Rings: Definition and examples – Properties – Types of rings – Characteristic of a ring – Subrings – Ideals. Some special classes of rings – Homomorphism of rings – Ideals and quotient rings – More ideals and quotient rings. (Chapter 4: Section-4.1, 4.2, 4.4 to 4.7)

UNIT V

Quotient Rings – Maximal and Prime Ideals – Homomorphism and Isomorphism of Ring – The field of quotients of an Integral Domain. (Chapter 4: Section-4.3, 4.8 to 4.11)

Recommended Text

1. S. Arumugam and A. Thangapandi Isaac, Modern Algebra, Scitech Publications, 2014.

Reference Books

1. I.N. Herstein, Topics in Algebra, Wiley Eastern Ltd. Second Edition, 2006.
2. John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
3. M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
4. Joseph A Gallian, Contemporary Abstract Algebra, 4th Edition, Narosa, 1999.

Website and e-Learning Source

1. <https://nptel.ac.in>



REAL ANALYSIS

Objectives of the Course

- Real Numbers and properties of Real-valued functions.
- Connectedness, Compactness, Completeness of Metric spaces.
- Convergence of sequences of functions, Examples and counter examples

UNIT 1

Metric spaces: Definition and Examples – Bounded sets – Open ball– Open sets – Subspaces– Interior of a set. (Chapter 2: Section - 2.1to 2.6)

UNIT 2

Closed sets– Closure– Limit point– Dense set– Complete metric space: Completeness –Cantor's inter section theorem– Baire's Category theorem. (Chapter 2: Sections - 2.7to 2.10 and Chapter 3: Sections – 3.1 and 3.2)

UNIT 3

Continuity: Continuity –Homeomorphism–Uniform Continuity – Discontinuous functions on R . (Chapter 4: Sections- 4.1 to 4.4)

UNIT 4

Connectedness: Definition and Examples –Connected subsets of R –Connectedness and continuity–Contraction mapping theorem. (Chapter 5: Sections-5.1 to 5.3 and Chapter 8: Section - 8.1)

UNIT 5

Compactness: Compact metric spaces–Compact subsets of R –Equivalent characterizations for compactness–Compactness and Continuity. (Chapter 6: Sections- 6.1 to 6.4)

Recommended Text

1. S.Arumugam and A. Thangapandi Issac, Modern Analysis, New Gamma Publishing House, Palayamkottai, 2015

Reference Books

1. Richard R. Goldberg, Methods of Real Analysis, (John Wiley & sons, 2nd Edition) (Indian edition –Oxford and IBH Publishing Co, New Delhi, 1st January 2020)
2. Walter Rudin, Principles of Mathematical Analysis, Tata McGraw Hill Education, Third Edition (1 July 2017).
3. Tom MA postal, Mathematical Analysis, Narosa Publishing House, 2nd edition(1974),Addison-Wesleypublishingcompany,NewDelhi.

Website and e-Learning Source

1. <https://nptel.ac.in>



MATHEMATICAL MODELLING

Objectives of the Course

- Construction and Analysis of Mathematical models found in real life problems.
- Modelling through differential and difference equations

UNIT I

Mathematical Modelling: Simple situations requiring mathematical modelling, characteristics of mathematical models. (Chapter 1: Sections -1.1 and 1.4)

UNIT II

Mathematical Modelling through differential equations: Linear Growth and Decay Models. Non-Linear growth and decay models, Compartment models. (Chapter 2: Sections -2.1to2.4)

UNIT III

Mathematical Modelling, through system of Ordinary differential equations of first order: Prey-predator models, Competition models, Model with removal and model with immigrations. Epidemics: simple epidemic model, Susceptible-infected-susceptible (SIS) model, SIS model with constant number of carriers. Medicine: Model for Diabetes Mellitus. (Chapter 3: Sections -3.1.1,3.1.2, 3.2.1to 3.2.4,3.2.6, 3.5.1)

UNIT IV

Introduction to difference equations. (Chapter 5: Sections -5.1, 5.2.1 to 5.2.3)

UNIT V

Mathematical Modelling through difference equations: Harrod Model, cob web model application to Actuarial Science (Chapter 5: Sections - 5.3.1, 5.3.2, 5.3.4)

Recommended Text

1. JN Kapur, Mathematical Modeling, New Age International Publishers, 2009.

Reference Books

1. Bimal K.Mishra and Dipak K. Satpathi, Mathematical Modeling, Ane Books India, 2007.
2. Sandip Banerjee, Mathematical Modeling Models, Analysis and Applications, CRC Press, Taylor & Francis group, 2014.
3. Mathematical Modeling applications with Geogebra by Jonas Hall & Thomas Ligefjard, John Wiley & Sons, 2017
4. Mark M. Meerschaert: Mathematical Modeling, Elsevier Publ., 2007.
5. Edward A. Bender: An introduction to mathematical Modeling, CRC Press,2002
6. Walter J. Meyer, Concepts of Mathematical Modeling, Dover Publ., 2000

Website and e-Learning Source

1. <https://nptel.ac.in>



PROJECT WITH VIVA-VOCE

Objectives of the Course

- Motivate the students to get thorough idea on a specific topic and an idea for doing research.

*Project viva-voce examination:

- Internal: 50 marks and External: 50 marks (Total: 100 marks)
- Group (maximum five students) project report should be submitted
- External 50 marks will be evaluated by external examiners.

OPERATIONS RESEARCH I

Objective of the Course

- To provide knowledge on Formulating real life problems into LPP
- To teach the techniques for converting the industrial problems as mathematical problems and solving them.

UNIT 1

Linear Programming: Linear Programming Problem: Formulating a problem as linear programming model – Examples of LP model formulation – General LPP – Canonical and Standard forms of LPP – Terminology for the solution of LPP - Graphical solution. (Chapter 2: Sections - 2.1, 2.5 to 2.9 and Chapter 3: Section - 3.1)

UNIT II

Solving LPP: The computational procedure – Simplex Algorithm – Two-Phase method and Big-M method – Theory of simplex method: Revised simplex method) (Chapter 3: Sections - 3.3 to 3.5 and Chapter 4: Section - 4.7)

UNIT III

Duality in LP: General Primal-Dual pair – Formulating a Dual problem – Properties of Dual problem – Duality and Simplex method – Dual Simplex method. (Chapter 5: Sections - 5.2 to 5.5, 5.8)

UNIT IV

Transportation Problem (TP): General structure of a TP – Existence of solution in TP – Duality in TP – Degeneracy in TP – Solution of a TP – Method for finding IBFS – North-West Corner method, Least-Cost method, Vogel's Approximation Method – Optimality test – Stepping stone method – MODI. (Chapter 7: Sections - 7.1 to 7.10)

UNIT V

Assignment Problem (AP): Formulation of an AP – Assumptions in AP – Methods of solving an AP (Hungarian method) – Special case in AP (Unbalanced AP & Maximization case in AP) – Dual of the AP. (Chapter 8: Sections - 8.1 to 8.4 and 8.6)



Recommended Text

1. Kanti Swarup, P. K. Gupta and Man Mohan, Operations Research, [20th Revised Edition], Sultan Chand & Sons, New Delhi, 2022.

Reference Books

1. P.K. Gupta, and D. S. Hira, Operations Research, Sultan Chand & Sons, New Delhi, 2020.
2. P.K. Gupta and Man Mohan. Problems in Operations Research [Ninth Edition], Sultan Chand and Sons, New Delhi, 2014.
3. S.Kalavathy, Operations Research [Fourth Edition], Vikas Publishing House, Chennai, 2012.

FUZZY SETS AND APPLICATIONS

Objectives of the Course

- To introduce Fuzzy concepts to students and to facilitate the students to study Fuzzy operations, Fuzzy numbers and Fuzzy Decision Making

UNIT I

From Crisp sets to Fuzzy sets: Crisp Sets – Fuzzy Sets – Basic Types – Basic Concepts – Characteristics and Significance of Paradigm Shift. (Chapter1: Sections - 1.1 to 1.5)

UNIT II

Fuzzy sets verses Crisp sets: Additional properties of α -cuts – Representations of Fuzzy sets – Extension principle of Fuzzy sets. (Chapter 2: Sections - 2.1 to 2.3)

UNIT III

Operations on Fuzzy sets: Types of Operations – Fuzzy Complements – Fuzzy intersections: t-Norms –Fuzzy Unions: t-Conorms – Combinations of operations. (Chapter 3: Sections - 3.1 to 3.5)

UNIT IV

Fuzzy Arithmetic: Fuzzy Numbers – Linguistic Variables – Arithmetic Operations on Intervals – Arithmetic Operations on Fuzzy Numbers - Lattice of Fuzzy numbers - Fuzzy Equations. (Chapter4: Sections - 4.1 to 4.6)

UNIT V

Fuzzy Decision Making: – Individual Decision Making – Multi- Person Decision Making – Multicriteria Decision Making – Fuzzy Linear Programming. (Chapter 15: Sections - 15.1 to 15.4 and 15.7)



Recommended Text

1. George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic Theory Applications, Prentice Hall of India, New Delhi, 2002.

Reference Books

1. George J. Klir and Tina A. Folger, Fuzzy sets, Uncertainty and Information, Prentice Hall of India, New Delhi, 2003.
2. S. Nanda and N. R. Das, Fuzzy Mathematical Concepts, Narosa Publishing House, 2012.

Website and e-Learning Source

1. <https://nptel.ac.in>

NAAN MUDHALVAN 4

STATISTICS WITH EXCEL PROGRAMMING

Objectives of the Course

- To Acquire the knowledge of some Statistical terms and interpret them in Excel sheet

UNIT I

Distribution of data- Characteristics of data - Frequency distribution - Procedure for Constructing a Frequency Distribution- Using Excel to Construct a Frequency Distribution - Relative Frequency Distribution - Cumulative Frequency Distribution.
(Chapter 2: Pages 58 to 70)

UNIT II

Histograms - Relative Frequency Histogram - Normal Distribution - Common Distribution Shapes – Skewness - Using XLSTAT for Histograms – Graphs – Using Excel to Construct a Scatter plot – Correlation Coefficient. (Chapter 2: Pages 70 to 81)

UNIT III

Time-Series Graph - Dotplots - Using XLSTAT for Stem plots - Bar Graphs - Using Excel to Create Bar Graphs - Pareto Charts - Pie Charts - Using Excel to Create Pie Charts - Frequency Polygon – Using Excel to Create Frequency Polygons.
(Chapter 2: Pages 81 to 98)

UNIT IV

Descriptive statistics – Measures of Center - Mean-Using Excel to Calculate the Mean - Median - Using Excel to Find the median. (Chapter 3: Pages 110 to 114)

UNIT V

Mode-Using Excel to Find the Mode - Midrange-Using Excel to Calculate the



Midrange – Weighted Mean-Using Excel for Descriptive Statistics. (Chapter-3: Pages 114 to 125)

Recommended Text

1. Mario F. Triola, Elementary Statistics Using Excel, Fifth Edition, Pearson New International Edition, 2014.

Reference Books

1. E.Balagurusamy, Computer Oriented Statistical and Numerical Methods, Macmillan Publishers India Limited, 2000.
2. V.K.Rohatgi, A.M.E.Saleh, An introduction to probability and statistics, JohnWiley & Sons, 2015.
3. B.Held, B.Moriarty and T.Richardson, Microsoft Excel Functions and Formulas, Stylus Publishing, LLC, 2019.
4. N. J. Salkind, Excel statistics: A quick guide, Sage Publications, 2015.
5. J.Schmuller, Statistical analysis with Excel for dummies, John Wiley & Sons, 2013.

Website and e-Learning Source

1. <https://nptel.ac.in>

INTERNSHIP / INDUSTRIAL TRAINING / FIELD VISIT / KNOWLEDGE UPDATING ACTIVITY**

Internal: 50 marks

External: 20 marks (Total: 100 marks)

- * A report should be submitted at the end of 5th semester and evaluated by external examiners.
- * Internship students should submit certificate of attendance from the industry along with report

