PERIYAR UNIVERSITY
SALEM - 11

M.Sc. Branch–I (B): Mathematics

(SEMESTER PATTERN)
(Under Choice Based Credit System)

(For University Department)

REGULATIONS AND SYLLABUS
(Candidates admitted from 2008-2009 onwards)

PERIYAR UNIVERSITY, SALEM –11

M.Sc. BRANCH 1(B) - MATHEMATICS - CHOICE BASED CREDIT SYSTEM (CBCS) REGULATIONS AND SYLLABUS

(For the candidates admitted from 2008-2009)

1. DURATION OF THE PROGRAMME :

The two-year postgraduate programme in M.Sc. Mathematics consists of four semesters under Choice Based Credit System.

2. ELIGIBILITY:

A candidate who has passed B.Sc. Degree Examination in Branch I- Mathematics of this University or an examination of some other university accepted by the syndicate as equivalent there to shall be permitted to appear and qualify for the M.Sc. Mathematics (CBCS) Degree Examination of this university after a course of two academic years in the Department of Mathematics of Periyar University.

3. DISTRIBUTION OF CREDIT POINTS AND MARKS:

The minimum credit requirement for a two – year Master's programme shall be 92 Credits. The break-up of credits for the programme is as follows:

- Core Courses : Minimum 66 credits
- Elective Courses : Minimum 16 credits
- Supportive Courses : Minimum 4 credits
- Project : 6 credits

* "Human rights" will be a compulsory non-credit course offered in the II semester.

4. COURSE OF STUDY:

The courses of study for the degree shall be in Branch I(B) - Mathematics (Choice Based Credit System) with internal assessment according to a syllabi prescribed from time to time.

Total Number of Marks : 1900
For Each Paper : 100 (Int. 25 + Ext. 75)
Project : 100

5. STRUCTURE OF THE PROGRAMME:

I SEMESTER

S.NO	COURSE CODE	TITLE OF THE COURSE	CREDIT	MARKS
1.	08 MAT C01	Algebra	5	100
2.	08 MAT C02	Real Analysis	5	100
3.	08 MAT C03	Ordinary Differential Equations	4	100
4.		Elective Course I	4	100
5.		Supportive Course	4	100

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II SEMESTER

6.	08 MAT C04	Advanced Algebra	5	100
7.	08 MAT C05	Partial Differential Equations	4	100
8.	08 MAT C06	Mechanics	5	100
9.	08 MAT C07	Graph Theory	4	100
10.		Elective Course – II	4	100
		Value Education	-	--

III SEMESTER

11.	08 MAT C08	Topology	5	100
12.	08 MAT C09	Complex Analysis	5	100
13.	08 MAT C10	Differential Geometry	5	100
14.	08 MAT C11	Probability Theory	5	100
15.		Elective Course - III	4	100

IV SEMESTER

16.	08 MAT C12	Measure Theory and Integration	5	100
17.	08 MAT C13	Functional Analysis	5	100
18.	08 MAT C14	Number Theory	4	100
19.		Elective Course - IV	4	100
	Project		6	100

DEPARTMENT ELECTIVE COURSES

S.NO	COURSE CODE	TITLE OF THE COURSE	CREDIT
1.	08 MAT E01	Discrete Mathematics	4
2.	08 MAT E02	Harmonic Analysis	4
3.	08 MAT E03	Difference Equations	4
4.	08 MAT E04	Numerical Analysis	4
5	08 MAT E05	Methods of Applied Mathematics	4
6.	08 MAT E06	Optimization Techniques	4
7.	08 MAT E07	Combinatorial Mathematics	4
8.	08 MAT E08	Fuzzy Sets and Their Applications	4
9.	08 MAT E09	Representation Theory	4
10.	08 MAT E10	Calculus of Variations and Integral Equations	4
11	08 MAT E11	Computer Programming Lab	4

SUPPORTIVE COURSES

S.NO	COURSE CODE	TITLE OF THE COURSE	CREDIT
1.	08 MAT S01	Applied Mathematics – I	4
2.	08 MAT S02	Applied Mathematics – II	4
3.	08 MAT S03	Numerical & Statistical Methods	4
4.	08 MAT S04	Statistics	4

6. QUESTION PAPER PATTERN:

(a) Question paper pattern for Theory Examination

Time: Three Hours Maximum: **75** Marks

Passing minimum: **38** Marks

Part - A (5x 5 = 25 Marks)

Answer **ALL** questions Two questions from each unit with internal choice

Part - B (5 x 10 = 50 Marks)

Answer **ALL** questions. Two questions from each unit with internal choice

(b) Question paper pattern for Practical Examination

Time: 3 Hours Maximum: **100(**Internal: 40 + External: 60) Marks

Practical Examination: 50 Marks Record: **10** Marks

Passing Minimum: 30 Marks (Aggregate of examination and Record)

There will be one question with or without subsections to be asked for the practical examination. Every question should be chosen from the question bank prepared by the examiner(s). A question may be used for at most three students in a batch.

7. PASSING MINIMUM

A candidate who has secured a minimum of 50% marks in all the courses (including practical) prescribed in the programme and earned minimum of 92 credits will be considered to have passed the Master's programme.

For the Practical paper, a minimum of 30 marks out of 60 marks in the University examination and the record notebook taken together is necessary for a pass. There is no passing minimum for the record notebook. However submission of record notebook is a must.

For the Project work and viva-voce a candidate should secure 50% of the marks for pass. The candidate should attend viva-voce examination to secure a pass in the Project.

8. COMMENCEMENT OF THIS REGULATION

These regulations shall take effect from the academic year 2008-09, that is, for students who are admitted to the first year of the programme during the academic year 2008-09 and thereafter.

9. DISSERTATION:

(a) Topic:

The topic of the dissertation shall be assigned to the candidate at the beginning of third semester and a copy of the same should be submitted to the University for approval.

(b) No. of copies of project/dissertation:

The students should prepare three copies of dissertation and submit the same for the evaluation by Examiners. After evaluation one copy is to be retained in the University library, one in the department library and one with the student.

Format for the preparation of project work:

(a) Title page

(b) Bonafide Certificate

(c) Acknowledgement

(d) Table of contents

CONTENTS

Format of the Title Page:

TITLE OF THE PRJOCET / DISSERTATION

Project/Dissertation Submitted in partial fulfillment of the requirement for the award of the

Degree of Master of Science in

MATHEMATICS

(Under Choice Based Credit System)

to the Periyar University, Salem – 636 011.

By

Students Name :

Register Number :

College :

Year :

Format of the Certificate:

CERTIFICATE

This is to certify that the dissertation entitled .....submitted in partial fulfillment of the requirement for the Degree of Master of Science in **MATHEMATICS (Under Choice Based Credit System)** to the Periyar University, Salem is a record of bonafide research work carried out by ..... under my supervision and guidance and that no part of the dissertation has been submitted for the award of any degree, diploma, fellowship or other similar titles or prizes and that the work has not been published in part or full in any scientific or popular journals or magazines.

Date:

Place: Signature of the Guide

Signature of the Head of the Department

08 MAT C01 **ALGEBRA**

UNIT I: Another Counting Principle

Another Counting Principle – Sylow's Theorem.

Chapter 2: 2.11 and 2.12

UNIT II: Direct Products

Direct Products – Finite Abelian Groups – Polynomial Rings.

Chapter 2: 2.13, 2.14 and Chapter 3: 3.9

UNIT III: Modules

Polynomials Over Rational Fields

Dual Spaces – Inner Product Spaces – Modules.

Chapter 3: 3.10

Chapter 4: 4.3, 4.4 and 4.5

UNIT IV: Galois Theory

Extension Fields – Roots of Polynomials – More about Roots – Elements of Galois Theory.

Chapter 5: 5.1, 5.3, 5.5 and 5.6

UNIT V: Finite Fields

Finite Fields – Wedderburn's Theorem – Theorem of Frobenius.

Chapter 7: 7.1, 7.2 and 7.3

TEXT BOOK:

I.N. Herstein, Topics in Algebra, 2nd edition, John Wiley and Sons, New York, 1975.

Books for Supplementary Reading and Reference:

1. S. Lang, Algebra, 3rd Edition, Addison-Wesley, Mass, 1993.
2. John B. Fraleigh, A First Course in Abstract Algebra, Addison Wesley, Mass, 1982.
3. M. Artin, Algebra, Prentice-Hall of India, New Delhi, 1991.

08 MAT C02 **REAL ANALYSIS**

UNIT I: Differentiation

Differentiation - The derivative of a real function – Mean value Theorems – The continuity of the Derivative – L' Hospital's Rule – Derivatives of Higher order – Taylor's theorem – Differentiation of Vector–valued functions.

Chapter 5: Page Number: 103 - 119

UNIT II: Riemann – Stieltjes Integral

The Riemann - Stieltjes Integral – Definition and Existence of the Integral – Properties of the Integral – Integration and Differentiation – Integration of Vector–valued functions – Rectifiable curves.

Chapter 6: Page Number: 120 - 142

UNIT III: Sequences and Series of Functions

Sequences and Series of Functions – Discussion of main problem – Uniform Convergence - Uniform Convergence and Continuity - Uniform Convergence and Integration-Uniform Convergence and Differentiation, Equicontinuous families of functions – Stone Weierstrass Theorem.

Chapter 7: Page Number: 143 - 171

UNIT IV: Some Special Functions

Some Special Functions – Power Series – The Exponential and Logarithmic functions – The Trigonometric functions- The algebraic completeness of the complex field – Fourier series - The Gamma function.

Chapter 8: Page Number: 172 – 203

UNIT V: Functions of Several Variables

Functions of several variables – Linear transformations – Differentiation – The contraction principle – The inverse function theorem – The implicit function theorem.

Chapter 9: Page Number: 204 – 227

TEXT BOOK:

Walter Rudin – Principles of Mathematical Analysis, 3rd edition, Mc Graw Hill Book Co., Kogaskusha, 1976.

Books for Supplementary Reading and Reference:

1. T.M. Apostol, Mathematical Analysis, Narosa Publ. House, New Delhi, 1985.
2. H.L. Royden, Real Analysis, Macmillan Publ. Co. Inc. 4th edition, New York, 1993.
3. V. Ganapathy Iyer, Mathematical Analysis, Tata McGraw Hill, New Delhi, 1970.

08 MAT C03 **ORDINARY DIFFERENTIAL EQUATIONS**

UNIT I: Linear Equations with Constant Coefficients

Introduction- Second order homogeneous equations - Initial value problems - Linear dependence and independence - Formula for Wronskian.

Chapter 2: Sections 1 to 5

UNIT II: Linear Equations with Constant Coefficients (Contd.)

Non-homogeneous equations of order two - Homogeneous and non-homogeneous equations of order n - Initial value problems - Annihilator method to solve a non-homogeneous equation.

Chapter 2: Sections 6 to 8 and Sections 10 - 11

UNIT III: Linear Equations with Variable Coefficients

Initial value problems for the homogeneous equation - Solutions of the homogeneous equations - Wronskian and linear independence - Reduction of the order of a homogeneous equation.

Chapter 3: Sections 1 to 5

UNIT IV: Linear Equations with Regular Singular Points

Linear equation with regular singular points - Euler equation - Second order equations with regular singular points - Solutions and properties of Legendre and Bessels equation.

Chapter: 3 Section 8 & Chapter 4: Sections 1 to 5

UNIT V: Existence and Uniqueness of Solutions of First Order Equations

Introduction - Equations with variables separated - Exact equations - Method of successive approximations – Lipschitz condition- Convergence of the successive approximations.

Chapter 5: Sections 1 to 6

TEXT BOOK:

E.A. Codington, An Introduction to Ordinary Differential Equations, Prentice Hall of India, New Delhi, 2007.

Books for Supplementary Reading and Reference:

1. R.P. Agarwal and Ramesh C. Gupta, Essentials of Ordinary Differential Equation, McGraw, Hill, New York, 1991.
2. D. Somasundaram, Ordinary Differential Equations, Narosa Publ. House, Chennai - 2002.
3. D. Rai, D.P. Choudhury and H.I. Freedman, A Course in Ordinary Differential Equations, Narosa Publ. House, Chennai, 2004.

08 MAT C04 **ADVANCED ALGEBRA**

UNIT I:

Algebra of linear transformations – Characteristic roots, Canonical roots – Canonical forms: Triangular form.

UNIT II:

Canonical forms: Nilpotent transformations, Jordan form, rational canonical form.

UNIT III:

Trace and transpose – Hermitian, Unitary and normal transformations – Real quadratic forms.

UNIT IV :

Rings and ring homomorphisms – Zero divisors, nilpotent elements, units – Nil radical and Jacobson radical – Extension and contraction.

UNIT V:

Modules and module homomorphisms – Operation on sub modules – Direct sum and product – Exact sequences – tensor product of modules – Exactness properties of the tensor product.

TEXT BOOK:

I.N. Herstein, Topics in Algebra, 2nd edition, John Wiley and Sons, New Delhi, 2004.

Chapter 6: Sections 1 to 8 and 10

M.F Atiyah and I.G. Macdonald, Introduction to Commutative Algebra, Addison – Wesley Publication Company, Inc. 1969.

Chapter: 1 and 2.

Books for Supplementary Reading and Reference:

1. N.S. Gopalakrishnan, Commutative Algebra, Oxonian Press Pvt. Ltd, New Delhi 1988.
2. F.W. Anderson and K.R. Fuller, Rings and Categories of Modules, 2 nd Edition, GTM vol. 13, Springer-verlog, New York 1992.

08 MAT C05 **PARTIAL DIFFERENTIAL EQUATIONS**

UNIT – I

Fundamental Concepts - Classification of Second Order PDE – Canonical Forms – Adjoint Operators – Riemann's Method.

UNIT – II

Elliptic Differential Equations - Occurrence of the Laplace and Poisson Equations – Boundary Value Problems – Some Important Mathematical Tools – Properties of Harmonic Functions – Separation of Variables.

UNIT - III

Dirichlet Problem for a Rectangle - Neumann Problem for a Rectangle – Interior Dirichlet Problem for a Circle - Exterior Dirichlet Problem for a Circle – Interior Neumann Problem for a Circle – Solution of Laplace Equation in Cylindrical Coordinates - Solution of Laplace Equation in Spherical Coordinates.

UNIT – IV

Parabolic Differential Equations – Occurrence of the Diffusion Equation – Boundary Conditions – Elementary Solutions of the Diffusion Equation – Separation of Variables Method - Solution of Diffusion Equation in Cylindrical Coordinates - Solution of Diffusion Equation in Spherical Coordinates.

UNIT – V

Hyperbolic Differential Equations – Occurrence of the Wave Equation – Derivation of One-dimensional Wave Equation – Solution of One-dimensional Wave Equation by Canonical Reduction - Initial Value Problem; D'Alemberts Solution - Vibrating String – Variables Separable Solution – Forced Vibrations – Solution of Non-homogeneous Equation – Duhamel's Principle.

TEXT BOOK:

K. Sankara Rao, Introduction to Partial Differential Equations, Second Edition, Prentice – Hall of India, New Delhi - 2006.

Books for Supplementary Reading and Reference:

1. I.N.Sneddon, Elements of Partial Differential Equations, International Edition, McGraw-Hill, Singapore, 1986.

2. J.N. Sharma and K. Singh, Partial Differential Equation for Engineers and Scientists, Narosa Publ. House, Chennai 2001.

08 MAT C06 **MECHANICS**

UNIT I: Mechanical Systems

The Mechanical system- Generalized coordinates – Constraints - Virtual work - Energy and Momentum

Chapter 1: Sections 1.1 to 1.5

UNIT II : Lagrange's Equations

Derivation of Lagrange's Equations- Examples- Integrals of the motion.

Chapter 2 : Sections 2.1 to 2.3 (Omit Section 2.4)

UNIT III: Hamilton's Equations

Hamilton's Principle - Hamilton's Equations - other Variational Principles.

Chapter 4 : Sections 4.1 to 4.3 (Omit section 4.4)

UNIT IV: Hamilton-Jacobi Theory

Hamilton Principle Function – Hamilton-Jacobi Equation - Separability

Chapter 5: Sections 5.1 to 5.3

UNIT V: Canonical Transformation

Differential forms and Generating Functions – Special Transformations– Lagrange and Poisson Brackets.

Chapter 6 : Sections 6.1, 6.2 and 6.3 (omit sections 6.4, 6.5 and 6.6)

TEXT BOOK:

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

Books for Supplementary Reading and Reference:

1. H. Goldstein, Classical Mechanics, 2nd Edition, Narosa Publishing House, New Delhi.
2. N.C.Rane and P.S.C.Joag, Classical Mechanics, Tata McGraw Hill, 1991.
3. J.L.Synge and B.A.Griffth, Principles of Mechanics, 3rd Edition, McGraw Hill Book Co., New York, 1970.

08 MAT C07 **GRAPH THEORY**

UNIT I:

Graphs, Subgraphs and Trees: Graphs and simple graphs – Graph Isomorphism - Incidence and Adjacency Matrices - Subgraphs – Vertex Degrees - Paths and Connection - Cycles - Trees - Cut Edges and Bonds - Cut Vertices – Cayley's formula.

Chapter 1 (Section 1.1 - 1.7), Chapter 2 (Section 2.1 - 2.4)

UNIT II:

Connectivity, Euler tours and Hamilton Cycles: Connectivity - Blocks - Euler tours – Hamilton Cycles.

Chapter 3 (Section 3.1 - 3.2), Chapter 4 (Section 4.1 - 4.2)

UNIT III:

Matchings, Edge Colourings: Matchings - Matchings and Coverings in Bipartite Graphs – Perfect Matching- Edge Chromatic Number - Vizing's Theorem.

Chapter 5 (Section 5.1 - 5.3), Chapter 6 (Section 6.1 - 6.2)

UNIT IV:

Independent sets and Cliques, Vertex Colourings: Independent sets - Ramsey's Theorem - Chromatic Number - Brooks' Theorem – Chromatic Polynomials.

Chapter 7 (Section 7.1 - 7.2), Chapter 8 (Section 8.1 - 8.2, 8.4)

UNIT V:

Planar graphs: Plane and planar Graphs - Dual graphs - Euler's Formula - The Five-Colour Theorem and the Four- Colour Conjecture.

Chapter 9 (Section 9.1 - 9.3, 9.6)

TEXT BOOK:

J.A.Bondy and **U.S.R. Murty**, Graph Theory and Applications, Macmillan, London, 1976.

Books for Supplementary Reading and Reference:

1. J.Clark and D.A.Holton, A First look at Graph Theory, Allied Publishers, New Delhi, 1995.
2. R.J..Wilson. and J.J.Watkins, Graphs: An Introductory Approach, John Wiley and Sons, New York, 1989.
3. S.A.Choudum, A First Course in Graph Theory, MacMillan India Ltd. 1987.
4. R. Balakrishnan and K. Ranganathan, A Textbook of Graph Theory, Springer Verlag, New York, 1999.

08 MAT C08 **TOPOLOGY**

UNIT I: Topological Spaces

Topological spaces – Basis for a topology – The order topology – The product topology on $X \times Y$ – The subspace topology – Closed sets and limit points.

Chapter 2, Sections 12 to 17

UNIT II: Continuous Functions

Continuous functions – The product topology – The metric topology.

Chapter 2 : Sections 18 to 21

UNIT III: Connectedness

Connected spaces- connected subspaces of the real line – Components and local connectedness.

Chapter 3 : Sections 23 to 25

UNIT IV: Compactness

Compact spaces – compact subspaces of the Real line – Limit Point Compactness – Local Compactness.

Chapter 3: Sections 26 to 29

UNIT V: Countability and Separation Axioms

The Countability Axioms – The separation Axioms – Normal spaces – The Urysohn Lemma – The Urysohn metrization Theorem - The Tietz extension theorem.

Chapter 4: Sections 30 to 34

TEXT BOOK:

James R. Munkres, "Topology", 2nd Edition, Prentice Hall of India Pvt. Ltd., 2000, (Third Indian Reprint)

Books for Supplementary Reading and Reference:

1. J. Dugundji , "Topology" , Prentice Hall of India, New Delhi, 1975.
2. George F.Sinmons,"Introduction to Topology and Modern Analysis", McGraw Hill Book Co., 1963.
3. J.L. Kelly, "General Topology", Van Nostrand, Reinhold Co., New York

08 MAT C09 **COMPLEX ANALYSIS**

UNIT I:

Lines and half planes in the Complex plane, the extended plane and its spherical representation, power series, analytic functions, analytic functions as mappings, mobius transformations.

UNIT II:

Riemann Stieltjes integrals, power series representation of analytic functions, zeros of an analytic function, the index of a closed curve.

UNIT III:

Cauchy's theorem and integral formula, the homotopic version of Cauchy's theorem and simple connectivity, counting zeros: The open mapping theorem, Goursat's theorem

UNIT IV:

Singularities: Classification of singularities, residues, the argument principle, the maximum principle, Schwarz's Lemma

UNIT V:

The space of continuous functions $C(G,\Omega)$, spaces of analytic functions, spaces of meromorphic functions, the Riemann mapping theorem.

TEXT BOOK:

John B. Convay, Functions of One Complex Variable, 2nd Edition, Narosa Publishing House, New Delhi, 1980.

Books for Supplementary Reading and Reference:

1. L.V. Ahlfors, Complex Analysis, 3rd Edition, McGraw - Hill Book Company, 1979.
2. V. Karunakaran, Complex Analysis - 2nd Edition, Narosa Publishing House, 2002.

08 MAT C10 **DIFFERENTIAL GEOMETRY**

UNIT I: Theory of Space Curves

Introduction – Representation of space curves – Unique parametric representation of a space curve – Arc-length – Tangent and osculating plane – Principal normal and binormal – Curvature and torsion – Behaviour of a curve near one of its points – The curvature and torsion of a curve as the intersection of two surfaces.

Chapter 1: Sections 1.1 to 1.9

UNIT II: Theory of Space Curves (Contd.)

Contact between curves and surfaces – Osculating circle and Osculating sphere – Locus of centres of spherical curvature – Tangent surfaces, involutes and evolutes – Intrinsic equations of space curves – Fundamental existence theorem – Helices

Chapter 1: Sections 1.10 to 1.13 and 1.16 to 1.18.

UNIT III: Local Intrinsic Properties of a Surface

Introduction - Definition of a surface – Nature of points on a surface – Representation of a surface – Curves on surfaces – Tangent plane and surface normal – The general surfaces of revolution – Helicoids – Metric on a surface – Direction coefficients on a surface.

Chapter 2: Sections 2.1 to 2.10

UNIT IV: Local Intrinsic Properties of Surface and Geodesics on a Surface

Families of curves – Orthogonal trajectories – Double family of curves – Isometric correspondence – Intrinsic properties – Geodesics and their differential equations – Canonical geodesic equations – Geodesics on surface revolution.

Chapter 2: Sections 2.11 to 2.15 and Chapter 3: Sections 3.1 to 3.4

UNIT V: Geodesics on a Surface

Normal property of geodesics – Differential equations of geodesics using normal property – Existence theorems – Geodesic parallels – Geodesic curvature – Gauss-Bonnet theorem – Gaussain curvature – Surfaces of constant curvature.

Chapter 3: Sections 3.5 to 3.8 and Sections 3.10 to 3.13

TEXT BOOK:

D. Somasundaram, Differential Geometry, A First Course, Narosa Publishing House, Chennai, 2005.

Books for Supplementary Reading and Reference:

1. T.Willmore, An Introduction to Differential Geometry, Clarendon Press, Oxford 1959.

2. D.J.Struik, Classical Differential Geometry, Addison Wesley Publishing Company INC, Massachusetts, 1961.

3. C.E.Weatherburn, Differential Geometry of Three Dimensions, University Press, Cambridge, 1930.

08 MAT C11 **PROBABILITY THEORY**

UNIT 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 1.1 to 1.7, Chapter 2 : Sections 2.1 to 2.9

UNIT 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

UNIT 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

UNIT 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 (Omit Section 5.11)

UNIT V

Limit Theorems - Stochastic convergence – Bernaulli law of large numbers – Convergence of sequence of distribution functions – Levy-Cramer Theorems – De Moivre-Laplace Theorem – Poisson, Chebyshev, Khintchine Weak law of large numbers – Lindberg Theorem – Lyapunov Theroem – Borel-Cantelli Lemma - Kolmogorov Inequality and Kolmogorov Strong Law of large numbers.

Chapter 6: Sections 6.1 to 6.4, 6.6 to 6.9 , 6.11 and 6.12. (Omit Sections 6.5, 6.10,6.13 to 6.15)

TEXT BOOK:

M. Fisz, Probability Theory and Mathematical Statistics, John Wiley and Sons, New York, 1963.

Books for Supplementary Reading and Reference:

1. R.B. Ash, Real Analysis and Probability, Academic Press, New York, 1972
2. K.L.Chung, A course in Probability, Academic Press, New York, 1974.
3. Y.S.Chow and H.Teicher, Probability Theory, Springer Verlag. Berlin, 1988 (2nd Edition)
4. R.Durrett, Probability : Theory and Examples, (2nd Edition) Duxbury Press, New York, 1996.
5. V.K.Rohatgi An Introduction to Probability Theory and Mathematical Statistics, Wiley Eastern Ltd., New Delhi, 1988(3rd Print).
6. S.I.Resnick, A Probability Path, Birhauser, Berlin,1999.
7. B.R.Bhat , Modern Probability Theory (3rd Edition), New Age International (P)Ltd, New Delhi, 1999.
8. J.P. Romano and A.F. Siegel, Counter Examples in Probability and Statistics, Wadsworth and Brooks / Cole Advanced Books and Software, California, 1968.

08 MAT C12 **MEASURE THEORY AND INTEGRATION**

UNIT I: Lebesgue Measure

Lebesgue Measure - Introduction – Outer measure - Measurable sets and Lebesgue measure-Measurable functions - Littlewoods' Three Principles.

Chapter 3: Sections 1 to 3, 5 and 6

UNIT II: Lebesgue integral

Lebesgue Integral - The Riemann integral - Lebesgue integral of bounded functions over a set of finite measure - The integral of a nonnegative function - The general Lebesgue integral.

Chapter 4: Sections 1 to 4

UNIT III: Differentiation and Integration

Differentiation and Integration - Differentiation of monotone functions - Functions of bounded variation - Differentiation of an integral - Absolute continuity.

Chapter 5 : Sections 1 to 4

UNIT IV: General Measure and Integration

General Measure and Integration - Measure spaces - Measurable functions - integration - General convergence theorem- Signed Measure - The Radon - Nikodym theorem.

Chapter 11: Sections 1 to 3, 5 and 6

UNIT V: Measure and Outer Measure

Measure and outer measure - outer measure and measurability - The Extension theorem - Product measures.

Chapter 12: Sections 1,2 and 4

TEXT BOOK:

H.L. Royden, Real Analysis, Mc Millan Publ. Co. New York 1993.

Books for Supplementary Reading and Reference:

1. G. de Barra, Measure Theory and Integration, Wiley Eastern Ltd., 1981.
2. P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New Age Int. (P) Ltd., NewDelhi, 2000.
3. Walter Rudin, Real and Complex Analysis, Tata McGraw Hill Publ. Co. Ltd., New Delhi, 1966.

08 MAT C13 **FUNCTIONAL ANALYSIS**

UNIT I: Banach Spaces

Definition and some examples – Continuous linear transformations – The Hahn-Banach theorem.

Chapter 9 : Sections: 46 to 48

UNIT II: Banach spaces and Hilbert spaces

The natural imbedding of N in N** - Open mapping theorem – conjugate of an operator – Definition and some simple properties.

Chapter 9 : Sections: 49 to 51 and Chapter 10 : Section: 52

UNIT III: Hilbert Spaces

Orthogonal complements – orthonormal sets - Conjugate space H* - Adjoint of an operator.

Chapter 10 : Sections: 53 to 56

UNIT IV: Operation on Hilbert spaces

Self-adjoint operators – Normal and unitary operators – Projections.

Chapter 10 : Sections: 57 to 59

UNIT V: General Preliminaries on Banach Algebras

Definition and some examples – Regular and singular elements – Topological divisors of zero – Spectrum – The formula for the spectral radius – the radical and semi-simplicity.

Chapter 12 : Sections: 64 to 69

TEXT BOOK:

G.F.Simmons , Introduction to topology and Modern Analysis, Tata McGraw -Hill Publishing Company, New Delhi, 2004.

Books for Supplementary Reading and Reference:

1. W. Rudin Functional Analysis, Tata McGraw-Hill Publishing Company, New Delhi , 1973.
2. G. Bachman & L.Narici, Functional Analysis Academic Press, New York ,1966.
3. H.C. Goffman and G.Fedrick, First course in functional Analysis, Prentice Hall of India, New Delhi, 1987

08 MAT C14 **NUMBER THEORY**

UNIT I: **Divisibility and Congruences**

Divisibility - Primes - Congruences - Solutions of congruences – Congruences of degree one.

Chapter 1: Sections 1.1 to 1.3 and Chapter 2: Sections: 2.1 to 2.3

UNIT II: **Congruences**

The function $\phi(n)$ - Congruences of higher degree - Prime power moduli - Prime modulus - Congruences of degree two, Prime modulus – Power residues.

Chapter 2: Sections 2.4 to 2.9

UNIT III: Quadratic reciprocity:

Quadratic residues - Quadratic reciprocity - The Jacobi symbol - Greatest integer function

Chapter 3: Sections 3.1 to 3.3 and Chapter 4: Section 4.1

UNIT IV: **Some Functions of Number Theory**

Arithmetic functions - The Moebius inversion formula - The multiplication of arithmetic functions.

Chapter 4: Sections 4.2 to 4.4

UNIT V: **Some Diophantine Equations**

The equation $ax+by=c$ - positive solutions - Other linear equations - The equation $x^2+y^2=z^2$ - The equation $x^4+y^4=z^2$ - Sums of four and five squares - Waring's problem - Sum of fourth powers - Sum of two squares.

Chapter 5: Sections 5.1 to 5.10

TEXT BOOK :

I. Niven and **H.S. Zuckerman,** An Introduction to the Theory of Numbers, 3rd edition, Wiley Easter Ltd., New Delhi, 1989.

Books for Supplementary Reading and Reference:

1. D.M. Burton, Elementary Number Theory, Universal Book, Stall, New Delhi 2001.
2. K. Ireland and M. Rosen, A Classical Introduction to Modern Number Theory, Springer Verlag, New York, 1972.
3. T.M. Apostol, Introduction to Analytic Number Theory, Narosa Publ. House, Chennai , 1980.

08 MAT E01 **DISCRETE MATHEMATICS**

UNIT I:

Logic – Propositional equivalence – Predicates and quantifiers – the growth of functions.

UNIT II:

Counting: Basics of counting – The pigeonhole principle – permutations and combinations – Generalized permutations and combinations – Generating permutations and combinations.

UNIT III:

Advanced counting techniques: recurrence relation – solving recurrence relations – Generating functions.

UNIT IV:

Boolean Algebra: Boolean functions – Representing Boolean functions – Logic Gates – Minimization of circuits.

UNIT V:

Modeling Computations: finite – state machines with output, finite – state machines with no output – Turing machines

TEXT BOOK:

Kenneth H. Rosen, Discrete Mathematics and its Applications (fourth edition), WCB/ McGraw Hill Publications,
Sections: 1.1, 1.2, 1.3, 1.8, 4.1 to 4.3, 4.6, 4.7, 5.1, 5.2, 5.4, 9.1 to 9.4, 10.2, 10.3, 10.5.

08 MAT E02 **HARMONIC ANALYSIS**

UNIT I:

Definition of Fourier Series and easy results - the Fourier Transform, Convolution - Approximate Identities - Fejer's Theorem - Unicity Theorem - Parseval's Relation - Fourier Steiltje's Coefficients.

Chapter 1: Sections: 1.1 - 1.4

UNIT II:

The Classical Kernels – Summability - Metric Theorems - Pointwise Summability - Positive Definite Sequences - Herglotz's Theorem

Chapter 1: Sections: 1.5 - 1.8

UNIT III:

The Inequality of Hausdorff and Young - Measures with bounded powers - Endomorphisms of l' - the Fourier Integral- Introduction - Kernels on R.

Chapter 1: Sections: 1.9 - 1.10, Chapter 2: Sections: 2.1 - 2.2.

UNIT IV:

The Plancherel Theorem - Another Convergence Theorem - the Poisson Summation Formula - Bockner's Theorem - The Continuity Theorem.

Chapter 2: Sections: 2.3 - 2.6.

UNIT V:

Characters of Discrete Groups - Characters of Compact Groups - Bockner's Theorem, Examples - Minkowski's Theorem.

Chapter 3: Sections: 3.1 - 3.5.

TEXT BOOK:

Henry Helson, "Harmonic Analysis", 2nd edition, Hindustan Book Agency, New Delhi, 1995.

Books for Supplementary Reading and Reference:

1. W.Rudin, "Real and Complex Analysis", 3rd edition, McGraw Hill International Editions, New York, 1987.
2. W.Rudin, "Fourier Analysis on Groups", Interscience Publishers, New York, 1985.
3. Rajendra Bhatia, "Fourier Series", 2nd edition, Hindustan Book Agency, New Delhi, 2003.

08 MAT E03 **DIFFERENCE EQUATIONS**

UNIT I: Difference Calculus

Difference operator - Summation – Generating function and Approximate Summation.

Chapter 2: Sections 2.1 to 2.3

UNIT II: Linear Difference Equations

First order equations - General results for linear equations - Solving Linear Equations.

Chapter 3: Sections 3.1 to 3.3

UNIT III: Linear Difference Equations (Contd.)

Equations with Variable Coefficients – The z -Transform.

Chapter 3: Sections 3.5 and 3.7

UNIT IV: Stability Theory

Initial value problems for linear systems – Stability of linear systems.

Chapter 4: Sections 4.1 and 4.2

UNIT V: Asymptotic Methods

Introduction- Asymptotic analysis of sums - Linear equations.

Chapter 5: Sections 5.1 to 5.3

TEXT BOOK:

W.G. Kelley and **A.C. Peterson,** Difference Equations,2nd edition Academic Press, New York, 1991.

Books for Supplementary Reading and Reference:

1. S.N. Elaydi, An Introduction to Difference Equations, Springer - Verlag, NewYork, 1995.
2. R. Mickens, Difference Equations, Van Nostrand Reinhold, New York, 1990.
3. R.P. Agarwal, Difference Equations and Inequalities, Marcel Dekker, New York, 1992.

08 MAT E04 **NUMERICAL ANALYSIS**

UNIT I: Solution of Nonlinear Equations

Newton's method – Convergence of Newton's method – Bairstow"s Method for quadratic factors. **NUMERICAL DIFFERENTIATION AND INTEGRATION**: Derivatives from Differences tables – Higher order derivatives – Divided difference, Central-Difference formulas – Composite formula of Trapezoidal rule – Romberg integration – Simpson's rules.

UNIT II: Solution of System of Equations

The Elimination method – Gauss and Gauss Jordan methods – LU Decomposition method – Matrix inversion by Gauss-Jordan method – Methods of Iteration – Jacobi and Gauss Seidal Iteration – Relaxation method – Systems of Nonlinear equations.

UNIT III: Solution of Ordinary Differential Equations

Taylor series method – Euler and Modified Euler methods – Rungekutta methods – Multistep methods – Milne's method – Adams Moulton method.

UNIT IV: Boundary Value Problems and Characteristic Value Problems

The shooting method – solution through a set of equations – Derivative boundary conditions – Characteristic value problems – Eigen values of a matrix by Iteration – The power method.

UNIT V: Numerical Solution of Partial Differential Equations

(Solutions of Elliptic, Parabolic and Hyperbolic partial differential equations) Representation as a difference equation – Laplace's equation on a rectangular region – Iterative methods for Laplace equation – The Poisson equation – Derivative boundary conditions – Solving the equation for time-dependent heat flow (i) The Explicit method (ii) The Crank Nicolson method -solving the wave equation by Finite Differences.

TEXT BOOK:

C.F.Gerald and **P.O.Wheatley**, Applied Numerical Analysis, Fifth Edition, Addison Wesley, (1998).

Books for Supplementary Reading and Reference:

1. M.K. Venkatraman, Numerical Methods in Science and Technology, National Publishers Company, 2nd Edition, (1992).
2. S.C. Chapra and P.C. Raymond: Numerical Methods for Engineers, Tata McGraw Hill, New Delhi, (2000).
3. P. Kandasamy et al.: Numerical Methods, S. Chand & Company Ltd., New Delhi (2003).

08 MAT E05 METHODS OF APPLIED MATHEMATICS

UNIT I: Calculus of Variations

Calculus of Variations – Maxima and Minima – Simplest case – Natural and transition boundary conditions – variational notation – general case – Constraints and Lagranges multipliers – variable end points – Sturm Liouvile problems.

UNIT II: Applications of Calculus of Variations

Hamiltons's principle – Lagranges equation – generalized dynamic entites – constraints in dynamical systems – small vibrations about equilibrium – variational problems for deformable bodies – Rayleih – Ritz method.

UNIT III: Integral equations

Integral equations – Relations between differential and integral equations – Green function – Fredholm equations with separable kernels.

UNIT IV: Integral equations (contd.)

Hilbert – Schmidt theory – Litrative method for solving equations of the second kind. Neumann Series – Fredholm theory – Singular integral equations.

UNIT V: Special devices

Special devices – Relative approximation to characteristic functions. Approximation of Fredholm equations by sets of algebraic equilibrium.

TEXT BOOK:

F.B. Hildebrand, Methods of Applied Mathematics, Prentice-Hall of India Pvt. New Delhi, 1968.

Books for Supplementary Reading and Reference:

1. R.P. Kanwal, Linear integral equation, Theory and Techniques, Acad. Press, 1971.
2. A.S. Gupta, Calculus of Variations with Application, Prentice-Hall of India, New Delhi, 2005
3. L. Elsgolts, Differential Equations and Calculus of Variations, Mir Publishers, Moscow, 1973.

08 MAT E06 **OPTIMIZATION TECHNIQES**

UNIT I: Linear Programming Proplems.

Dual Simplex – Revised Simplex - Illustrative Applications - Integer Programming Algorithms

Chapter: 4: Section 4.4., Chapter 7: Section 7.2 and Chapter 9: Section 9.1 and 9.2

UNIT II: Decision Analysis and Games

Decision Making under Certainty – Decision Making under Risk – Decision under uncertainty – Game Theory.

Chapter 14: Sec. 14.1 to 14.4

UNIT III: Inventory Models - Deterministic Models

Inventory Models - Probabilistic Models

Chapter 11: Sec. 11.1 to 11.3 and Chapter 16: Sec. 16.1.

UNIT IV: Queuing Theory

Elements of a Queuing model – Role of Exponential Distribution – Pure Birth and Death Models – Generalized Poisson Queuing Model – Specialized Poisson Queues – (M/G/1): (GD/∞/∞) – Pollaczek - Khintchine (P-K) Formula.

Chapter 17: Sec.17.2 to 17.7 (Omit Section: 17.6.4)

UNIT V: Optimization Theory

Classical Optimization Theory – Unconstrained Problems – Constrained Problems.

Chapter 20: Sections. 20.1 and 20.2

TEXT BOOK

Hamdy A Taha, Operations Research – An Introduction, Seventh Edition, Prentice – Hall of India, New Delhi, 2003.

Books for Supplementary Reading and Reference:

1. F.S.Hillier and G.J.Lieberman, Introduction to Operations Research (IV Edition), Mc Graw Hill Book Company, New York, 1989.
2. Philips D.T., Ravindra A. and Solberg J., Operations Research, Principles and Practice, John Wiley and Sons, New York, 1991.
3. B.E.Gillett, Operations Research – A Computer Oriented Algorithmic Approach, TMH Edition, New Delhi, 1976.

08 MAT E07 **COMBINATORIAL MATHEMATICS**

UNIT I:

Permutations and combinations.

UNIT II:

Generating functions.

UNIT III:

Recurrence relations.

UNIT IV:

Principle of inclusion and exclusion.

UNIT V:

Polya's theory of counting.

TEXT BOOK

C.L.Liu, Introduction to Combinatorial Mathematics, Tata MacGraw Hill, Chapters 1 to 5.

08 MAT E08 **FUZZY SETS AND THEIR APPLICATIONS**

UNIT I: Fuzzy sets

Fuzzy sets – Basic types – basic concepts – Characteristics- Significance of the paradigm shift - Additional properties of α – cuts.

Chapter 1: Sections 1.3 to 1.5 and Chapter 2: Section 2.1

UNIT II: Fuzzy sets versus CRISP Sets

Representation of Fuzzy sets- Extension principle of Fuzzy sets – Operation on Fuzzy Sets – Types of operation – Fuzzy complements

Chapter 2: Sections 2.2 and 2.3 and Chapter 3: Sections 3.1 and 3.2

UNIT III:Operations on Fuzzy sets

Fuzzy intersection – t-norms , Fuzzy unions – t conorms-Combinations of operations – Aggregation operations

Chapter 3: Sections 3.3 to 3.6

UNIT IV: Fuzzy Arithmetic

Fuzzy numbers – Linguistic variables – Arithmetic operation on intervals – Lattice of Fuzzy numbers.

Chapter 4: Sections 4.1 to 4.4

UNIT V: Constructing Fuzzy Sets

Methods of construction: an overview – direct methods with one expert – direct method with multiple experts – indirect method with multiple experts and one expert- Construction from sample data

Chapter 10: Sections 10.1 to10.7

TEXT BOOK:

G.J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, Prentice Hall of India Ltd, New Delhi, 2005.

Books for Supplementary Reading and Reference:

1. H.J.Zimmermann, Fuzzy Set Theory and its Applications, Allied Publishers, Chennai, 1996.
2. A.Kaufman, Introduction to the Theory of Fuzzy Subsets, Academi Press, New York, 1975.
3. V.Novak, Fuzzy Sets and Their Applications, Adam Hilger, Bristol, 1969.

08 MAT E09 **REPRESENTATION THEORY**

UNIT I: Group representations

Group representations – FG modules - FG-submodules and reducibility- group algebras.

UNIT II: Group algebra

FG- homomorphisms- Maschke's Theorem- Schur's Lemma- Irreducible modules and the group algebra.

UNIT III: More on the group Algebra

More on the group algebra- conjugacy classes- characters.

UNIT IV: Irreducible characters

Inner product of characters- the number of irreducible characters.

UNIT V: Character tables

Character tables and orthogonality relations- normal subgroups and lifted characters- some elementary character tables.

TEXT BOOK:

G.James and M.Liebeck, Representations and Characters of Groups, 2nd edition, Cambridge University Press, London, 2001.

Books for Supplementary Reading and Reference:

1. C.W. Curtis and I.Reiner, Methods of Representation Theory with Applications to Finite Groups and Orders, Volume 1, Wiley – Interscience, New York, 1981.
2. J.P. Serre, Linear Representation of Finite Groups, Springer-Verlag, New York, 1977.
3. W. Fulton and J.Harris, Representation Theory – A First Course, Graduate Texts in Mathematics 129, Springer – Verlag, New York, 1991.

08 MAT E10 CALCULUS OF VARIATIONS AND INTEGRAL EQUATIONS

UNIT I: Variational problems with fixed boundaries

The concept of Variation and its properties - Euler's equation - Variational problems for Functionals - Functionals dependent on higher order derivatives - Functions of several independent variables - Some applications to problems of Mechanics.

Chapter 1: Sections 1.1 to 1.7

UNIT II: Variational problems with moving boundaries

Movable boundary for a functional dependent on two functions - One-sided variations - Reflection and Refraction of extremals - Diffraction of light rays.

Chapter 2: Sections 2.1 to 2.5

UNIT III: Integral Equation

Introduction - Types of Kernels - Eigen values and Eigen function - connection with differential equation - Solution of an integral equation - Initial value problems - Boundary value problems.

Chapter 1: Sections 1.1 to 1.3 and 1.5 to 1.8

UNIT IV: Solution of Fredholm integral equation

Second kind with separable kernel - Orthogonality and reality eigen function - Fredholm Integral equation with separable kernel - Solution of Fredholm Integral Equation by successive substitution - Successive approximation - Volterra integral equation- Solution by successive substitution.

Chapter 2: Sections 2.1 to 2.3 and Chapter 4: Sections 4.1 to 4.5

UNIT V: Hilbert - Schmidt Theory

Complex Hilbert space - Orthogonal system of functions - Gram–Schmit orthogonalization process - Hilbert-Schmidt theorems – Solutions of Fredholm integral equation of first kind.

Chapter 3: Sections 3.1 to 3.4 and 3.8 to 3.9

TEXT BOOK:

1. **A.S. Gupta,** Calculus of Variations with Application, Prentice Hall of India, New Delhi, 2005.
2. **Sudir K. Pundir and Rimple Pundir,** Integral Equations and Boundary Value Problems,Pragati Prakasam, Meerut, 2005.

Books for Supplementary Reading and Reference:

1. F.B. Hildebrand, Methods of Applied Mathematics, Prentice - Hall of India Pvt. New Delhi, 1968.
2. R.P. Kanwal, Linear Integral Equations, Theory and Techniques, Academic Press, New York, 1971.
3. L. Elsgolts, Differential Equations and Calculus of Variations, Mir Publishers, Moscow, 1973.

08 MAT E11 **COMPUTER PROGRAMMING LAB**

Classes and Objects – Constructors and Destructors – Inheritance (single, multiple, hybrid, hierarchical) – Polymorphism (function overloading, function overriding and operator overloading) – Templates – Exception Handling.

LIST OF PRACTICALS

1. Solving a quadratic equation for all types of roots
2. Obtaining the root of an equation by bisection method
3. Obtaining the root of an equation by False – position method
4. Obtaining the root of a transcendental equation by Newton – Raphson method
5. Determining the Eigenvalues & Eigenvectors of a symmetric matrix.
6. Programming for polynomial Interpolation
7. Single Integration by Trapezoidal rule.
8. Single Integration by Simpson's 1/3 rule.
9. Solving ODE using second order Runge-Kutta Method.
10. Solving ODE using fourth order Runge-Kutta Method.
11. Solving ODE using Taylor's Series Method.
12. Solving ODE using Euler's Method.
13. Solving set of simultaneous linear equations by Jacobi Iteration Method.
14. Solving set of simultaneous linear equations by Gauss elimination Method.
15. Solving set of simultaneous linear equations by Gauss Seidal Iteration Method

One question may be asked from the above list.

TEXT BOOK:

E. Balagurusamy, Programming in ANSI C, 2nd Edition, Tata Mc Graw Hill (1992).

Books for Supplementary Reading and Reference:

1. V. Rajaraman, Computer Programming in C, Eastern Economy Edition, Second Printing (1995).
2. E. Balagurusamy, Programming in ANSI C, 2nd Edition, Twentieth Reprint, Tata McGraw Hill Publishing Co., Ltd., New Delhi (1998).
3. C.Xavier, C Language and Numerical Methods, New Age International (P) Limited, Publishers, New Delhi, (1999).

08 MAT S01 **APPLIED MATHEMATICS – I**

UNIT I: Ordinary Differential Equations

Second and higher order linear ODE – Homogeneous linear equations with constant and variable coefficients – Nonhomogeneous equations – Solutions by variation of parameters.

UNIT II: Functions of Several Variables

Partial derivatives – Total differential – Taylor's expansions – Maxima and Minima of functions – Differentiation under integral sign.

UNIT III: Partial Differential Equations

Formation of PDE by elimination of arbitrary constants and functions – Solutions – General and singular solution- Lagrange's Linear equation – Linear PDE of second and higher order with constant coefficients.

UNIT IV: Fourier Series

Dirichlet's conditions – General Fourier series – Half range Sine and Cosine series – Parseval's identity – Harmonic Analysis.

UNIT V: Boundary Value Problems

Classifications of PDE – Solutions by separation of variables - One dimensional heat and wave equation.

Books for Supplementary Reading and Reference:

1. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons, (Asia) Pte Ltd., Singapore, 2000.
2. Grewal, B.S., Higher Engineering Mathematics, Thirty Eighth Edition, Khanna Publishers, Delhi 2004.

08 MAT S02 **APPLIED MATHEMATICS – II**

UNIT I: Laplace Transform

Transform of elementary functions – Transforms of derivatives and integrals – Initial and final value theorems – Inverse Laplace transform – Convolution theorem – Solutions of linear ODE with constant coefficients.

UNIT II: Fourier Transforms

Fourier integral theorem – Fourier transform pairs– Fourier Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT III: Multiple Integrals

Double integration – Cartesian and polar co-ordinates – Change of order of integration – Area as a double integral – Triple integration – Volume as a triple integral.

UNIT IV: Vector Calculus

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem, Gauss divergence theorem and Stoke's theorem.

UNIT-V: Numerical Solutions of ODEs

Solution by Taylor's series Method - Euler's Method – Modified Euler Method, Runge-Kutta Method – Solving simultaneous equations.

Books for Supplementary Reading and Reference:

1. Kreyszig, E., "Advanced Engineering Mathematics" (8th Edition), John Wiley and Sons, (Asia) Pte Ltd., Singapore, 2000.
2. Grewal, B.S., Higher Engineering Mathematics, Thirty Eighth Edition, Khanna Publishers, Delhi 2004.

08MAT S03 **NUMERICAL & STATISTICAL METHODS**

(Theorems and proof are not expected)

UNIT I:

Algebraic and Transcendental Equations: Bisection Method – Iteration Method – The Method of False Position – Newton- Raphson – Method.

UNIT II:

System of Linear Equation: Gauss Elimination, Gauss Jordon elimination – Triangularization method –Iterative Methods, Jacobi, Gauss-seidal iteration, Iterative method for A^{-1}.

UNIT III:

Numerical differentiation: Maximum and minimum values of a tabulated function. Numerical Integration: Trapezoidal Rule – Simpson's Rule – Numerical double Integration.

UNIT IV:

Correlation Coefficient – Rank correlation coefficient of determination – Linear regression –Method of least squares – Fitting of the curve of the form $ax+b$, ax^2+bx+c, ab^x and ax^b – Multiple and partial correlation (3-variable only).

UNIT V:

Binominal Distribution – Poisson Distribution – Normal Distribution – Properties and Applications.

TEXT BOOK

1. **S.S. Sastry**, Introductory Methods of Numerical Analysis, Prentice Hall of India, pvt Ltd., 1995.

2. **S.C. Gupta and V.K. Kapoor,** Fundamentals of Mathematical Statistics, Sultan Chand & Sons, (1994).

Books for Supplementary Reading and Reference:

1. S.Kalavathy, Numerical Methods, Vijay Nicole, Chennai, 2004.
2. Dr. Kandasamy, Numerical Methods, Sultan Chand, New Delhi.

08 MAT S04 **STATISTICS**

UNIT I:

Collection, classification and tabulation of data, graphical and diagrammatic representation – Bar diagrams, Pie diagram, Histogram, Frequency polygon, frequency curve and Ogives.

UNIT II:

Measures of central tendency – Mean, Median and Mode in series of individual observations, Discrete series, Continuous series (inclusive), More than frequency, Less than frequency, Mid-value and open-end class.

UNIT III:

Measures of dispersion – Range, Quartile deviation, Mean deviation about an average, Standard deviation and co-efficient of variation for individual, discrete and continuous type data.

UNIT IV:

Correlation – Different types of correlation – Positive, Negative, Simple, Partial Multiple, Linear and non-Linear correlation. Methods of correlation – Karlpearson's Spearman's correlations and Concurrent deviation.

UNIT V:

Regression types and method of analysis, Regression line, Regression equations, Deviation taken from arithmetic mean of X and Y, Deviation taken from assumed mean, Partial and multiple regression coefficients – Applications

TEXT BOOK

S.C.Gupta and V.K.Kapoor, Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi, 1994.

Books for Supplementary Reading and Reference:

1. Freund J.E.(2001); Mathematical Statistics, Prentice Hall of India.
2. Goon, A.M., Gupta M.K., Dos Gupta, B, (1991), Fundamentals of Statistics, Vol. I, World Press, Calcutta.