GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE

RAJNANDGAON (C.G.)

SCHEME OF EXAMINATION
&
SYLLABUS
of

M.Sc. (MATHEMATICS)

UNDER
FACULTY OF SCIENCE
Session 2025-26

(Approved by Board of Studies)
Effective from July 2025

DEPARTMENT OF MATHEMATICS

Department of Mathematics

List of members of Board of Studies

1. **Dr. Kailash Kumar Dewangan (Chairman)-**

   H.O.D. Department of Mathematics

   Govt. Digvijay Autonomous P.G. College, Rajnandgaon

2. **Dr. Rajesh Pandey (V.C. Nominee) –**

   Additional Director, Higher Education Department, Durg Division

3. **Dr. C.L. Dewangan (Principal Nominee) -**

   Additional Director, Regional Office, Raipur Division

4. **Dr. Pushpa Kaushik (Principal Nominee) -**

   Govt. J. Yoganandam Chhattisgarh College, Raipur

5. **Dr. Hemant Kumar Sao (Member)**

6. **Dr. Kavita Sakure (Member)**

7. **Mr. Rajkumar Jain (Industrialist)**

8. **Miss Prakshi Nayak (Ex-student)**

INTRODUCTION

To meet the need and requirements of the society and order to enhance the quality and standards of education syllabus are regularly updated. M.Sc. Mathematics programs we included core course and optional papers. The teaching program is expected to be supplemented by tutorials, seminar and PPTs.

It is recommended that each paper further divided into five units in B.Sc. and four units in M.Sc. and question from each unit be asked so as to ensure the student has actually studied all the topics. In order to test the grasp of the underlining principles of the various topics, very short answer type questions, short answers and long answer type questions covering the entire syllabus will be asked.

OBJECTIVE

1. A student should be able to understand the proof technique in Mathematics and its importance.
2. A student should acquire sufficient technical competence to solve the problems of varying difficulties levels.
3. A student should acquire communication skill to present technical Mathematics so as takes up career into Teaching/research in Mathematics and other various level competition exams like UPSC, PSC, etc.

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M.Sc. MATHEMATICS

Semester System, 2025-26 Onwards

There shall be five papers (Theory/Practical) in M.Sc. Mathematics Course (Third & Fourth semester) Mathematics in each Semester. All are compulsory. Each paper Will have 100 (80 Theory + 20 Internal Assessment) Marks. Overall marks in Theory and Practical in each semester will be 500. The course content of each paper has been divided into four units. However, there will be internal choice in each Unit.

First Semester

Course	Subject	Theory	Int. Ass.	Max Marks
Paper-I	Advanced Abstract Algebra (I)	80	20	100
Paper-II	Real Analysis (I)	80	20	100
Paper-III	Topology (I)	80	20	100
Paper-IV	Complex Analysis (I)	80	20	100
Paper-V	Advanced Discrete Mathematics (I)	80	20	100

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Second Semester

Course	Subject	Theory	Int. Ass.	Max Marks
Paper-I	Advanced Abstract Algebra (II)	80	20	100
Paper-II	Real Analysis (II)	80	20	100
Paper-III	General and Algebraic Topology (II)	80	20	100
Paper-IV	Complex Analysis (II)	80	20	100
Paper-V	Advanced Discrete Mathematics (II)	80	20	100

Third Semester

Course	Subject	Theory	Practical	Int Ass.	Max Marks
Paper I	Integration Theory and Functional Analysis (I)	80	-	20	100
Paper-II	Partial Differential Equations	80	-	20	100
Paper-III	Programming in C (ANSI features) Theory and Practical (I)	50	30	20	100
Paper-IV	Operations Research (I)	80	-	20	100
Paper-V	Optional -1				
	Fuzzy Sets and Its Applications (I)	80	-	20	100
	Optional -2				
	Fundamental of Computer Science Theory & Practical	50	30	20	100

Fourth Semester

Course	Subject	Theory	Practical	Int.Ass.	Max Mark
Paper-I	Functional Analysis (II)	80	-	20	100
Paper-II	Mechanics	80	-	20	100
Paper-III	Programming in C (ANSI features) Theory and Practical (II)	50	30	20	100
Paper-IV	Operations Research (II)	80	-	20	100
Paper-V	Optional -1				
	FuzzySets and Its Applications (II)	80	-	20	100
	Optional -2				
	Operating System data base Management System				
	Theory & Practical	50	30	20	100

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CREDIT BASED SYSTEM (CBS)

At post-graduate level, candidates are required to study twenty papers in I^{st,} IInd, IIIrd and IVth Semester Examination (5-papers in each semester). This is treated as twenty papers course structure. So there will be twenty papers in each POST-GRADUATE EXAMINATION in MATHEMATICS containing 100 credits. In first and second semester, each paper shall carry 100 marks (80 marks for external examination and 20 marks for internal examination). In Third and Fourth semester, Third paper (Programming in C) and Fifth(Optional Theory and Practical)) paper will carry 50 marks for External Examination and 20 marks for Internal Examination and 30 marks for Practical Examination. There shall be 2000 marks in M.Sc. Candidates shall have to secure 36 percent marks in aggregate of all papers in order to pass the M.Sc. Examination.

M.Sc. SEMESTER – I

Paper	Title Of The Paper	Credits
PAPER-I	Advanced Abstract Algebra(I)	05
PAPER-II	Real Analysis(I)	05
PAPER -III	Topology(I)	05
PAPER-IV	Complex Analysis(I)	05
PAPER-V	Advanced Discrete Mathematics(I)	05
	Total Credits	**25**

M.Sc. SEMESTER – II

Paper	Title Of The Paper	Credits
PAPER-I	Advanced Abstract Algebra(II)	05
PAPER-II	Real Analysis(II)	05
PAPER -III	General and Algebraic Topology (II)	05
PAPER-IV	Complex Analysis(II)	05
PAPER-V	Advanced Discrete Mathematics(II)	05
	Total Credits	**25**

M.Sc. SEMESTER – III

Paper	Title Of The Paper		Credits
PAPER-I	Integration Theory and Functional Analysis (I)		05
PAPER-II	Partial Differential Equations		05
PAPER-III	Programming in C (ANSI Features) Theory and Practical (I)	Theory	03
		Practical	02
PAPER-IV	Operation Research (I)		05
PAPER-V Optional- 1	Fuzzy Sets and its Applications (I)		05
PAPER-V Optional- 2	Fundamentals of Computer Science- Theory and Practical (Object Oriented Programming and Data Structure)	Theory	03
		Practical	02
		Total Credits	**25**

M.Sc. SEMESTER – IV

Paper	Title Of The Paper		Credits
PAPER-I	Functional Analysis (II)		05
PAPER-II	Mechanics		05
PAPER-III	Programming in C (ANSI Features) Theory and Practical (I)	i. Theory	03
		ii. Practical	02
PAPER-IV	Operation Research (II)		05
PAPER-V Optional- 1	Fuzzy Sets and its Applications (II)		05
PAPER-V Optional- 2	Operating System and Database Management System Theory and Practical	iii. Theory	03
		iv. Practical	02
		Total Credits	**25**
Total Credits -M.Sc. First to Fourth Semester			**100**

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M.Sc. Mathematics (First Semester) 2025-26

Paper-I: ADVANCED ABSTRACT ALGEBRA (I)

Max Marks. 80

Unit-I Series of Groups: Normal and Subnormal Series, Composition Series, Jordan – Holder Theorem, Solvable Groups and its properties, Commutator subgroup, Nilpotent groups and its properties.

Unit-II Field Theory: Extension Field, Finite extension, Algebraic element, Algebraic and Transcendental extensions, algebraically closed Fields, Roots of polynomials, Splitting field

Unit-III Simple extension, Primitive element, Separable and inseparable extensions, Perfect Field, Finite Fields, Automorphisms of extensions, Normal extensions

Unit-IV Galois Theory- Galois Extensions, Galois group Fundamental Theorem, Galois Theory. Solution of Polynomial equations, by Radicals, Insolvability of the general question of degree 5 by Radicals

Internal Assessment: 20

Recommended Books

1. P.B.Bhattcharya, S.K.Jain,S.R Nagpaul:Basic Abstract Algebra,Cambris University Press.
2. I.N.Heristin: Topics In Algebra,Willy Easterm Ltd.
3. Quazi Zameeruddin and Surjeet Singh:Modern Algerbra.

Reference

1. M.Artin,Algebra,Prentice-Hall of India,1991.
2. P.M.Cohn,Algebra,Vols.I,II&III,John Willey & Sons,1982,1989,1991.
3. N.jacobson,Basic Algebra,Vols.I,W.H.Freeman,1980(alsoPublished By Hindushtan Publishing Company).
4. S.Lang, Algebra, 3rd Edition, Addison-Wesely,1993.
5. I.S.Luther and I.B.S.Passi,Algebra,Vol.I-Groups,Vol.II-Rings,NarosaPublishing House (Vol.I- 1996, Vol. II-1999)
6. D.S.Malik,J.N.Mordeson,andM.K.Sen,Fundamental Of Abstract Algebra,MC Graw-
7. Hill,International Edition,1997.
8. Vivek Sahai and vikas Bist,Algebra,Narosha Publishing House,1999.
9. I.Stewart,Galois Theory,2nd Edition,Chapman and Hall,1989.
10. J.P.Escofier,Galois Theory,GTM Vol.204,Springer,2001.
11. Fraleigh,A First Course In Algebra,Narosa,1982.

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M.Sc. Mathematics (First Semester) 2025-26

Paper-II: REAL ANALYSIS (I)

Max Marks. 80

Unit-I Sequence and series of function, Pointwise and uniform Convergence, Cauchy Criterion for uniform convergence, weierstrass M-Test.Abel's and Dirichlet's,Test for Uniform Convergence, Uniform Convergence and Continuity, Uniform Convergence and Differentiation, Weiestrass Approximation Theorem,

Unit-II Power Series, Uniqueness theorem for Power Series,Abel's and Tauber's Theorem. Rearrangements of terms of a Series, Riemann's theorem

Unit-III Function of several variables, linear Transformations, Derivatives in an Open Subset of R^n Chain Rule, Partial, Deriavatives, Interchange of the order of differentiation, Derivatives of Higher Orders, Taylor's Theorem, Inverse Function Theoram, Implicit Function Theorem.

Unit-IV Jacobians, Extremum problem with Constraints, Lagrange's multiplier method, Differentiation of Integrals.Partitions of unity, Differential Forms,Stoke's Theorem

Internal Assessment M.M.:-20

Recommended Books

1. Walter Rudin, principals Of Mathematical Analysis (3rd Edition).Mc Graw Hill, Kogakusha, 1976, International Student edition

Reference:

2. T.M. Apostol, Mathematical Analysis Narosa Publishing House, New Delhi, 1985.
3. Gabriel Klambauer, Mathematical Analysis Marcel Dekkar, Inc.NewYork, 1975.
4. A.J.White,Real Analysis,An Introduction,Addison-Wesley Publishing Co.,Inc.,1968
5. G.De Barra, Measure Theory In Integration,Wiley Esterm Limited,1981.
6. E.Hewitt and K.Stromberg. Real And Abstract Analysis,Berlin Springer,1969.
7. P.K.Jain and V.K.Gupta,Labesuge Measure And Integration,New age International(P) Limited Published,New Delhi,1986 Reprint 2000.
8. I.P.Natanson,Theory Of Function of a Real Variable.Vol.I,Frederick Unagar Publishing Co., 1961.
9. H.L.Royden,Real Analysis,Macmillan Pub.Co.Inc.4th Edition,Newyork,1962.
10. Richard L.Wheeden and Antoni Zygmund,Measure and Integral:An Introduction to Real Analysis, Marcel Dekkar Inc.,1977.
11. J.H.Williamson, Lebesgue Integration,Holt Rinchart and Winston,Inc.New York.1962.
12. A.Friedman, Foundation of Modern Analysis,Holt,RineHart and Winston,Inc.New York, 1970.

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M.Sc. Mathematics (First Semester) 2025-26

Paper-III: TOPOLOGY

Max Marks. 80

Unit – I Countable and uncountable sets and the Axiom of choice Cardinal numbers and its arithmetic. Schroeder – Bernstein theorem. Cantor's theorem and continumm hypothesis . Zorn's lemma, well ordering theorem . Definition and examples of Topological spaces .Closed sets, Closure, Dense sets, Neighborhoods, Interior, exterior and boundary. Accumulation points and derived sets. Bases and sub-bases .Subspaces and relative topology.

Unit –II Alternative methods of defining a topology in terms of Kuratowski Closure Operator and Neighbourhood Systems. Continuous functions and homeomorphism. First and second Countable spaces. Lindeloff's theorems. Separable Spaces. Second countability Separabitlty.

Unit – III Separation axioms; their Characterization and basic properties. Urysohn's lemma, Tietze extension theorem. Compactness-Continuous functions and compact sets. Basic properties of compactness.compectness and finite intersection property

Unit – IV sequentially and count ably compact sets. Local compactness and one point, compactification Stone – Cech compactification. Compactness in metric spaces, Equivalence of compactness, countable compactness and sequential compactness in metric, space, Connected Spaces, Connectedness on the real line Components, Locally connected spaces

Internal Assessment M.M.:-20

Recommended Books

1. James R. Munkres, Topology: A First Course, Prentice Hall of India Pvt. Ltd., New Delhi,2000.
2. K. D. Joshi, Introduction to General Topology, Wiley Eastern Ltd., 1983.

Reference:

1. J. Dugundji, Topology, Prentice Hall of India Pvt. Ltd., 1966.
2. George F. Simmons, Introduction to Topology and Modern Analysis, Mc Graw-Hill Book Company,1963.
3. K. D. Joshi, Introduction to General Topology, Wiley Eastern Ltd.,1983.
4. J. Hocking and G. Young, Topology, Addision-Wiley Reading,1961.
5. J. L. Kelley, General Topology, Van Nostrand, Reinhold Co., New York,1995.
6. L. Steen and J. Seebatch, Counter example in Topology, Holt Reinhart And Winston, New York,1970.
7. W. Thron, Topologically Structures, Holt, Rinehart and Winston, New York,1966.
8. N. Bourbaki, General Topology Part I (Transl.), Addision Wesley,Reading,1966.

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M.Sc. Mathematics (First Semester) 2025-26

Paper-IV: COMPLEX ANALYSIS (I)

Max Marks. 80

Unit-I Complex Integration, Cauchy-Goursat Theorem, Cauchy's Integral Formula, Higher Order Derivatives, Morera's Theorem. Cauchy's Inequality and Liouville's Theorem.The Fundamental Theorem of Algebra, Taylor's Theorem, Laurent's Series, Isolated Singularities, Meromorphic Functions

Unit-II Maximum Modulus Principle, Schwarz lemma, The argument Principle .Rouche's Theorem, Inverse Function Theorem

Unit-III Residues, Cauchy's residue Theorem, Billinear Transformations, their Properties and classifications .Definitions and examples of conformal mappings

Unit-IV Evaluation of Integrals, Branches of Many Valued Functions With special Reference to arg Z, log Z and Zn. Spaces of Analytic Functions, Hurwitz's Theorem, Montel's Theorem, Riemann Mapping Theorem

Internal Assessment -20

Recommended Books

1. H.A.Priestly,Introduction to Complex Analysis,Clarendon Press,Oxford 1990.
2. J.B. Conway,Function of One Complex variable,Springer-Verlag,International Student-Edition,Naosa Publishing House,1980.
3. Liang-Shin Hahn & Bernard Epstein, Classical Complex Analysis, Jones and Bartlett Publisher's International,London,1966.
4. L.V. Ahlfors Complex Analysis,MC Graw-Hill,1979.
5. S.Lang,Complex Analysis,Addison Wesely,1977.
6. D.Sarason ,Complex Function Theory,Hindustan Book Agency,Delhi,1994.
7. Mark J.Ablowitz and A.S. Fokas,Complex variables,Introduction and Applications, Cambridge University Press,South Asian Edition,1998.
8. E.Hille,Analytic Function Theory (2 Vols.) Gonn & Co.,1959.
9. W.H.J.Fuchs,Topics in The Theory of functions of one Complex variable,D.van Nostrand Co.,1967.
10. C.Caratheodory, Theory of Functions (2 Vols.) Chelsea Publishing Company, 1964.
11. M.Heins, Complex function Theory, Academic Press, 1968.
12. Walter Rudin, Real and Complex Analysis, Mc-Graw Hill Book Co., 1966.
13. S.Saks and A.Zygmund, Analytic Functions, Monographic matematyczne, 1952.
14. E.c.Titchmarsh, The Theory of Functions, Oxford University Press, London.
15. W.A. Veech,A Second Course in Complex Analysis,W.A.Benjamin,1967.
16. S.Ponnusamy, Foundation of Complex Analysis,Narosa Publishing House,1997.

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M.Sc. Mathematics (First Semester) 2025-26

Paper – V: ADVANCED DISCRETE MATHEMATICS (I)

Max Marks. 80

Unit-I Formal Logic-Statements.Symbolic Representation and Tautologies.Quantifiers, Predicates and validity, Propositional Logic,Semigroups and Monoids-Definitions and Examples of semigroups monoids (Including those pertaining to concatenation Operation).Homomorphism of Semi groups and monoids, Congruence relation and Quotient Semi groups, Sub Semi Groups and submonoids. Direct Products.Basic Homomorphism Theorem

Unit-II Lattices-Lattice as Partially orderd sets. Their Properties.,Lattices and Algebraic systems. Sub lattices, and Homomorphisms. Some Special lattices e.g. Complete, Complemented and Distributive Lattices. Boolean Algebras- Boolean Algebras as Lattice.Various Boolean Identities, The Switching Algebra example, Sub algebras.

Unit-III Direct Products and Homomorphisms.Join- Irreducible elements, Atoms and Minterms, Boolean Forms and their Equivalence, Minterm and Boolean Forms, Sum of Products Canonical Forms, Minimization of Boolean Functions, Applications of Boolean Algebra to Switching Theory (Using AND, OR, & NOT Gates).The Karnaugh Map Method.

Unit-IV Grammars and Languages-Phrase- Structure Grammars, Rewriting Rules, Derivation,Sentential Forms.Language generated by a Grammar. Regular, context Free and Context Sensutuve Grammars and Languages.Regular sets Regular Expressions and The Pumping Lemma. Kleene's Theorem Notions of Syntax Analysis, Polish Notations Conversions of Infix Expression to Polish Notation, The Reverse Polish Notation

Internal Assesment-20

Recommended Books

1. Elements of Discrete Mathematics By C.L.Liu
2. J.P.Tramblay & Monohar, Discrete Mathematical Structures with Applications of Compute Science, Mc-Graw Hill Book Co., 1997.

Reference

1. J.L.Gersting, Mathematical Structures for Computer Science,(3rd edition), Computer Science Press, New York.
2. Seymour Lepschutz, Finite Mathematics (International Edition 1983), Mc-Graw Hill Book Company New York.
3. S.Witala , Discrete Mathematics-A Unified Approach Mc-Graw Hill Book Co.

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M.Sc. Mathematics (Second Semester) 2025-26

Paper-I: ADVANCED ABSTRACT ALGEBRA (II)

Max Marks. 80

Unit-I Modules: Cyclic modules. Simple modules, Semi-Simple modules Schedular's Lemma, Free modules, Noetherian and Artinian modules and rings Hilbert basis Theorem,Wedderburn Artin Theorem, Uniform modules, Primary modules, and Noether-Lasker Theorem.

Unit-II Linear Transformations: Algebra of Linear Transformations, characteristic roots, matrices and linear transformations.

Unit-III Canonical Form: Similarity of linear transformations. Invariant subspaces, Reduction to triangular forms. Nilpotent transformations, Index of Nilpotency, Invariants of a nilpotent transformation. The primary decomposition theorem, Jordan blocks and Jordon forms

Unit-IV Smith normal form over a principal ideal domain and rank. Fundamental structure theorem for finitely generated modules over a principal ideal domain and its applications to finitely generated Abelian groups, rational canonical form, Generalized Jordan form over and field

Internal Assessment:-20

Recommended Books

1. P.B.Bhattcharya,S.K.Jain,S.R Nagpaul:Basic Abstract Algebra,Cambris University Press.
2. I.N.Heristin:Topics In Algebra,Willy Easterm Ltd.
3. Quazi Zameeruddin and Surjeet Singh:Modern Algerbra.

References

1. M.Artin, Algebra, Prentice-Hall of India, 1991.
2. P.M.Cohn,Algebra,Vols.I ,II &III,John Willey & Sons,1982,1989,1991.
3. N.Jacobson,Basic Algebra,Vols.I,W.H.Freeman,1980(Published By Hindustan Publishing Company).
4. S.Lang, Algebra, 3rd Edition, Addison-Wesely,1993.
5. I.S.Luther and I.B.S. Passi, Algebra,Vol.I- Groups, Vol.II-Rings, NarosaPublishing House (Vol.I- 1996, Vol. II-1999)
6. D.S.Malik, J.N.Mordeson,andM.K.Sen,Fundamental Of Abstract Algebra, MC Graw-Hill,International Edition,1997.
7. Vivek Sahai and vikas Bist,Algebra,Narosha Publishing House,1999.

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M.Sc. Mathematics (Second Semester) 2025-26

Paper-II: REAL ANALYSIS (II)

Max Marks. 80

Unit-I Definition and Existence of Riemann- stieltjes integral, Properties of the Riemann-stieltjes integral, Integration and Differentiation, The Fundamental Theorem of calculus, Integration of Vector- valued Functions, Rectifiable Curves

Unit-II Lebesgue Outer measurability, Non measurable sets. Regularity, Measurable function Borel and Lebesgue measurability, Non measurable sets, Integration of Non-Negative Function, The General Integral. Integration of Series

Unit-III Measures and Outer Measures, Extension of a Measure Uniqueness of Extension, Completion of a measure, Measure space, Integration on Masurable spaces with respect to a measure, Reimann and Lebesgue Integrals

Unit-IV The four derivatives, Lebesgue Differentiation theorem, Differentiation and Integration, Function of bounded variation, The LP- Spaces. Convex Functions, Jensen's Inequality. Holder and Minkowski Inequalities, Completeness of LP, Convergence in Measure, Almost uniform Convergence.

Internal Assessment M.M.:20

Recommended Books

1. Principal of mathematical Analysis By W.Rudin
2. Real Analysis By H.L.Roydon

References

1. Walter Rudin, principals Of Mathematical Analysis (3rd Edition), Mc Graw Hill, Kogakusha, 1976,International Student edition
2. T.M. Apostol, Mathematical Analysis Narosa Publishing House, New Delhi, 1985.
3. Gabriel Klambauer, Mathematical Analysis Marcel Dekkar, Inc.NewYork, 1975.
4. A.J.White, Real Analysis, An Introduction, Addison-Wesley Publishing Co.,Inc.,1968
5. G.De Barra, Measure Theory In Integration, Wiley Esterm Limited, 1981.
6. E.Hewitt and K.Stromberg. Real and Abstract Analysis, Berlin Springer, 1969.
7. P.K.Jain and V.K. Gupta, Labesuge Measure And Integration, New age International(P) Limited Published, New Delhi, 1986 Reprint 2000.
8. I.P.Natanson, Theory of Function of a Real Variable, Vol,.I, Frederick Unagar Publishing ,Co., 1961.

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M.Sc. Mathematics (Second Semester) 2025-26

Paper-III: GENERAL AND ALGEBRAIC TOPOLOGY

Max Marks. 80

Unit – I Tychonoff Product Topology in Terms of standard Sub base and its Characterizations, Projection Maps, Separation axioms and product Spaces, Connectedness and product Spaces, Compactness and product Spaces (Tychonoff's theorem), Countability and product Spaces

Unit –II Embedding and Metrization- Embedding Lemma and Tychonoff Embedding, The Urysohn Metrization Theorem. Local finiteness, The Nagata- Smirnov Metrization Theorem, Para Compactness, The Smirnov Metrization Theorem

Unit – III Nets and Filter – Topology and Convergence of Nets, Hausdorffness and Nets, Compactness and Nets, Filters and their Convergence, Canonical way of Converting nets into filters and vice-versa. Ultra-Filters and Compactness

Unit – IV The Fundamental Group and Covering Spaces- Homotopy of paths, The Fundamental group, Covering spaces, The Fundamental group of the Circle, The Fundamental Theorem of Algebra

Internal Assessment M.M.:-20

Recommended Books

1. James R. Munkres, Topology: A First Course, Prentice Hall of India Pvt. Ltd., New Delhi,2000.
2. K. D. Joshi, Introduction to General Topology, Wiley Eastern Ltd., 1983.

References

1. J. Dugundji, Topology, Prentice Hall of India Pvt. Ltd., 1966
2. George F. Simmons, Introduction to Topology and Modern Analysis, Mc Graw -Hill Book Company,
2. J. Hocking and G Young, Topology, Addision-Wiley Reading,1961.
3. J. K. Kelley, General Topology,Van Nostrand, Reinhold Co., New York,1995
4. L. Steen and J. Seebatch, Counter example in Topology, Holt Reinhart And Winston, New York, 1970
5. W. Thron, Topologically Structures, Holt, Rinehart and Winston, New York,1966.
6. N. Bourbaki, General Topology Part I (Transl.), Addision Wesley,Reading,1966.

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M.Sc. Mathematics (Second Semester) 2025-26

Paper-IV: ADVANCED COMPLEX ANALYSIS (II)

Max Marks. 80

Unit-I Weierstrass's Factorisation theorem, Gamma function and its properties, Riemann Zeta Function, Riemann's Functional equation, Runge's theorem. Mittag- Leffler's Theorem,

Unit-II Analytic Continuation, Uniqueness of direct analytic Continuation. Uniqueness of Analytic Continuation along a Curve, Power series method of Analytic Continuation Schwarz Reflection, Principle, Monodromy theorem and its Consequences. Harmonic Functions on a Disk

Unit-III Harnack's Inequality and Theorem, Dirichelet Problem. Green's Function, Canonical products, Jensen's Formula, Poisson-Jenson Formula, Hadamard's three circles theorem, Order of an entire function, Exponent of Convergence, Borel's theorem. Handamard's Factorization theorem

Unit-IV The Range of an Analytic Function, Bloch's Theorem, The Little Picard theorem, Schottky's Theorem, Montel Caratheodory and the great Picard's theorem, Univalent Functions. Bieberbach's Conjecture (Statement only) and the "1/4-Theorem."

Internal Assessment: 20

Recommended Books

1. L.V. Ahlfors Complex Analysis,MC Graw-Hill,1979.
2. D.Sarason, Complex Function Theory,Hindustan Book Agency,Delhi,1994.
3. J.B. Conway,Function of One Complex variable, Springer-Verlag, International Student-Edition,Narosa Publishing House, 1980.

References

1. H.A.Priestly, Introduction to Complex Analysis, Clarendon Press,Oxford 1990.
2. Liang-Shin Hahn & Bernard Epstein, Classical Complex Analysis, Jones and Bartlett Publisher's International, London, 1996.
3. S.Lang,Complex Analysis,Addison Wesely,1977.
4. Mark J.Ablowitz and A.S. Fokas, Complex variables, Introduction and Applications, Cambridge University Press,South Asian Edition,1998.
5. E.Hille,Analytic Function Theory (2 Vols.) Gonn & Co.,1959

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M.Sc. Mathematics (Second Semester) 2025-26

Paper-V: ADVANCED DISCRETE MATHEMATICS (II)

Max Marks. 80

Unit-I Graph Theory- Definition of (Undirected) Graphs, Paths, Circuits Cycles, & Subgraphs. Induced Subgraph, Degree of Vertex, Connectivity, Planar Graph and their properties, Trees, Euler's Formula for connected planar Graph, Complete & Complete Biparatite Graph, Kuratowski's Theorem (Statement Only) and its use

Unit-II Spanning Trees, Cut-Sets, Fundamental Cut-Sets' and cycle, Minimal Spanning Trees and Kruskal's Algorithm, Matrix Representations of Graphs, Euler's Theorem on the Existence of Eulerian paths and circuits. Directed Graphs, In degree and Out Degree of a Vertex. Weighted undirected Graphs

Unit-III Dijkstra's Algorithms, Strong Connectivity & warshall's Algorithm. Directed Trees, Search Tree, Tree Traversals, Introductry Computability Theory Finite state Mechanics and Their Transition Table Diagrams. Equialence of finite State Machines, Reduced Machines, Homomorphism

Unit-IV Finite Automata, Acceptors, Non- deterministic finite Automata and equivalence of its power to that of Deterministic Finite Automata, Moore and mealy Machines, Turing Machine and Partial Recursive Functions

Internal Assessment: 20

Recommended Books

1. Elements of Discrete Mathematics By C.L.Liu
2. Graph Theory and its application By N.Deo.
3. Theory of Computer Science By K.L.P. Mishra and N. Chandrashekaran.

References

1. J.L. Gersting, Mathematical Structures for Computer Science,(3rd edition), Computer Science Press, New York.
2. Seymour Lipschutz, Finite Mathematics (International Edition 1983), Mc-Graw Hill Book Company New York.
3. Seymour Lipschutz, Finite Mathematics (International) edition 1983.

DEPARTMENT OF MATHEMATICS
Govt. Digvijay Autonomous PG College, Rajnandgaon, C. G.

M.Sc. Mathematics (Third Semester) 2025-26

Paper- I: INTEGRATION THEORY AND FUNCTIONAL ANALYSIS (I)

Max Marks. 80

INTEGRATION THEORY

Unit-I Signed Measure, Hahn Decomposition Theorem, Mutually singular measures, Radon-Nikodym theorem, Lebesgue decompostition, Riesz Representation Theorem, Extension Theorem (Caratheodory), Product measures, Fubini's Theorem.

FUNCTIONAL ANALYSIS

Unit-II Normed linear spaces, Banach spaces and examples, Quotient space of Normed linear spaces and its Completeness, Equivalent norms. Riesz Lemma. Basic properties of finite dimensional Normed linear spaces and Compactness

Unit-III Weak convergence and Bounded linear Transformations, Normed linear spaces of Bounded linear Transformations. Dual spaces with examples.

Unit-IV Contraction Mapping Theorem and its Application, Banach Fixed point Theorem, Picard's Theorem, Banach fixed point theorem as source of existence and uniqueness theorem for integral equations, Nonlinear operators, examples of convex functions, epigraph, monotone mapping, α-monotone, coercive mapping, duality maps.

Internal Assessment: 20

Recommended Books

1 H.L. Royden, Real Analysis, Macmillan Publishing Co. Inc. New York. 4th Edition. 1993.
2 B. Choudhary and Sudarsan Nanda, Functional Analysis with Applications, Wiley Eastern Ltde.,1989

References

1 J.H. Williamson, Lebesgue Integration, Holt Rinehart and Winston, Inc. New York, 1962.
2 P.R. Halmos, Measure Theory, Van Noastrand, Princeton,1950
3 T.G. Hawkins, Lebesgue's Theory of Integration: Its Origin and Development, Chelsea, New York, 1979
4 J.H. Williamson, Lebesgue Integration, Holt Rinehart and Wintson, Inc. New York, 1962.
5 K.R. Parthasarathy, Inttroductionto Probability and Measure, Macmillion Company of India Ltd., Delhi, 1977
6 R.G. Bartle, The Elements of Integration, John Wiley and Sons, Inc. New York, 1966

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Govt. Digvijay Autonomous PG College, Rajnandgaon, C. G.

M.Sc. Mathematics (Third Semester) 2025-26

Paper- II: PARTIAL DIFFERENTIAL EQUATIONS

Max Marks. 80

Unit-I Examples of P.D.E. Classification, Transport Equation – Initial value Problem, Non-homogeneous Equation, Laplace's Equation-Fundamental Solution, Mean Value Formuae, Properties of Harmonic Functions, Green's Function, Energy Methods, Heat Equation Methods, Wave Equation-Solution by Spherical Means, Non-Homogeneous Function, Energy Methods

Unit-II Nonlinear First Order PDE-Complete Integrals, Envelopes. Characteristics, Hamilton Jacobi Equation (Calculus of variations, Hamilton' ODE, Legender Transform, Hopf-Lax Formula, Weak Solutions, Uniqueness) Conservation Laws (Shocks, Entropy Condtion, Lax Oleinik formula, Weak Solutions, Uniqueness, Riemann's Problem, Long Time Behaviour)

Unit-III Representation of Soutions-seperation of Vaariables, Similarity Solutions (Plane and Travelling Waves, Solitons, Similarity under scaling) Fourier and Laplace Transform, Hopf-Cole Transform, Hodograph and Legendre Transforms, Potential Functions.

Unit IV Asymptotics (Singular Perturbations, Laplace's Method, Geometric Optics, Stationary Phase, Homogenization), Power Series (Non-Characteristic Surfaces, Real Analytic Functions, Cauchy-Kovalevskaya Theorem)

Internal Assessment: 20

References

1.L.C. Evans, Partial Differntial Equations, Graduate Studies in Mathematics, Volume 19, AMS, 1998.
2.Books with the above title by 1. N. sneddon, F. John, P. Prasad and R. Ravindran, Amarnath ect.

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DEPARTMENT OF MATHEMATICS
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M.Sc. Mathematics (Third Semester) 2025-26

Paper- III: PROGRAMMING IN C (WITH ANSI FEATURES)

THEORY AND PRACTICAL

Max Marks. 50

Unit-I An Overview of Programming, Programming language, Classification, C Essentials-Program Development, Functions. Anatomy of a C Function. Variables and Constant, Expressions, Assignment Statements. Formatting Source Files. Continuation Character.The Preprocessor

Unit-II Scalar Data Types-Declarations, Different Types of Integers. Different Kinds of Integer Constants. Floation-Point Types. Initialization. Mixing Types. Explicit Conversions-Casts. Enumeration Types. The Void Data Type. Typedefs. Finding The Address of an Object. Ponters.

Unit-III Control Flow-Conditional Branching. The Switch Statement. Looping. Nested Loops. The break and Continue Statements. The goto statement. Infinite Loops. Arrays-Declaring an Array. Arrays and Memory. Initializing Arrays. Encryption and Decryption.

Unit-IV Operators and Expressions-Precedence and Associativity. Unary Plus and Minus operators, Increment and Decrement Operators, Comma Operator, Relational Operator. Logical Operator. Bit-Manipulation Operator, Bitwise Assignment Operators. Cast Operator. Size of Operators. Conditional Operator. Memory Operators

Internal Assessment: 20

References

1 Peter A. Darnell and Philip E. Margolis, C: A Software Engineering Approach, Narosa Publishing House (Springer International Student Edition) 1993.
2 Samuel P. Harkison and Gly L. Steels Jr., C: A Reference Manual, 2nd Edition, Prentice Hall, 1984.
3 Brian W, Kernighan & Dennis M. Ritohie, The C Programme Language. 2nd Edition (ANSI Features), Prentice Hall 1989.

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M.Sc. Mathematics (Third Semester) 2025-26

Paper- IV: OPERATION RESEARCH (I)

Max Marks. 80

Unit-I	Operations Research and its Scope, Necessity of Operations Research in Industry, Mathematical Formulation of Linear Programming Problems, **General Linear Programming Problem**: Simplex Method exceptional cases, artificial variable techniques; Big M method, two phase Method and problem degeneracy
Unit-II	Duality in Linear Programming, Fundamental Properties of duality and theorem of duality, Duality and simplex method, Dual Simplex Method and Sensitivity Analysis
Unit-III	Transportation and Assignment Problems **Game Theory** – Two-person, Zero sum Games. Games with Mixed Strategies, Graphical Solution, Solution by Linear Programming
Unit IV	**Network Analysis** – Shortest path Problem, Minimum Spanning Tree Problem, Maximum Flow I Problem, Minimum Cost Flow Problem, Network Simplex Method, Project Planning and Control I with PERT-CPM.

Internal Assessment: 20

References

1 F.S. Hillier and G.J. Ueberman. Introduction to Operations Res Barefr (Sixth Edition), McGraw Hill International Edition, Industrial Engineering Series, 1995. (This book comes with a CD containing tutorial software)
2 G. Hadley, Linear Programming, Narosa Publishing House, 1995.
3 G. Hadley, Nonlinear and Dynamic Programming, Addison-Wesley, Reading Mass.
4 Mokhtar S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network flows, John Wiley I' & Sons, New York, 1990.
5 H.A. Taha, Operations Research-An Introduction, Macmillan Publishing Co., Inc., New York.

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M.Sc. Mathematics (Third Semester) 2025-26

PAPER-V (Optional-1)
FUZZY SETS AND ITS APPLICATIONS (I)

Max Marks. 80

Unit-I Fuzzy Sets, basic definitions, alpha-level sets, convex fuzzy sets, Basic operations On fuzzy sets, Cartesian product, Algebraic products, bounded sum and difference, t-norms and t-conorms.

Unit-II Extension Principle- the Zadeh's extension principle, Image and inverse image of fuzzy sets, Fuzzy numbers. Elements of fuzzy arithmetic

Unit-III Fuzzy relations and fuzzy graphs- Fuzzy relations on fuzzy sets, composition Of fuzzy relations, min-max composition and its properties, fuzzy equivalence relations, fuzzy compatibility relations, fuzzy relation equations, fuzzy graphs, similarity relation

Unit IV Possibility Theory, Fuzzy measure, evidence theory necessity measure, possibility measure, possibility distribution, possibility theory and fuzzy sets, Possibility theory versus probability theory

Internal Assessment: 20

References

1. H.J. Zimmermann. Fuzzy Set theory and its Applications. Allied Publishers Ltd. New Delhi 1991.
2. G.J. Klir and B.Yuan, Fuzzy Sets and Fuzzy logic. Prentice-Hall of India,New Delhi.1995

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M.Sc. Mathematics (Third Semester) 2025-26

PAPER-V (Optional-2)
FUNDAMENTALS OF COMPUTER SCIENCE
THEORY AND PRACTICAL
(OBJECT ORIENTED PROGRAMMING AND DATA STRUCTURE)

Max. Marks. 100 (Theory-50 +Practical-30+Internal -20)

Unit-I Object Oriented Programming-Classes and Scope, nested classes, pointer class members; Class initialization, assignment and destruction.

Unit-II Overloaded functions and operators; Templates including class templates; class inheritance and virtual functions.

Unit-III Data Structures-Analysis of algorithms, q, W, 0, o, w notations; Sequential and linked representations, Lists, Stacks, and queues;

Unit-IV Trees: Binary tree- search tree implementation, B-tree (concept only);

Sorting: Insertion sort, shell sort, quick-sort, heap sort and their analysis;

Hashing-open and closed.

Books Recommended:

1. S. B. Lipman, J. Lajoi: C++ Primer, Addison Wesley.
2. B. Stroustrup; The C++ Programming Language, Addison Wesley.
3. C. J. Date : Introduction to Database Systems, Addison Wesley.
4. C. Ritehie: Operating Systems-Incorporating UNIX and Windows, BPB Publications.
5. M. A. Weiss, Data Structures and Algorithm Analysis in C++, Addison Wesley

DEPARTMENT OF MATHEMATICS
Govt. Digvijay Autonomous PG College, Rajnandgaon, C. G.

M.Sc. Mathematics (Third Semester) 2025-26

Paper- III: Programming in C (with ANSI features) Practical

Max Marks. 30

In the Syllabus of M.Sc. final (Mathematics), 2024-25 the papers having practical examination will have 30 marks for practical. Out of these 30 marks, 5 marks will be for viva-voce, 5 marks for sessional and remaining 20 marks will be practical. The time duration for practical will be of three hours.

LIST OF PROGRAMS

1. WAP for compound interest.
2. WAP to sum of first n numbers.
3. WAP to find area and circumference of circle.
4. WAP to check the number is palindrome or not.
5. WAP to find roots of quadratic equation.
6. WAP to check the given number is Armstrong number or not.
7. WAP to find Fibonacci series.
8. WAP using switch statement to convert a number into corresponding days.
9. WAP to copy one string into another string.
10. WAP to construct pyramid of *.
11. WAP to prepare mark sheet using switch statement.
12. WAP to sum of array for any 10 elements.
13. WAP to sort a string in alphabetic order .
14. WAP to remove or delete vowels from a string.
15. WAP to add one string after another string.

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DEPARTMENT OF MATHEMATICS
Govt. Digvijay Autonomous PG College, Rajnandgaon, C. G.

M.Sc. Mathematics (Fourth Semester) 2025-26

Paper-I: FUNCTIONAL ANALYSIS (II)

Max Marks. 80

Unit-I Uniform Boundedness theorem and some of its consequences. Open Mapping and Closed Graphs Theorems.

Unit-II Hahn-banach Theorem for real linear spaces, Complex linear spaces and normed linear spaces. Reflexive spaces. Weak Sequention Compactness, Compact Operators. Solvability of linear Equations in branch spaces, The closed range Theorm

Unit-III Inner product spaces. Hilbert Spaces. Orthonormal sets. Bessel's in quantity. Complete Orthonormal sets and parseveral's identity. Structure of Hilbert spaces. Projection Theorem. Riesz Representation Theorem.

Unit-IV Adjonit of an Operator on a Hilbert spaces, Reflexivity of Hilbert space. Self-adjoint operators, Positive Projection Normal and Unitary Operators, Abstract Variational Boundrary-value Problem.

Internal Assessment: 20

References

1. Walter Rudin, Real and Complex Analysis, Tata Mc-Graw Hill Publishing.
2. Edwin Hevitt and korl Stromberg, Real and Abstract Analysis, Springer Verlag, New York.
3. Edwin Hevitt and Kenneth A.Ross, Abstract Haronic Analysis, Vol. I Springer-Verlag, 1993.
4. G.Bachman and L.Narici, Functional Analysis, Academic Press, 1966.
5. N.Dunford and J.t. Schwartz, Linear Operator, Part I, Interscience, New York, 1965.
6. R.E.Edwards, Function Analysis, Holt Rinehart and Winston, New York, 1965.
7. C.Goffman and G.Pedrick, First Course in Function Analysis, Prentice Hall of India, New Delhi, 1987.

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M.Sc. Mathematics (Fourth Semester) 2025-26

Paper-II: MECHANICS

Max Marks. 80

Unit-I Generalized Coordinates.Holonomic and Non Holonomic Systems,Scleronomic and Rhonomic systems.Generalized Potential.Lagrange's Equations of First kind Lagrange's Equations of second kind.Uniqueness of Solution.Energy Equation for Conservative Fields. Hamilton's Variables. Donkin's Theorem. Hamilton Canonical Equations. Cyclic Coordinates. Routh's equations.

Unit-II Poisson's Bracket, Poission's Identity. Jacobi-poission's Theorem. Motivation Problems of calculus of variations, Shortest Distance. Minimum Surface of Revolution. Brachistochrone Problem. Isoperimetric Problem. Geodesic, Fundamental Lemma of Calculas of variations. Euler's Equations for one Dependent Function and its Generalization to (i) 'n' Dependent Functions, (ii) Higher Order Derivatives. Conditional Extremum under geometric , Constrainsts and under integral Constrainsts.Hamilton's Principle. Principles of least Action Poincare Carton Integral Invariant.

Unit-III Whittaker's Equations, Jacobi Equations. Statement of Lee Hwa Chungs Theorem. Hamilton-Jacobi Equations Theorem. Method of Sepration of variables. Lagrange Bracket. Condition of Canonical Character of a Transformation in Terms of Lagrange Brackets and Poisson Brackets under Canonical Transformations.

Gravitational Unit-IV Attraction and Potential of rod, disc, Spherical shells and sphere, Surface Integral of normal Attraction with Application & gauss Theorem), Lap lace and Poisson equation. Work done of self attracting Systems. Distributions for a given Potential. Equipotential Surface. Surface and solid Harmonics. Surface density in terms of Surface harmonics

Internal Assessment: 20

References

1. A.S.Ramsay, dynamics Part II, The English Language Book Society and Cambridge University Press, 1972.
2. F.Gantamacher, Lectures in Analytic Mechanics, MIR Publisher, Moscow,1975.
3. H.Goldstein, Classical Mechanics (2nd Edition), Narosa Publishing House, New Delhi.
4. I.M.Gelfand and S.V.Fomin, Calculus of variations, Prentice Hall.

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M.Sc. Mathematics (Fourth Semester) 2025-26

Paper-III: PROGRAMMING IN C (WITH ANSI FEATURES) THEORY (II)

Max Marks. 50

Unit-I Storage Class-Fixed Vs Automatic Duration, Scope of Variables, The Register Specifier. Ansi rules for the syntax and Semantics of the Storage class Keywords.

Unit-II Pointers-Pointer Arithmetic, Passing pointer as Function Arguments. Accessing Array Elements Through Pointers. Passing Array as Function Arguments. Sorting Algorithms. Strings. Multidimensinal Arrays. Arrays of Pointers, Pointers to Pointers.

Unit-III Functions-Passing Argument, declaration and Calls. Pointers to Functions. Recursion. The main function, Complex Declarations the C Processor-Macro Substitution, Conditional Compilation. Include Facility. Line Control

Unit-IV Structures and Unions- Structures. Dynamic Memory Allocation. Linked Lists. Unions, Enum Declarations, Input and Output-Streams, Buffering. The <Studio.h> Header File. Error Handling. Opening and Closing a File. Reading and Writing Data. Selecting an I/O Method. Unbufferd I/O Random Access. The Standard Library for I/O

Internal Assessment: 20

References

1. Peter A. darnell and Philip E. Margolis, C: A Software Engineering Approch, Narosa Publishing Hous (Springe International Edition) 1993.
2. Samuel P. Harikision and Gly L. Steel J.r., C: A Reference Manual, 2nd Edition, Prentice Hall, 1984.
3. Brian W. Kernighan & Dennis M. Ritchie, The C Progamme Language, 2nd Edition (ANSI Features). Prentice Hall, 1989.

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M.Sc. Mathematics (Fourth Semester) 2025-26

Paper-III: PROGRAMMING IN C (WITH ANSI FEATURES) Practical (II)

Max Marks. 30

In the Syllabus of M.Sc. final (Mathematics) 2025-26 the papers having practical examination will have 30 marks for practical. Out of these 30 marks, 5 marks will be for viva-voce, 5 marks for sessional and remaining 20 marks will be practical. The time duration for practical will be of three hours.

LIST OF PROGRAMS

1. WAP to input any number and compute sum of its digits using
2. WAP to compute factorial of any number using recursive function.
3. WAP to perform different arithmetic operations using pointers.
4. WAP to print the element of an array using pointers.
5. WAP to calculate the sum of all elements stored in an array using pointer.
6. WAP to exchange two values using call by reference.
7. WAP to print the reverse of an integer number entered by user using recursion.
8. WAP for multi dimensional arrays.
9. WAP to short an integer array using sorting algorithm.
10. WAP to print prime numbers between 1 and n.
11. WAP to add n numbers which will be entered by the user.
12. WAP to add two matrices.
13. WAP to calculate the length of the string using pointer.
14. WAP to find maximum element in array.
15. WAP to swap strings.

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M.Sc. Mathematics (Fourth Semester) 2025-26

Paper-IV: OPERATIONS RESEARCH (II)

Max Marks. 80

Unit I **Integer Programming**: Gomory's all I.P.P. method, constructions of Gomory's constraints, Fractional cut method-all integer and mixed integer, Branch-and-Bound method

Dynamic Programming- The recursive equation approach, characteristics of dynamic programming, dynamic programming algorithm, solution of-Discrete D.P.P. solution of L.P.P. by Dynamic Programming,

Unit II Post optimal analysis Linear Goal Programming problem, Parametric Linear Programming, Upper Bound Technique

Unit III **Queuing system**: Introduction to Stochastic Process, Markov chain, Poisson process Birth and Death process, Concept of queues, Deterministic queuing system, Probability distribution in Queuing , Classification of Queuing models, Poisson Queuing system (M/M/I):(∞/FIFO),(M/M/I):(SIRO), (M/M/I):(N/FIFO).

Inventory Control: The concept of EOQ, Deterministic inventory problem with no shortages

Unit IV **Nonlinear Programming** – One/ and Multi- Variable Unconstrained Optimization. Kuhn-Tucker Condition for Constrained Optimization, Quadratic Programming, Separable Programming, Convex Programming, Non-Convex Programming

Internal Assessment: 20

References

1 F.S. Hillier and G.J. Ueberman. Introduction to Operations Res Barefr (Sixth Edition),
2 McGraw Hill International Edition, Industrial Engineering Series, 1995. (This book comes with a CD containing tutorial software)
3 G. Hadley, Linear Programming, Narosa Publishing House, 1995.
4 G. Hadley, Nonlinear and Dynamic Programming, Addison-Wesley, Reading Mass.
5 Mokhata S. Bazaraa, John J. Jarvis and Hanif D. Sherali, Linear Programming and Network flows, John Wiley I' & Sons, New York, 1990.
6 H.A. Taha, Operations Research-An Introduction, Macmillan Publishing Co., Inc., New York.
7. Kanti Swarup, P.K. Gupta and Man Mohan, Operation Reserch, Sultan Chand & Sons, New Delhi.
8. S.S.Rao, Optimization Theory and Application, Wiley Eastern Ltd., New Delhi.
9. Prem Kumar Gupta and D.S.Hira, Operation Research an Introduction. S.Cliand & Company Ltd., New Delhi.

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M.Sc. Mathematics (Fourth Semester) 2025-26

PAPER-V (Optional-1)
FUZZY SETS AND ITS APPLICATIONS (II)

Max Marks. 80

Unit-I Fuzzy Logic-An overview of classical logic, Multivalued logics, Fuzzy propositions. Fuzzy quantifiers. Linguistic variables and hedges. Inference from conditional fuzzy propositions, the compositional rule of inference

Unit-II Approximate Reasoning-An overview of Fuzzy expert system. Fuzzy implications and their selection. Multiconditional approximate reasoning. The role of fuzzy relation equation

Unit-III An introduction to Fuzzy Control-Fuzzy controllers. Fuzzy rule base. Fuzzy inference engine. Fuzzification.Defuzzification and the various defuzzitication methods (the centre of area, the centre of maxima, and the mean of maxima methods)

Unit IV Decision Making in Fuzzy Environment-Individual decision making. Multiperson decision making. Multicriteria decision making. Multistage decision making. Fuzzy ranking methods. Fuzzy linear programming

Internal Assessment: 20

References

1. H.J. Zmmemann, Fuzzy set theory and its Applications, Allied Publishers Ltd. New Delhi, 1991.
2. G.J. Klir and B. Yuan- Fuzzy sets and fuzzy logic, Prentice-Hall ol India, New Delhi, 1995.

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M.Sc. Mathematics (Fourth Semester) 2025-26

PAPER-V (Optional-2)
OPERATING SYSTEM AND DATABASE MANAGEMENT SYSTEM THEORY AND PRACTICAL

Max. Marks. 100 (Theory-50 +Practical-30+Internal -20)

Unit-I Database Systems-Role of database systems, database system architecture and data modelling

Unit-II Introduction to relational algebra and relational calculus

Unit-III Introduction to SQL: Basic features including views; Integrity constraints; Database design-normalization up to BCNF.

Unit-IV Operating Systems- Overview of operating system, user interface, processor management, memory management. I/O management, concurrency and Security, network and distributed systems

Books Recommended:

1. S. B. Lipman, J. Lajoi: C++ Primer, Addison Wesley.
2. B. Stroustrup; The C++ Programming Language, Addison Wesley.
3. C. J. Date: Introduction to Database Systems, Addison Wesley.
4. C. Ritehie: Operating Systems-Incorporating UNIX and Windows, BPB Publications.
5. M. A. Weiss, Data Structures and Algorithm Analysis in C++, Addison Wesley

Practical Examination Scheme
Max. Marks – 30 Time Duration – 3 Hrs.
Practical (two) 20 Marks (10 marks each)
Viva 05 Marks
Sessional -05 Marks

DEPARTMENT OF MATHEMATICS
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M.Sc. Mathematics (Fourth Semester) 2025-26

Paper-V: OPERATING SYSTEM AND DATABASE MANAGEMENT SYSTEM PRACTICAL

Max Marks. 30

In the Syllabus of M.Sc. final (Mathematics), 2025-26 the papers having practical examination will have 30 marks for practical. Out of these 30 marks, 5 marks will be for viva-voce, 5 marks for sessional and remaining 20 marks will be practical. The time duration for practical will be of three hours.

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