DEPARTMENT OF MATHEMATICS

SYLLABUS

FOR

New curriculum of M.Sc.
SEMESTER SYSTEM

2022-2023

(SEMESTER I to IV)

GOVT. E. RAGHAVENDRA RAO P. G. SCIENCE COLLEGE, BILASPUR (C.G.)

COURSE STRUCTURE

SESSION 2022-2023

M.Sc. (MATHEMATICS)

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FIRST- SECOND SEMESTER

FIRST SEMESTER

Paper Code No.	Title	Max. Marks
M-101	Advanced Abstract Algebra - I	80
M-102	Real Analysis – I	80
M-103	Topology – I	80
M-104	Complex Analysis -I	80
M-105	Advanced Discrete Mathematics - I	80

SECOND SEMESTER

Paper Code No.	Title	Max. Marks
M-201	Advanced Abstract Algebra - II	80
M-202	Real Analysis – II	80
M-203	Topology – II	80
M-204	Complex Analysis -II	80
M-205	Advanced Discrete Mathematics - II	80

GOVT. E. RAGHAVENDRA RAO P. G. SCIENCE COLLEGE, BILASPUR (C.G.)

SESSION 2022-2023

M.Sc. [MATHEMATICS]

FIRST SEMESTER

PAPER I [M-101] : ADVANCED ABSTRACT ALGEBRA - I

Min Marks 29 **Max. Marks: 80**

NOTE Ten Questions will be set and a student shall be required to attempt any five questions.

GROUPS - Normal and Subnormal series, Composition series,Jordan-Holder theorem, Solvable groups, Nilpotent groups.

FIELD THEORY- Extension fields, Algebraic and transcendental extensions, Separable and inseparable extensions, Normal extensions.

Perfect fields, Finite fields, Primitive elements, Algebraically closed fields.

Automorphisms of extensions, Galois extension, Fundamental theorem of Galois theory.

Solution of polynomial equations by radicals, Insolvability of the general equation of degree 5 by radicals.

Books Recommended:

1. P.B.Bhattacharya, S.K.Jain, S.R.Nagpaul : Basic Abstract Algebra, Cambridge University press
2. I.N.Herstein : Topics in Albegra, Wiley Eastern Ltd.
3. Quazi Zameeruddin and Surjeet Singh : Modern Algebra
4. M.Artin, Algeabra, Prentice -Hall of India, 1991.
5. P .M. Cohn, Algebra, Vols. I,II &III, John Wiley & Sons, 1982,1989,1991.
6. N. Jacobson, Basic Algebra, Vols. I ,W. H. Freeman, 1980 (also published by Hindustan Publishing Company).
7. S.Lang, Algebra, 3rd edition, Addison-Wesley, 1993.
8. I.S. Luther and I.B.S. Passi, Algebra, Vol. I-Groups, Vol.II-Rings, Narosa Publishing House (Vol.I-1996,Vol. II-1999)
9. D.S.Malik, J.N.Mordeson, and M.K.Sen, Fundamentals of Abstract Algebra, Mc Graw-Hill, International Edition,1997.
10. Vivek Sahai and Vikas Bist, Algebra, Narosa Publishing House, 1999.
11 I. Stewart, Galois theory, 2nd edition, chapman and Hall, 1989.
12. J.P. Escofier, Galois theory, GTM Vol.204, Springer, 2001..
13. Fraleigh , A first course in Algebra Algebra, Narosa,1982.

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SESSION 2022-2023

M.Sc. [MATHEMATICS]

SECOND SEMESTER

PAPER I [M-201] : ADVANCED ABSTRACT ALGEBRA - II

Min Marks 29 **Max. Marks: 80**

NOTE :Ten Questions will be set and a student shall be required to attempt any five **questions.**

MODULES - Cyclic modules, Simple modules, Semi-simple modules, Schuler's Lemma, Free modules, Noetherian and artinian modules and rings- Hilbert basis theorem, Wedderburn Artin theorem, Uniform modules, primary modules, and Noether-Lasker theorem.

LINEAR TRANSFORMATIONS - Algebra of linear transformation, characteristic roots, matrices and linear transformations.

CANONICAL FORMS - 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 Jordan forms.

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 from, Generalised Jordan form over any field.

Books Recommended:

1. P.B.Bhattacharya, S.K.Jain, S.R.Nagpaul : Basic Abstract Algebra, Cambridge University press
2. I.N.Herstein : Topics in Albegra, Wiley Eastern Ltd.
3. Quazi Zameeruddin and Surjeet Singh : Modern Algebra
4. M.Artin, Algeabra, Prentice -Hall of India, 1991.
5. P.M. Cohn, Algebra,Vols. I,II &III, John Wiley & Sons, 1982,1989,1991.
6. N.Jacobson, Basic Algebra, Vols. I & II,W.H. Freeman, 1980 (also published by Hindustan Publishing Company).
7. S.Lang, Algebra, 3rd edition, Addison-Wesley, 1993.

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SESSION 2022-2023

M. Sc. MATHEMATICS

FIRST SEMESTER

PAPER II[M-102] : REAL ANALYSIS - I

Min Marks 29 **Max. Marks: 80**

NOTE :Ten Questions will be set and a student shall be required to attempt any five questions.

The Riemann - Stieltjes Integral: Definition and existence Riemann- Stieltjes integral, Properties of the Integral, Integration and differentiation, the fundamental theorem of Calculus, integration of vector-valued function Rectifiable curves.

Functions of Several Variables : Linear transformation, Derivatives in an open subset of R^n, Contraction principle, Inverse function theorem, Implicit function theorem, Derivatives of higher orders, Differentiation of integrals

Sequences and series of Functions : Point wise and uniform convergence, Cauchy criterion for uniform convergence, Weierstrass M-test, Abel's and Dirichlet's tests for uniform convergence, Uniform convergence and continuity uniform convergence and Riemann-Stieltjes integration, uniform convergence and differentiation, Weierstrass approximation theorem

Power Series : Uniquencess theorem for power series, Abel's and Tauber's theroem

Recommended Text :

[1] Walter Rudin, 'Principles of Mathematical Analysis' (3re edition) Mc Graw Hill, Kogakusha, 1976, International student edition.

[2] P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New age International (P) Limited published, New Delhi 1986 (Reprint 2000).

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SESSION 2022-2023

M.Sc. MATHEMATICS

SECOND SEMESTER

PAPER II[M- 202] : REAL ANALYSIS - II

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Measurable sets and Functions: Lebesgue outer measure, Lebesgue measure, Properties of measurable sets, Borel sets and their measurability characterization of measurable sets, Non measurable set.

Definition and properties; Simple, Step and characteristics function, Continuous function, sets of measure Zero. Sequence of functions, Egoroff's theorem structure of measurable function, Lusin theorem, Frechet theorem, Convergence in measure, Riesz theorem.

Lebesgue Integral : Lebesgue integral of a bounded function, Comparison of Riemann integral and Lebesgue integral, Bounded Convergence Theorem, Integral of non negative measurable functions, Fatou's lemma, Monotone convergence theorem, General Lebesgue integral, Lebesgue dominated convergence theorem.

Differentiation and integration : Dini derivatives, Differentiation of monotone functions, Lebesgue theorem, Function of bounded variation, Differentiation of an integral, Lebesgue sets, Absolutely Continous Functions, Integral of the derivatives

Recommended Text :

[1] Walter Rudin, 'Principles of Mathematical Analysis' (3re edition) Mc Graw Hill, Kogakusha, 1976, International student edition.

[2] P.K. Jain and V.P. Gupta, Lebesgue Measure and Integration, New age International (P) Limited published, New Delhi 1986 (Reprint 2000).

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SESSION 2022-2023

M.Sc. MATHEMATICS

FIRST SEMESTER

PAPER III[M- 103] : TOPOLOGY - I

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Countable and uncountable sets, Schroeder-Bernstein theorem, Cantor's theorem and the continuums hypothesis.

Definition and examples of topological spaces. Closed sets, Closure, Dense subsets , Base and sub-bases, subspaces and relative topology, continuity and homeomorphism, alternate methods of defining a topology in terms of Kuratowski closure operator and neighborhood systems.

Connectedness, continuity and connectedness, components, totally disconnected spaces.

Compactness, continuous functions and compact sets, Basic properties of compactness, compactness and FIP , sequentially and countably compact sets, compactness for metric spaces.

References

1. Topology, A First Couse. : Jame R. Munkres.
2. Introduction to General Topology : K.D.Joshi
3. Topology : J.Dugundji
4. Introduction to Topology : B.Mendelson
5. Advanced General Topology : K.K. Jha

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SESSION 2022-2023

M.Sc. MATHEMATICS

SECOND SEMESTER

PAPER III[M- 203] : TOPOLOGY - II

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

First and second countable spaces, Lindelofs theorems, Seperable spaces, Second Countability and seperability.

Seperation axims, T_0, T_1 T_2 $T_{3\,1/2}$, T_4 their Characterization and basic properties,

Urysohn's lemma and Tietz extentions theorem.

Projection Maps, Product invariant properties for finite products, Tychonoff product topology, tychonoffs theorem, Alexander sub-base lemma, Embedding & Metrization theorem, Urysohn's embedding theorem.

Filters and their comparision, Ultrafilters, Filters base, Convergence of filterscharacterization of continuity by filters, convergence of nets, Hausdorffness and nets.

References

1. Topology, A First Course. : Jame R. Munkres.
2. Introduction to General Topology : K.D.Joshi
3. Topology : J.Dugundji
4. Introduction to Topology : B.Mendelson
5. Topology : J. N. Sharma
6. Advanced General Topology : K.K. Jha

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SESSION 2022-2023

M.Sc. MATHEMATICS

FIRST SEMESTER

PAPER IV[M- 104] : COMPLEX ANALYSIS - I

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Complex Integration. Cauchy-Goursat Theorem. Cauchy's integral Formula. Higher order derivatives. Morera's theorem. Cauchy inequality and Liouville theorem. The fundamental theorem of Algebra. Taylor's theorem. Maximum modulus principle, Scwartz lemma. Laurent's series isolated singularities, Meromorphic functions.

The Argument principle. Rouche's theorem, Inverse function theorem.

Residues, Cauchy's residue theorem. Evaluation of integrals. Branches of many values functions with special references to argz. logz. and z^a.

Bilinear transformations their properties and classification. Definitions and examples of Conformal mappings.

Spaces of Analytic functions. Hurwitz's theorem. Montel's theorem. Riemann mapping theorem.

References :-

1. J.B. Convay : Functions of one complex variable. Springer-Verlag international student Edition. Narosa. publishing House. 1980.
2. S.Ponnusamy : Foundation of complex Analysis. Narosa publishing house 1997.
3. Functions of a complex variable by J.N. Sharma.

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SESSION 2022-2023

M.Sc. MATHEMATICS

SECOND SEMESTER

PAPER IV[M- 204] : COMPLEX ANALYSIS - II

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Weierstrass factorization theorem Gamma function and its properties. Riemann Zeta function. Riemann's functional equation. Runge's theorem. Mittag Leffler's theorem. Analytic continuation uniqueness of direct analytic continuation. Uniqueness of analytic continuation along curve.

Power series method of analytic continuation. Schwartz Reflection principle. Monodromy theorem and it consequences. Harmonic function on a disc. Harnack's inequality and theorem.

Canonical product. Jensen'ss formula. Poisson - Jenson Formula. Hadamard's three circles theorem. Order of an entire function. Exponent covergance, Borel's theorem. Hadamard's factorization theorem.

The range of an analytic function. Bloch's theorem. The little picard theorem.

Schottky's theorem. Univalent functions. Bieberbach's conjecture (statement only) and the " 1/4 - theorem.

References :-

1. J.B. Convay : Functions of one complex variable. Springer-Verlag international student Edition. Narosa. publishing House. 1980.
2. S.Ponnusamy : Foundation of complex Analysis. Narosa publishing house 1997.
3. Functions of a complex variable by J.N. Sharma.

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SESSION 2022-2023

M.Sc. MATHEMATICS

FIRST SEMESTER

PAPER V[M- 105] : ADVANCED DISCRETE MATHEMATICS - I

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Mathematical logic : Statements, Symbolic representation, Tautologies, Contradictions, Duality, Operations, Quantifiers, Arguments, Predicates and validity, Propositional logic.

Semigroup and Monoids : Definition and Examples of Semigroups and Monoids (including those pertaining to concatenation operation), Homomorphism of semigroups and monoids, Congruence relation and Quotient Semigroups, Sub semigroup and Sub Monoids. Direct products. Basic Homomorphism theorem.

Lattices : Lattices as partially ordered sets and their properties, Duality, Lattices as Algebraic systems, Sub lattices, Direct products, and homomorphism and Isomorphism, Bounded Lattices, Complete, Complimented, Modular and distributive Lattices.

Boolean Algebra : Boolean Algebras , Duality, Sub Algebra, Homomorphism and Isomorphism of Boolean Algebra, Boolean Algebras as lattices. Boolean Function, Minimization of Boolean functions Karnaugh Map, Direct products, Atoms and minterms.. Minterm Boolean forms.

Reference :

1. J.P. Tremblay & R. Manohar. Discrete Mathematical structure with application to computer sciences. McGraw Hill Book Co. 1997.
2. C.L. Liu. Elements of Discrete mathematics. McGraw Hill Book Col
3. M. K. Gupta: Discrete Mathematics: Krishna Prakashan Media , Meerut.

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SESSION 2022-2023

M.Sc. MATHEMATICS

SECOND SEMESTER

PAPER V[M- 205] : ADVANCED DISCRETE MATHEMATICS - II

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Logical Circuits: Application of Boolean Algebra Switching theory (Using AND, OR, NOT gates)

Graph Theory : Graphs, Sub graphs and Complements, Walk, Paths, Circuits, Connected Graphs and Components, Operations on graphs, types of Graphs, Eulerian Graphs, Fleury Algorithm, Hamiltonian Graphs, Weighted undirected Graphs, Dijkstra Algorithm. Strong connectivity & Warshall's Algorithms.

Trees, Planar Graphs, Matrices of Graphs, Directed Graphs: Trees, Spanning Trees, Directed trees, Search trees, Tree traversals. Fundamental Circuits, Planar Graphs, Euler's Formula for connected planner Graphs. Kuratowski's Theorem.(statement only), Incidence Matrix, Adjacency Matrix, Directed Graphs, In degree and out degree of a vertex. Weighted directed Graphs.

Formal Languages, Grammars and Finite State Machines : Languages and Grammars, Finite state Machines and their Transition, Table diagrams, Equivalence of Finite state Machines, Machine Minimization, Reduced machines, Homomorphism Finite automata, and equivalence of its power to that of Deterministic finite Automata. Moore and Mealy Machines, Turing machines and partial recursive functions.

Reference :

1. J.P. Tremblay & R. Manohar. Discrete Mathematical structure with application to computer sciences. McGraw Hill Book Co. 1997.
2. N. Deo. Graph Theory with applications to Engineering and Computer Sciences. Prentice Hall of India.
3. M. K. Gupta: Discrete Mathematics: Krishna Prakashan Media , Meerut.
4. C.L. Liu. Elements of Discrete mathematics. McGraw Hill Book Col.

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COURSE STRUCTURE

SESSION 2022-2023

M.Sc. (MATHEMATICS)

THIRD – FOURTH SEMESTER

THIRD SEMESTER

Paper Code No.	Title	Max. Marks
M-301	INTEGRATION THEORY AND FUNCTIONAL ANALYSIS – I	80
M-302	FLUID DYNAMICS &GRAVITATION	80
M-303	PROGRAMMING IN C (WITH ANSI FEATURES)	80
M-304	FUZZY SETS AND THEIR APPLICATIONS – I	80
M-305	OPERATIONS RESEARCH – I	80

FOURTH SEMESTER

Paper Code No.	Title	Max. Marks
M-401	INTEGRATION THEORY AND FUNCTIONAL ANALYSIS – II	80
M-402	CLASSICAL MECHANICS	80
M-403	DATA STRUCTURES	50+30
M-404	FUZZY SETS AND THEIR APPLICATIONS – II	80
M-405	OPERATIONS RESEARCH – II	80

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SESSION 2022-2023

M.Sc. MATHEMATICS

THIRD SEMESTER

PAPER I[M- 301] : INTEGRATION THEORY AND FUNCTIONAL ANALYSIS-I

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

The Classical Banach space : - The Lebesgue L^p space, The Minkowski and Holder, Inequalities, Convergence and Completeness, Riesz- Fischer Theorem. Bounded linear functionals on the L^p space, Riesz Representation theorem.

Normed and Banach spaces – Definitions and elementary properties, some concrete and Banach spaces, The Euclidean space R^n, the Unitary space C^n , The space $l^p(n)$, The sequence space l^p, l^∞ , The function space C[a, b], L^p[a, b]; Subspaces, Quotient spaces, Completion of normed spaces,

Bounded Linear Operators – Definations, examples and basic properties; spaces of bounded linear operators; equivalent norms; Finite dimensional normed space and compactness – Riesz Lemma, Riesz Theorem; Open mapping theorem and its consequence, Closed graph theorem and its consequences, Uniform boundedness principal

Bounded Linear Funtional – Definitions, example and basic properties The form of some dual spaces; Hahn – Banach Theorem and its consequences; Embedding and reflexivity of normed space; Adjoint of bounded linear operators; weak convergence.

Recommended Text :

1. H.L.Royden Real Analysis, Macmillan Publishing Co. Inc. Newyork, 4th Edition. 1993.

2. P. K. Jain, O. P. Ahuja & Khalil Ahmed, : Functional Analysis, New Age International (P) Lmt. Pub. New Delhi, 1997.

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SESSION 2022-2023

M.Sc. MATHEMATICS
FOURTH SEMESTER

PAPER I [M- 401] : INTEGRATION THEORY AND FUNCTIONAL ANALYSIS-II

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Integration Theory -Measure spaces, Measurable functions, Integration, General covergence theorems, Signed measures, Hahn decomposition theorem, Radon - Nikodym theorem, Lebesgue decomposition..

Extension theorem (caratheodory). Lebesgue-Stieltjes Integral. Product measure Fubinis theorem, Tonelli's theorem, Integral operators, Inner measure. Extension by set of measure zero. Caratheodory outer measure, Hausdorff measure.

Functional Analysis : The concept and specific Geometry of Hilbert space – Definitions and basic properties of inner product spaces and Hilbert space - Schwartz Inequality ; Conmpletion of Inner product spaces. Orthogonality of vectors; orthogonal complements and projection theorem ; Orthonormal sets and Fourier Analysis – Bessel Inequality and Bessel's Generalised inequality. Complete orthonormal sets

Functional and Operators on Hilbert space – Bounded linear functional – Riesz – Frechet theorem; Hilbert - Adjoint operators; Self-adjoint operators, Normal operators; Unitary operators; Orthogonal Projection Operators

Spectral Theory – Eigen value of linear operator, the spectrum of a bounded linear operator, spectral properties, complex analysis and spectral theory.

Recommended Text :

1. H.L.Royden Real Analysis, Macmillan Publishing Co. Inc. Newyork, 4th Edition. 1993.

2. P. K. Jain, O. P. Ahuja & Khalil Ahmed, : Functional Analysis, New Age International (P) Lmt. Pub. New Delhi, 1997.

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SESSION 2022-2023

M.Sc. MATHEMATICS

THIRD SEMESTER

PAPER II[M-302]: FLUID MECHANICS AND GRAVITATION

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

FLUID DYNAMICS:

Kinematics : : Lagrangian and Eulerian methods Equation of continuity Boundary surfaces stream lines and pathlines. Steady and unsteady flows. Velocity potential, worked examples. Acceleration of a fluid. Irrotational and rotational motions.

Equation of motion : Lagrange's and Euler's Equation of motion. Bernoulli's theorem, Bernoulli's equation worked examples..

Motion in two dimensions: complex velocity potential Sources, sinks and Doublets,and their images.

Attraction & Potential :

Attraction & Potential of rod, disc, spherical shell & sphere.

Text Book :

(1) F.Chorlton, Text Book of Fluid Dynamics, CBS Publishers, Delhi, 1985.

(2) Besaint and A.S.Ramsay, A Treatise on Hydrodynamics, Part-II,CBS Pub., Delhi, 1988.

(3) G.K.Batchelor, An Introduction to Fluid Mechanics, Foundation Books, New Delhi, 1994.

(4) H.Schlichting, Boundary Layer Theory, McGraw Hill Book Company, New York, 1971.

(5) R.K.Rathy, An Introduction to Fluid Dynamics, Oxford and IBH Pub.Delhi, 1976.

(6 A.D.Young, Boundary Layers, AIAA Education Series, Washington, DC, 1989.

(7) M.Ray & G.C.Chadda Hydrodynamics Student friends & Co.Agra 1993

(8) S.L.Loney :Elemetary treatise on Statics ,Kalyani pub.New Delhi

(9) A.S.Ramsey :Newtonian gravitation

5) Statics -S.L.Loney

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SESSION 2022-2023

M.Sc. MATHEMATICS

FOURTH SEMESTER

PAPER II[M-402]: CLASSICAL MECHANICS AND GRAVITATION

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Mechanics Variation Principal and Lagrangian Formulation:

Mechanics Of Particle, Mechanics Of A System Of Particles, Constrained Motion, Holonomic And Non-Holonomic Systems, Scleronomic And Rhenomic Sysytem, Degree Of Freedom, Generalised Co – Ordinates , Generalised Notations.

Calculus Of Variations, Motivating Problems Of Calculus Of Variations Shortest Distance, Minimum surface of revolution, Branchistochrone Problem, Euler – Lagrange Differential Equation, Hamilton's Variational Principle, Deduction of Lagrange's Equations, Hamilton's Principle, Newton's Second Law, Lagrange's equations of non - holonomics system, Conservation Theorem, Cyclic co – ordinate, Jacobi's integral, Routhian function. Gauge Function for Lagrangian, Point Transformations, Applications and Problems based on above topics.

Hamiltonian Formulation in Mechanics:

Hamilton's canonical equations of motion, Deduction of Canonical equations, Principle of Least Action, Canonical Transformations, Infinitesimal contact transformations, Hamilton – Jacobi Method, Hamilton's Characteristic function, Possion Brackets, Jacobi – Possion Theorem, Lagrange's Brackets, Liouvill's Theorem, Applications and Problems based on above topics.

Gravitation:

work done by self attracting system. Distribution for a given potential equipotential surface & solid harmonic surface density in terms of surface harmonics.

Recommended Text Books :

1)	Classical - Mechanics	Gupta Kumar & Sharma
2)	Classical Mechanics	H.Goldstem
3)	Classical Mechanics	N. C. Rana & Sharad,& Joag
4)	Classical Mechanics	B.D. Gupta & Satya Prakash
5)	Statics	S.L.Loney

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SESSION 2022-2023

M. Sc. MATHEMATICS
THIRD SEMESTER

PAPER III[M- 303] : PROGRAMMING IN C (WITH ANSI FEATURES) -I

Min Marks 18 **Max. Marks: 50**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Overview of C : History of C, Importance of C, C Essential - Program Development, Programming Style, Executing a C Programming.

Constant, Variable and Data Types : Character Set, C Tokens, Keyword and Identifiers, Constants, Variables, Data Types, Declaration of Variable and Storage Class, Assigning values Variables, Symbolic Constant, Declaring a Variable as Constant and Variable as Volatile.

Operators and Expressions: Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operators, Increment and Decrement Operators, Conditional Operators, Bitwise Operators, Special Operators, Arithmetic Expressions, Evaluation Expression, Precedence of Arithmetic Operators, Type Conversions in Expressions, Operator Precedence and Associativity.

Managing Input and Output Operations: Reading and Writing a Character, Formatted Input and Output.

Decision Making and Branching: Decision Making with if Statement, if statement , if .... else statement , Nested if .... else statements, Else if Ladder, Switch statement, ?: Operator, Goto statement.

Decision Making and Looping : While Statement, do Statement, for Statement, Jumps in Loops.

PRACTICAL Min. Marks 11 **Max. Marks 30**

Recommended Text :

1. Programming in ANSI C by Balagurusamy

Reference :

1. Peter A. Darnell and Phillip Margolis - C:A Software Engineering Approach. Narosa Publishing House (Springer International Student Edition) 1993.

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SESSION 2022-2023

M.Sc. MATHEMATICS
FOURTH SEMESTER

PAPER III[M- 403] : PROGRAMMING IN C (WITH ANSI FEATURES) - II

Min Marks 18 **Max. Marks: 50**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Arrays : One – Dimensional Arrays, Declaration And Initialization Of One – Dimensional Arrays, Two – Dimensional Arrays, Initializing Two – Dimension Arrays, Multi – Dimensional Arrays, Dynamic Arrays.

Character Arrays And Strings : Declaration And Initializing String Variables, Reading Strings From Terminal, Writing Strings To Screen, Arithmetic Operations On Characters, Putting Strings Together, Comparison Of Two Strings, String – Handling Functions, Table And Features Of Strings.

User – Defined Functions: Need For User – Defined Functions, Multi – Function Program, Elements Of User – Defined Functions, Function, Calls, Declaration And Category Of Functions, No Arguments And No Return Values, Arguments But No Return Values, Arguments But Return Values, No Arguments And Return Values, Returns Multiple Values, Nesting Of Functions, Recursion, Arrays And Strings To Functions, Scope, Visibility And Lifetime Of Variables.

Structures And Unions: Structures, Declaring Structure Variables, Accessing Structure Members, Structure Initialization, Copying And Comparing Structure Variables, Operations On Individual Members, Arrays Of Structures, Structures And Functions, Unions. Size Of Structures, Bit Fields.

Pointer: Pointer, Accessing The Address Of A Variable, Declaring And Initialization Of Pointer Variables, Accessing A Variable Through Its Pointer, Chain Of Pointers, Pointer Expressions, Pointer Increments And Scale Factor, Pointer And Arrays, Pointers And Character Strings, Array Of Pointers, Pointer As Function Arguments, Functions Returning Pointers, Pointers To Functions, Pointers And Structures.

PRACTICAL Min. Marks 11 **Max. Marks 30**

Reference :

1. Peter A. Darnell and Phillip Margolis - C:A Software Engineering Approach. Narosa Publishing House (Springer International Student Edition) 1993.
2. Programming in ANSI C : Balagurusamy

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SESSION 2022-2023

M.Sc. MATHEMATICS

THIRD SEMESTER

PAPER IV[M- 304] : FUZZY SETS AND THEIR APPLICATIONS - I

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Fuzzy sets , Basic definitions, α-level sets, Convex fuzzy sets , Basic operations on fuzzy sets, Types of fuzzy sets, The Extension principle , The Zadeh's extension Principle . Cartesian products , Algebraic products , Bounded sum and difference,t- norms and t-conorms ,Image and inverse image of fuzzy sets.

Fuzzy numbers, Elements of fuzzy arithmetic , 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 equation, Fuzzy graphs, Similarity relation.

Possibility Theory , Fuzzy measures, Evidence theory , Necessity measure, Possibility measure , Possibility distribution , Possibility theory and fuzzy sets ,Possibility theory versus probability theory.

References :

1. Fuzzy sets and fuzzy logic by G.J. Klir and B. Yuan, Prentice-Hall of, New Delhi, 1995

2. Fuzzy set theory and its Applictions , By H.J.Zimmermann , Allied Publishers Ltd., New Delhi , 1991.

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SESSION 2022-2023

M.Sc. MATHEMATICS

FOURTH SEMESTER

PAPER IV[M- 404] : FUZZY SETS AND THEIR APPLICATIONS - II

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Fuzzy Logic - An overview of classical logic . Multivalued logics . Fuzzy propositions. Fuzzy quantifiers. Linguistic variable and hedges. Inference from conditional fuzzy proposition . The compositional rule of inference.

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

An introduction to Fuzzy Control - Fuzzy Controllers . Fuzzy Rule base . Fuzzy inference engine .Fuzzification . Defuzzification and various defuzzification methods.

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

References :

1. Fuzzy sets and fuzzy logic by G.J. Klir and B. Yuan, Prentice-Hall of, New Delhi, 1995

2. Fuzzy set theory and its Applictions , By H.J.Zimmermann , Allied Publishers Ltd., New Delhi , 1991.

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SESSION 2022-2023

M.Sc. MATHEMATICS

THIRD SEMESTER

PAPER V [M- 305] : OPERATION RESEARCH - I

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

The linear programming problem. Problem Formulation. Linear programming in matrix notation. Graphical solution of linear programming problems. Some basic properties of convex sets, convex functions and concave functions.

Theory and application of the simplex method of solution of a linear programming problem. Charne's M-Technique. The two phase method

Principle of duality in linear programming problem, Fundamental duality theorem, sensitivity Analysis.

Other algorithms for linear programming - Dual simplex method, Parametric linear programming. Upper Bound Technique. Interior point algorithm. Linear Goal Programming.

Transportation and Assignment problem.

References :-

1. Kanti Swarup P.K. Gupta and Man Mohan. Operations Research, Sultan chand and sons. New Delhi.
2. Linear programming by R.K. Gupta.
3. Operational Research by R.K. Gupta.
4. F. S. Hillier and G. L. Lieberman Introduction to Operations Research

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SESSION 2022-2023

M.Sc. MATHEMATICS

FOURTH SEMESTER

PAPER V[M- 405] : OPERATION RESEARCH – II

Min Marks 29 **Max. Marks: 80**

NOTE : Ten Questions will be set and a student shall be required to attempt any five questions.

Network Analysis Shortest Path Problem. Minimum Spanning tree problem. Maximum Flow Problem . Minimum cost flow problem. Network Simplex method . Project planning and Control with PERT CPM.

Dynamic programming. Deterministic and probabilistic Dynamic Programming.

Game theory - Two person, Zero-sum Games. Games with Mixed Strategies. Graphical Solution-Solution by linear programming.

Integer programming - Branch and Bound technique.

Non linear programming - One and multi-Variable. Unconstrained optimization. Kuhn-Tucker conditions for constrained Optimization. Quadratic Programming. Separable programming. Convex programming. Non Convex Programming.

References :-

1. S.S. Rao. Optimization theory and applications. Wirely Eastern Ltd. New Delhi.
2. N.S. Kambo. Mathematical programming Techniques. Affiliated East-West press Pvt. New Delhi, Madras.
3. Kanti Swarup P.K. Gupta and Man Mohan. Operations Research, Sultan chand and sons. New Delhi.
4. Linear programming by R.K. Gupta.
5. Operational Research by R.K. Gupta.

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SESSION 2022-2023

List of Practical Semester III and IV

1. Input a character using one by one character using loop structure.
2. Use to print() to print the string on output screen.
3. To show input of a string.
4. To read and write a line of text with space.
5. To show the output manipulations on string.
6. Input a string and print it character by character.
7. Input a string and count total number of characters in it.
8. Input two strings and compare them.
9. Find factorial of a number using without arguments without return function.
10. Find factorial of a number using without argument and with return functions.
11. Find sum of two numbers using with arguments and without return function.
12. Find sum of two numbers using with arguments and with return function.
13. To use local and global variables.
14. Priority of local and global variables.
15. Scope of automatic variables.
16. To show the use of static variable.
17. To illustrate the use of pointers.
18. To illustrate the use of "call by value".
19. To illustrate the use of "call by reference".
20. To display an array element with pointers.
21. To pass array statements to a function.
22. Passing entire array to a function.
23. To find sum of array elements by pointers.
24. To use pointers with two-dimensional array.
25. To pass string as function argument.
26. To write a function stringlen().
27. Use the structure type student for managing the details of three students as name, roll_no, class, city.
28. Showing copy and comparison of structures variables.
29. Cretes the structure type program for five persons then declare array type.
30. To create the nested structure for employee details.
31. Factorial by recursion.
32. Calculate x the power n by recursion.

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