CBCS System

Scheme of Examination

&

Syllabus

For

Master of Science (M.Sc.)

Mathematics

Part I & II – Semester I, II, III & IV

SESSION 2022-23

CHRISTIAN EMINENT COLLEGE, INDORE
ACADEMY OF MANAGEMENT, PROFESSIONAL EDUCATION & RESEARCH
An Autonomous Institution Established in 1996
AFFILIATED TO DEVI AHILYA VISHWAVIDYALAYA, INDORE
F-SECTOR, R.S.S. NAGAR, H.I.G. MAIN ROAD, INDORE

CHRISTIAN EMINENT COLLEGE, INDORE

(Academy of Management, Professional Education & Research)

An Autonomous Institution Established in 1996

NAAC (UGC) Accredited WITH GRADE "A"

F-Sector, H.I.G., Ravi Shankar Shukla Nagar Main Road, Indore (M.P.) – 452011

2022-23

Scheme of Examination

M.Sc. (Mathematics) Part I – Semester I

COURSE	CREDITS	TOTAL HOURS	LECTURE HOURS PER WEEK	MIN. GRADE POINT OUT OF 10
CORE COURSE				
MAT-T101 ADVANCED ABSTRACT ALGEBRA - I	04	64	04	04
MAT -T102 REAL ANALYSIS	04	64	04	04
MAT -T103 TOPOLOGY - I	04	64	04	04
MAT -T104 COMPLEX ANALYSIS - I	04	64	04	04
CORE ELECTIVE COURSE (ANY ONE)				
MAT-T105A DIFFERENTIAL EQUATIONS – I	03	48	03	04
MAT-T105B ADVANCED DISCRETE MATHEMATICS – I				
SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC / GC)				
MAT – 106 SKEG (ANY ONE)	SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC/GC)			
SKEG-T108 HEALTH EDUCATION	03	48	03	04
SKEG-T116 MANAGERIAL SKILLS				
SKEG-T119 PERSONALITY DEVELOPMENT				
SKEG-T/P114 INTRODUCTION TO ICT I	02+01	32+16	02+02	04
TOTAL	22	352	22/23	

Course	Max. Marks				Min. Marks		
	External Theory Examination	Internal Theory Examination	Practical Examination	TOTAL MARKS	External Theory Exam.	Internal Theory Exam.	Practical Marks
MAT-T101 ADVANCED ABSTRACT ALGEBRA - I	70	30	-	100	28	12	-
MAT -T102 REAL ANALYSIS	70	30	-	100	28	12	-
MAT -T103 TOPOLOGY - I	70	30	-	100	28	12	-
MAT -T104 COMPLEX ANALYSIS - I	70	30	-	100	28	12	-
MAT-T105 CORE ELECTIVE	70	30	-	100	28	12	-
MAT – T 106 SKEG (ANY ONE) SKILL ENHANCEMENT COURSE	70	30	-	100	28	12	-
TOTAL MARKS	420	180	-	600	-	-	
SKEG-T/P114 ELECTIVE(SEC/GC)	50	30	20	100	20	12	08
TOTAL MARKS	400	180	20	600	-	-	
GRAND TOTAL	600				270		

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2022-23

Scheme of Examination

M.Sc. (Mathematics) Part I – Semester II

COURSE	CREDITS	TOTAL HOURS	LECTURE HOURS PER WEEK	MIN. GRADE POINT OUT OF 10
CORE COURSE				
MAT-T201 ADVANCED ABSTRACT ALGEBRA-II	04	64	04	04
MAT-T202 LEBESGUE MEASURE & INTEGRATION	04	64	04	04
MAT-T203 TOPOLOGY -II	04	64	04	04
MAT -T204 COMPLEX ANALYSIS -II	04	64	04	04
CORE ELECTIVE COURSE (ANYONE)				
MAT-T205 A DIFFERENTIAL EQUATIONS – II	03	48	03	04
MAT-T205 ADVANCED DISCRETE MATHEMATICS – II				
SKILL ENHANCEMENT / GENERIC COURSE - ANYONE (SEC / GC)				
MAT – 206 SKEG (ANYONE)	SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC/GC)			
SKEG-T103 COMMUNICATIVE ENGLISH	03	48	03	04
SKEG-T108 HEALTH EDUCATION				
SKEG-T119 PERSONALITY DEVELOPMENT				
SKEG-T/P115 INTRODUCTION TO ICT II	02+01	32+16	02+02	04
TOTAL	22	352	22/23	

Course	Max. Marks				Min. Marks		
	External Theory Examination	Internal Theory Examination	Practical Examination	TOTAL MARKS	External Theory Exam.	Internal Theory Exam.	Practical Marks
MAT-T201 ADVANCED ABSTRACT ALGEBRA-II	70	30	-	100	28	12	-
MAT-T202 LEBESGUE MEASURE & INTEGRATION	70	30	-	100	28	12	-
MAT-T203 TOPOLOGY -II	70	30	-	100	28	12	-
MAT -T204 COMPLEX ANALYSIS -II	70	30	-	100	28	12	-
MAT-T205 CORE ELECTIVE	70	30	-	100	28	12	-
MAT – T 206 SKEG (ANY ONE) SKILL ENHANCEMENT COURSE	70	30	-	100	28	12	-
TOTAL MARKS	420	180	-	600	-	-	
SKEG-T/P115 ELECTIVE(SEC/GC)	50	30	20	100	20	12	08
TOTAL MARKS	400	180	20	600	-	-	
GRAND TOTAL	600				270		

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2022-23

Scheme of Examination

M.Sc. (Mathematics) Part II – Semester III

COURSE	CREDITS	TOTAL HOURS	LECTURE HOURS PER WEEK	MIN. GRADE POINT OUT OF 10
CORE COURSE				
MAT-T301 FUNCTIONAL ANALYSIS - I	04	64	04	04
MAT –T302 ADVANCE SPECIAL FUNCTION - I	04	64	04	04
MAT –T303 INTEGRAL TRANSFORMS - I	04	64	04	04
MAT –T304 OPERATION RESEARCH - I	04	64	04	04
CORE ELECTIVE COURSE (ANY ONE)				
MAT-T305(A) FUNDAMENTAL OF COMP. SC. – I	02	32	02	04
MAT-P305(A) PRACTICAL ON FUN. OF COMP. SC. – I	01	16	02	04
MAT-T305(B) ADVANCE NUMERICAL ANALYSIS – I	02	32	02	04
MAT-P305(B) PRACTICAL ON ADVANCE NUMERICAL ANALYSIS – I	01	16	02	04
SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC / GC)				
MAT – 306 SKEG (ANY ONE)	SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC/GC)			
SKEG-T108 HEALTH EDUCATION	03	48	03	04
SKEG-T116 MANAGERIAL SKILLS				
SKEG-T119 PERSONALITY DEVELOPMENT				
SKEG-T130 RESEARCH METHODOLOGY I				
TOTAL	22	352	23	

Course	Max. Marks				Min. Marks		
	External Theory Examination	Internal Theory Examination	Practical Examination	TOTAL MARKS	External Theory Exam.	Internal Theory Exam.	Practical Marks
MAT-T301 FUNCTIONAL ANALYSIS - I	70	30	-	100	28	12	-
MAT –T302 ADVANCE SPECIAL FUNCTION - I	70	30	-	100	28	12	-
MAT –T303 INTEGRAL TRANSFORMS - I	70	30	-	100	28	12	-
MAT –T304 OPERATION RESEARCH - I	70	30	-	100	28	12	-
MAT-T305 (A/B) CORE ELECTIVE	50	30	-	80	20	12	-
MAT-P305 (A/B) CORE ELECTIVE	-	-	20	20	-	-	08
MAT – T 306 SKEG (ANY ONE) SKILL ENHANCEMENT COURSE	70	30	-	100	28	12	-
TOTAL MARKS	400	180	20	600	-	-	
GRAND TOTAL	600				270		

Scheme of Examination

M.Sc. (Mathematics) Part II – Semester IV

COURSE	CREDITS	TOTAL HOURS	LECTURE HOURS PER WEEK	MIN. GRADE POINT OUT OF 10
CORE COURSE				
MAT-T401 FUNCTIONAL ANALYSIS - II	03	48	03	04
MAT –T402 ADVANCE SPECIAL FUNCTION - II	03	48	03	04
MAT –T403 INTEGRAL TRANSFORMS - II	03	48	03	04
MAT –T404 OPERATION RESEARCH - II	03	48	03	04
CORE ELECTIVE COURSE (ANY ONE)				
MAT-T405(A) FUNDAMENTAL OF COMPUTER SCIENCE – II	02	32	02	04
MAT-P405(A) FUNDAMENTAL OF COMPUTER SCIENCE – II	01	16	02	04
MAT-T405(B) ADVANCE NUMERICAL ANALYSIS – II	02	32	02	04
MAT-P405(B) PRACTICAL ON ADVANCE NUMERICAL ANALYSIS – II	01	16	02	04
SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC / GC)				
MAT – 406 SKEG (ANY ONE)	SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC/GC)			
SKEG-T103 COMMUNICATIVE ENGLISH	03	48	03	04
SKEG-T108 HEALTH EDUCATION				
SKEG-T119 PERSONALITY DEVELOPMENT				
SKEG-T131 RESEARCH METHODOLOGY II				
PROJECT / INTERNSHIP				
MAT-P407 PROJECT / INTERNSHIP	02	32	-	04
MAT-P408 COMPREHENSIVE VIVA	02	32	-	04
TOTAL	22	352	19	

Scheme of Examination

Scheme of Examination

M.Sc. (Mathematics) Part II – Semester IV

Course	Max. Marks				Min. Marks		
	External Theory Examination	Internal Theory Examination	Practical Examination	TOTAL MARKS	External Theory Exam.	Internal Theory Exam.	Practical Marks
MAT-T401 FUNCTIONAL ANALYSIS - II	70	30	-	100	28	12	-
MAT –T402 ADVANCE SPECIAL FUNCTION - II	70	30	-	100	28	12	-
MAT –T403 INTEGRAL TRANSFORMS - II	70	30	-	100	28	12	-
MAT –T404 OPERATION RESEARCH - II	70	30	-	100	28	12	-
MAT-T405 (A/B) CORE ELECTIVE	50	30	-	80	20	12	-
MAT-P405 (A/B) CORE ELECTIVE	-	-	20	30	-	-	08
MAT – T 406 SKEG (ANY ONE) SKILL ENHANCEMENT COURSE	70	30	-	100	28	12	-
MAT-P407 PROJECT / INTERNSHIP	-	-	100	100	-	-	40
MAT-P408 COMPREHENSIVE VIVA	-	-	50	50	-	-	20
TOTAL MARKS	400	180	170	750	-	-	
GRAND TOTAL	750				338		

Scheme of Examination

Under CBCS System

Part I & II – Semester I, II, III & IV

- Under CBCS System every PG Course and B.Ed. has been distributed in two parts namely – Core and Elective. The subjects related to course are Core and are compulsory. In each semester the students have to opt one Elective Course from prescribed electives.
- The minimum credits for each course are 20 and maximum may be 24. The credits are finalized with the requirements of respective course.
- The total minimum credits for completing the Post Graduate course and B.Ed are 80.
- For each course there will be 70% marks for External Examinations and 30% for Internal Examinations (CCE). The students have to clear both External and Internal Examinations separately.
- The pass marks in individual paper will be **40%** and in aggregate **45%**.
- The subject wise marks obtained by the student will be converted into prescribed 10 Point Grade Scale. The prescribed Grade Scale and related information are available in Examination Rules and for details follow or refer prescribed CBCS Guidelines.
- The students who are **awarded ATKT in two subjects** will be eligible to appear in the examination of next semester. However the student **will not be allowed** to appear in the next semester examination with more than **four ATKT at a time**.
- In case of more than two ATKT in a particular semester will be considered as fail in that semester and the student has to reappear in that particular semester examination.
- ATKT students have to follow the old syllabus but repeaters have to take the examination with the new syllabus.
- A student will have to compulsorily clear a program within **Three Academic Years** including the academic year of the admission, failing which he /she will not be allowed to continue the course. If a student doesn't clear all the semesters of the course in the above three years completely, then all his/ her previous result will be treated as null and void.
- Only those students who clear the program in one attempt and without gap will be eligible for position in the **Merit List**.
- A student who fails in aggregate is permitted to appear in **any one or two** papers of his/her choice to make up for the shortfall in the aggregate. Such a student can also appear in all the papers of that semester as an ex-student, provided the student applies for the same in the beginning of the semester.
- The students who are declared fail in aggregate will be eligible to appear in external theory examination of the corresponding papers only.
- Any point regarding the examination in the above scheme, which is not covered, will be applicable as per the examination scheme of respective course declared by the University or M.P. Government, whichever may be applicable, and the final decision in this regard will be taken by the Principal on the recommendation of Examination Committee.

Syllabus

M.Sc. (Mathematics) Part I – Semester I

MAT - T101 – CORE COURSE I – ADVANCED ABSTRACT ALGEBRA – I

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures: 64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**12 Lectures**
Normal & Subnormal series of Groups, Composition series, Jordan-Holder series, Solvable & Nilpotent Groups.	
Unit-II	**14 Lectures**
Algebraic extension of fields, irreducible polynomials and Eisenstein criterion, Adjunction of roots, Algebraic and Transcendental Extensions, Algebraically closed fields.	
Unit-III	**13 Lectures**
Splitting fields, Normal Extension, Multiple roots, Finite fields, Separable and Inseparable extension. Prime Field, Galois Field.	
Unit-IV	**13 Lectures**
Galois theory, Automorphism groups and Fixed Fields, Fundamental theorem of Galois theory, Fundamental theorem of Algebra.	
Unit-V	**12 Lectures**
Application of Galois theory to classical problems, Roots of Unity and cyclotomic polynomials, Cyclic Extensions, Polynomial solvable by radicals, Insolvability of general equation of degree 5 by radicals.	

BOOKS:

1. J. K. Goyal & K. P. Gupta, Advanced Course in Modern Algebra, Pragati Prakashan
2. I. N. Herstein, Topics in Algebra, John Wiley & Sons
3. Dr. H. K. Pathak, Advanced Abstract Algebra, Shiksha Sahitya Prakashan

REFERENCES:

1. P. B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge University Press

Syllabus

M.Sc. (Mathematics) Part I – Semester I

MAT - T102 – CORE COURSE II – REAL ANALYSIS

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week : 04 Hours **Total Lectures: 64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**13 Lectures**
Definition and Existence of Riemann-Stieltjes Integral and its Properties, Integration and Differentiation, The Fundamental Theorem of Calculus, Integration by Parts.	
Unit-II	**12 Lectures**
Integration of Vector-valued Functions, Rectifiable Curves, Sequences and Series of Functions, Uniform Convergence and Continuity, Cauchy's criterion for Uniform Convergence, Weierstrass M-Test.	
Unit-III	**13 Lectures**
Uniform Convergence and Differentiation, Uniform Convergence and Integration, Equicontinuous Families of Functions, Stone-Weierstrass Theorem.	
Unit-IV	**14 Lectures**
Some Special Functions, Power Series, The Algebraic Completeness of Complex Fields, Linear Transformations.	
Unit-V	**12 Lectures**
Functions of Several Variables: Differentiation, Chain Rule, Partial Derivatives, Contraction Principle, The Inverse Function Theorem, The Implicit Function Theorem, Derivatives of Higher Orders, Differentiation of Integrals.	

BOOKS:

1. T.M. Apostal, Mathematical Analysis, Narosa
2. Dr. H. K. Pathak ,Real Analysis, Shiksha Sahitya Prakashan

REFERENCES:

1. Walter Rudin, Principles of Mathematical Analysis, McGraw Hill
2. H.L. Rayden, Real Analysis, Macmillan (Indian Edition)

Syllabus

M.Sc. (Mathematics) Part I – Semester I

MAT - T103 – CORE COURSE III – TOPOLOGY - I

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week : 04 Hours **Total Lectures: 64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**10 Lectures**
Finite and Infinite Sets, Countable and Uncountable Sets. Schroeder-Bernstein Theorem, Axiom of Choice, Well-ordered Sets, Cardinal Numbers and its Arithmetic, Cantor's Theorem, Zorn's lemma.	
Unit-II	**14 Lectures**
Definition and Examples of Topological Spaces, Bases and Sub-bases, Order Topology, Product Topology, Subspaces and Relative Topology.	
Unit-III	**15 Lectures**
Closed Sets and Limits File, Closure of a Set, Dense Subsets, Neighborhoods and Neighborhoods System, Continuous Functions and Homeomorphism, Examples.	
Unit-IV	**13 Lectures**
Connected Spaces, Connected Subspaces of Real Line, Continuity and Connectedness, Path-connectedness	
Unit-V	**12 Lectures**
Countability Axioms, First and Second Countable Spaces, Lindeloff's theorem, Separable Space, Second Countability and Separability.	

BOOKS:

1. J. R. Munkres, Topology-A first course, Prentice-Hall of India
2. Dr. H. K. Pathak & J.P. Chouhan, Topology, Shiksha Sahitya Prakashan

REFERENCES:

1. G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill
2. K. D. Joshi, Introduction to General Topology, Wiley Eastern

Syllabus

M.Sc. (Mathematics) Part I – Semester I

MAT - T104 – CORE COURSE IV – COMPLEX ANALYSIS - I

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures: 64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**10 Lectures**
Complex Equation of a Straight line in the Complex Plane, Limit and Continuity, Continues Functions, Uniform Continuity, Analytic Function, Cauchy Riemann Equations (Necessary and Sufficient Condition for f(z) to be Analytic), Conjugate Functions, Harmonic Functions.	
Unit-II	**14 Lectures**
Complex Integration, Line Integrals as Functions of Arcs ,Cauchy Theorem ,Cauchy Fundamental Theorem, Cauchy-Goursat Theorem, Cauchy Integral Formula, Higher Order Derivatives, Extension of Cauchy Theorem to Multiply Connected Regions.	
Unit-III	**15 Lectures**
Morera's Theorem, Cauchy's Inequality, Liouville's Theorem, The Fundamental Theorem of Algebra, Taylor's Theorem, Problems based on Taylor's Theorem.	
Unit-IV	**13 Lectures**
The Maximum Modulus Principle, Minimum Modulus Principle, Schwartz Lemma, Laurent Series, Problems based on Laurent Series.	
Unit-V	**12 Lectures**
Bilinear Transformations, Fixed Point, Critical Point, Cross Ration, Normal Form of Bilinear Transformation, Problems on Bilinear Transformation, Mapping by Elementary Transformation (Transition, Rotation, Magnification, Inversion).	

BOOKS:

1. J. B. Convey, Functions of One Complex Variable, Springer- Verlag
2. Dr. H. K. Pathak, Complex Analysis, Shiksha Sahitya Prakashan
3. S. Ponnuswamy, Foundations of Complex Analysis, Narosa Publishing House
4. L. V. Ahlfors, Complex Analysis, McGraw Hill

Syllabus

M.Sc. (Mathematics) Part I – Semester I

MAT - T105 – CORE ELECTIVE COURSE V(A) - DIFFERENTIAL EQUATION- I

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 03 Hours **Total Lectures: 48**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**10 Lectures**
Initial Value Problem and Inn Equivalent Integral Equation, m^{th} Order Equation in d-Dimensions as a First Order System, Concepts of Local Existence, Existence Uniqueness of Solutions with Examples.	
Unit-II	**09 Lectures**
Basic Theorem, Ascoli-Arzela Theorem, Theorem on Convergence of Solutions of a Family of Initial Value Problems.	
Unit-III	**08 Lectures**
Picard-Lindelof Theorem, Peano's Existence Theorem and Corollary. Maximal Intervals of Existence. Extension Theorem and Corollaries, Kamkes Convergence Theorem. Kneser's Theorem (Statement only).	
Unit-IV	**09 Lectures**
Differential Inequalities and Uniqueness - Gronwall's Inequality. Maximal and Minimal Solutions. Differential Inequalities. A Theorem of Wintner. Uniqueness Theorems. Nagumo's and Osgood's Criteria.	
Unit-V	**12 Lectures**
Egres points and Lyapunov Functions. Successive Approximations. Linear Differential Equations--Linear Systems, Variation of Constants, Reduction to Smaller Systems. Basic Inequalities, Constant Coefficients. Floquet Theory, Adjoint Systems, Higher Order Equations.	

BOOKS:

1. R. Hartman, Ordinary Differential Equations, John Wiley

REFERENCES:

1. W. T. Reid, Ordinary Differential Equations, John Wiley & Sons
2. E. Steiner, The Chemistry Mathematics book, Oxford University Press

Syllabus

M.Sc. (Mathematics) Part I – Semester I

MAT - T105 – CORE ELECTIVE COURSE V(B) - ADVANCED DISCRETE MATHEMATICS – I

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 03 Hours **Total Lectures: 48**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**10 Lectures**
Formal Logic: Statement, Connectives, Tautologies, Contradiction, Logical Equivalence, Quantifiers: Universal and Existential Quantifiers.	
Unit-II	**11 Lectures**
Boolean Algebra: Various Boolean Identities and its properties, Demorgan's Law Sub Algebras, Direct Products and Homomorphism. Boolean Functions, Boolean Forms and Free Boolean Algebras.	
Unit-III	**10 Lectures**
Boolean Functions: Representation and Minimization of Boolean Functions, Bool's Expansion Theorem, Sum of Products Canonical Forms, Product of Sum Canonical Forms, Applications of Boolean Algebra to Switching Theory (using AND, OR a NOT Gates). The Karnaugh Map methods, Binomial Net.	
Unit-IV	**08 Lectures**
Lattices: Lattices as Partially Ordered Sets and their Properties, Lattices as Algebraic Systems, Sub Lattices, Direct Products and Homeomorphisms, Some Special Lattices e.g. Complete, Complemented and Distributive Lattice.	
Unit-V	**09 Lectures**
Semi Groups & Monoids – Definition & Examples (including those pertaining to concatenation operation), Homomorphism of Semi Groups and Monoids, Congruence Relation, Quotient Semi Groups and Sub Semi Groups, Sub Monoids, Direct products of Semi Groups and Monoids.	

BOOKS:

1. J. P. Tremblay & R. Manohar, Discrete Mathematical Structures, McGraw Hill
2. N. Deo, Graph Theory with Applications, Prentice Hill
3. Dr. H. K. Pathak, Advanced Discrete Mathematics, Shiksha Sahitya Prakashan

REFERENCES:

1. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill

Syllabus

M.Sc. (Mathematics) Part I – Semester I

MAT – 106 (SKEG) – SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC / GC) –

SKEG-T/P114 – INTRODUCTION TO ICT I

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

PART A : THEORY - MAX. MARKS: 50 + 30 **MIN. PASS MARKS: 20 + 12**

No. of Lectures per week : 02 Hours **Total Lectures: 32**

PART B : PRACTICALS - MAX. MARKS: 20 **MIN. PASS MARKS: 08**

No. of Laboratory per week: 02 Hours **Total Lectures: 32**

SKEG- T-119 – PERSONALITY DEVELOPMENT

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week: 03 Hours **Total Lectures: 48**

SKEG-T116 – MANAGERIAL SKILLS

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week : 03 Hours **Total Lectures: 48**

SKEG-T108 – HEALTH EDUCATION

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week : 03 Hours **Total Lectures: 48**

Syllabus

M.Sc. (Mathematics). Part I – Semester II

MAT – T201 – CORE COURSE I – ADVANCED ABSTRACT ALGEBRA –II

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures: 64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**13 Lectures**
Introduction to Modules and its Examples, Submodules and Direct Sums, Cyclic Modules, R-Homomorphism and Quotient Modules, Isomorphism.	
Unit-II	**13 Lectures**
Completely Reducible Modules, Schur's Lemma, Free Modules, Representation of Linear Mapping, Rank of Linear Mapping.	
Unit-III	**13 Lectures**
Noetherian & Artinian Modules and Rings, Hilbert Basis Theorem, Wedderburn – Artin Theorem, Nilpotent Ideal.	
Unit-IV	**13 Lectures**
Uniform Modules, Primary Modules, Finitely Generated Modules over a PID, Decomposition Theorem, Uniqueness of the Decomposition, Application to Finitely Generated Abelian Groups.	
Unit-V	**12 Lectures**
Linear Transformation, The Algebra of Linear Transformation, Characteristic Roots, Canonical Forms (Triangular form, Nilpotent Transformations, Generalized Jordan form over any Field, Rational Canonical Form).	

BOOKS:

1. Dr. H. K. Pathak, Advanced Abstract Algebra, Shiksha Sahitya Prakashan
2. J. K. Goyal & K. P. Gupta, Advanced Course in Modern Algebra, Pragati Prakashan
3. I. N. Herstein, Topics in Algebra, John Wiley & Sons

REFERENCES:

1. P. B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Cambridge University Press

Syllabus

M.Sc. (Mathematics). Part I – Semester II

MAT – T202 – CORE COURSE II – LEBESGUE MEASURE & INTEGRATION

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures: 64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**15 Lectures**
F_σ, G_δ Sets, Introduction to Lebesgue Outer Measure, Measurable Sets and Lebesgue Measure, Non-Measurable Sets.	
Unit-II	**12 Lectures**
Measurable Functions, Egoroff' Theorem, Lusin's Theorem, Little-wood's Three Principles, A Non-Borel Measurable Set. The Riemann Integral, The Lebesgue Integral of a Bounded Function over a Set of Finite Measure.	
Unit-III	**12 Lectures**
The Integral of a Non-Negative Function, The General Lebesgue Integral, Convergence in Measure, Differentiation in Monotone Functions, The Four Derivatives.	
Unit-IV	**13 Lectures**
Functions of Bounded Variation, Absolute Continuity, Convex Functions, Jensen Inequality. L^p – spaces, The Holder and Minkowski Inequalities.	
Unit-V	**12 Lectures**
Convergence and Completeness, Riesz-Fischer Theorem, Approximations in L^p, Bounded Linear Functional on the L^p – Spaces, Riesz Representation Theorem.	

BOOKS:

1. H.L. Royden, Real Analysis, Macmillan (Indian Edition)
2. Dr. H. K. Pathak, Real Analysis, Wiley Eastern (Indian Edition)

REFERENCES:

1. G. de Barra. Measure Theory and Integration, Wiley Eastern (Indian Edition)

Syllabus

M.Sc. (Mathematics). Part I – Semester II

MAT – T203 – CORE COURSE III – TOPOLOGY-II

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures: 64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**14 Lectures**
Compactness: Basic Properties of Compactness, Continuous Functions and Compact Sets, Compactness and F.I.P. (Finite Intersection Property), Sequential and Countable Compact Spaces, Compactness in Metric Space.	
Unit-II	**15 Lectures**
The Separation Axioms, Hausdorff Space, Regular and Normal Spaces, Urysohn's Lemma, Tietze's Extension Theorem.	
Unit-III	**12 Lectures**
Tychnoff Product Topology in terms of Standard Sub-base and its Characterizations, Embedding and Metrization, Embedding Lemma and Tychnoff Embedding, The Urysohn's Metrization.	
Unit-IV	**12 Lectures**
Nets and Filters, Topology and Convergence of Nets, Hausdorffness and Nets, Compactness and Nets, Filters and their Convergence. The Nagata-Smirnov metrization theorem.	
Unit-V	**11 Lectures**
The Fundamental Group and Covering Spaces, Homotopy of Paths, The Fundamental Group, Covering Spaces, The Fundamental Group of Circle and the Fundamental Theorem of Algebra.	

BOOKS:

1. J. R. Munkres, Topology-A first course, Prentice-Hall of India
2. Dr. H. K. Pathak & J.P. Chouhan, Topology, Shiksha Sahitya Prakashan

REFERENCES:

1. G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill
2. K. D. Joshi, Introduction to General Topology, Wiley Eastern

Syllabus

M.Sc. (Mathematics). Part I – Semester II

MAT – T204 – CORE COURSE IV – COMPLEX ANALYSIS –II

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures: 64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**12 Lectures**
Isolated Singularities, Problems based on Singularities, Meromorphic Functions, Poles and Zeros, N-P Theorem, The Arguments Principle, Rouche's Theorem ,Problems based on Rouche's Theorem.	
Unit-II	**12 Lectures**
Residues, Residue at Infinity, Computation of Residue at a Finite Pole, Cauchy's Residue Theorem, Problems based on Residue Theorem, Integration Round the Circle, Evaluation of the Integral $\int_0^{2\pi} f(cos\theta, sin\theta)d\theta$	
Unit-III	**12 Lectures**
Jordan's Inequality, Jordan's Lemma, Evaluation of Improper Real Integrals of the type $\int_{-\infty}^{\infty} f(z)$ dz,	
Unit-IV	**14 Lectures**
Gamma Function, Infinite Product, Properties of Gamma Functions, Legendre's Duplication Formula, Riemann Zeta Function, Riemann Functional Equation, Relation between Gamma and Zeta Functions, Weierstrass Factorization Theorem.	
Unit-V	**14 Lectures**
Analytic Continuation, Power Series Method of Analytic Continuation. Uniqueness of Direct Analysis Continuation along a Curve, Schwartz Reflection Principle, Harmonic Function, Mean Value Theorem, Poisson Kernel, Problems based on Analytic Continuation.	

BOOKS:

1. J. B. Convey, Functions of One Complex Variable, Springer- Verlag
2. S. Ponnuswamy, Foundations of Complex Analysis, Narosa Publishing House
3. L. V. Ahlfors, Complex Analysis, McGraw Hill
4. Dr. H. K. Pathak, Complex Analysis, Shiksha Sahitya Prakashan

Syllabus

M.Sc. (Mathematics). Part I – Semester II

MAT – T205 – CORE ELECTIVE COURSE V(A) - DIFFERENTIAL EQUATION- II

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 03 Hours **Total Lectures: 48**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**09 Lectures**
Dependence on initial conditions and parameters, Preliminaries, continuity, differentiability, Higher order differentiability.	
Unit-II	**11 Lectures**
Poincare-Bendixson Theory-Autonomous systems, Umlanfsatz, Index of a stationary point, Poincare-Bendixson theorem Stability of periodic solutions, rotation points, foci, nodes and saddle points.	
Unit-III	**10 Lectures**
Linear second order equations—Preliminaries, Basic facts. Theorems of Sturm. Sturm Liouville Boundary Value Problems. Number of zeroes, Nonoscillatory equations and principal solutions. Nonoscillation theorems,	
Unit-IV	**09 Lectures**
Use of Implicit function and fixed point theorems-Periodic solutions. Linear equations. Nonlinear problems.	
Unit-V	**09 Lectures**
Second order Boundary' value problems, Linear problems, Nonlinear problems, Aprori bounds.	

BOOKS:

1. R. Hartman, Ordinary Differential Equations, John Wiley

REFERENCES:

1. W. T. Reid, Ordinary Differential Equations, John Wiley & Sons
2. E. Steiner, The Chemistry Mathematics book, Oxford University Press

Syllabus
M.Sc. (Mathematics). Part I – Semester II

MAT – T205 – CORE ELECTIVE COURSE V(B)- ADVANCED DISCRETE MATHEMATICS-II

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 03 Hours **Total Lectures: 48**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**10 Lectures**
Graph Theory: Definition of Undirected & Directed Graph, Simple Graph, Multi Graph, Isomorphic Graph, Path, Reachability and Connectedness, Simple Path, Simple Cycle, Unilaterally Connected, Strongly Connected, Dijkstra's Algorithm, Konigsberg Bridge problems.	
Unit-II	**09 Lectures**
Matrix Representation of Graphs, Adjacency Matrix, Incident Matrix, Reachability Matrix, Warshal's Algorithm for finding Transitive Closures, Trees, Directed Tree, Binary Tree, Terminal Node.	
Unit-III	**11 Lectures**
Grammars and Languages: Phrase–Structure Grammars, Rewriting Rules, Derivations, Sentential Forms, Languages Generated by a Grammar, Regular, Context- Free and Context- Sensitive Grammars and Languages, Notion of Syntax Analysis, Polish Notion, Conversion of Infix Expressions to Notations.	
Unit-IV	**08 Lectures**
Finite State Machine: Introductory Sequential Circuits, Equivalence of Finite State Machines, Finite-State Machines and their Transition Table Diagram.	
Unit-V	**10 Lectures**
Introductory Computability Theory: Finite–State Acceptors and Regular Grammars, Nondeterministic Finite Automation, Introduction and Definition of Turing Machines.	

BOOKS:

1. J. P. Tremblay & R. Manohar, Discrete Mathematical Structures, McGraw Hill
2. N. Deo, Graph Theory with Applications, Prentice Hill
3. Dr. H. K. Pathak, Advanced Discrete Mathematics, Shiksha Sahitya Prakashan

REFERENCES:

1. C. L. Liu, Elements of Discrete Mathematics, McGraw Hill

Syllabus

M.Sc. (Mathematics). Part I – Semester II

MAT – 206 (SKEG) – SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC / GC) –

SKEG-T/P115 – INTRODUCTION TO ICT II

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

PART A : THEORY - MAX. MARKS: 50 + 30 **MIN. PASS MARKS: 20 + 12**

No. of Lectures per week : 02 Hours **Total Lectures: 32**

PART B : PRACTICALS - MAX. MARKS: 20 **MIN. PASS MARKS: 08**

No. of Laboratory per week: 02 Hours **Total Lectures: 32**

SKEG- T-119 – PERSONALITY DEVELOPMENT

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week: 03 Hours **Total Lectures: 48**

SKEG-T103 – COMMUNICATIVE ENGLISH

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week : 03 Hours **Total Lectures: 48**

SKEG-T108 – HEALTH EDUCATION

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week : 03 Hours **Total Lectures: 48**

Syllabus

M.Sc. (Mathematics) Part II – Semester III

MAT-T301- CORE COURSE- I- FUNCTIONAL ANALYSIS -I

MAX.MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures - 64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**13 Lectures**
Normed Linear Spaces, Banach Spaces and examples, Properties of Normed linear spaces, Completeness Proof of Banach Spaces, Quotient Spaces.	
Unit-II	**12 Lectures**
Finite Dimensional Normed Spaces & Subspaces Equivalent norms, Compactness and Finite Dimension, Riesz Lemma, Linear Operators.	
Unit-III	**13 Lectures**
Bounded & Continuous Linear Operators, Linear Functionals, Riesz-Representation theorem.	
Unit-IV	**13 Lectures**
Linear Operators & Functional and Finite Dimensional Spaces, Normed Spaces of Operators	
Unit-V	**13 Lectures**
Zorns Lemma, Hahn–Banach Theorem, Hahn–Banach Theorem for Complex Vector Spaces and Normed Spaces, Application to Bounded Linear Functional on C[a,b]	

TEXT BOOKS:

1. E. Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons
2. Walter Rudin, Functional Analysis, McGraw-Hill

REFERENCE:

1. B. Choudhary and Sudarshan Nanda, Functional Analysis with applications, Wiley Eastem Ltd.
2. G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill

Syllabus

M.Sc. (Mathematics) Part II – Semester III

MAT-T302 - CORE COURSE- II- ADVANCED SPECIAL FUNCTION-I

MAX.MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures-64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**13 Lectures**
The Gamma and Beta Functions: The Euler or Mascheroni Constant γ, Gamma Function, A series for Γ' (z) / Γ (z), Evaluation of Γ1 and Γ' 1, the Euler product for Γ (z), the Difference equation Γ(z+1) = zΓ(z), the Beta function, the value of Γ(z) Γ(1-z), The Factorial Function, Legendre's duplication formula, Gauss Multiplication theorem.	
Unit-II	**12 Lectures**
Hypergeometric functions: Hypergoemetric functions, integral Representation of F(a,b;c; z), Hypergeometrical differential equation, Simple transformation, Quadratic transformation.	
Unit-III	**13 Lectures**
Generalized Hypergeometric functions: The Function ${}_pF_q$, A differential equation, Contiguous function relations, A simple integral, Saalschutz theorem, Whipple's theorem, Dixon's theorem, Kummer's theorem, Ramanujan's theorem.	
Unit-IV	**13 Lectures**
Bessel's Function: Definition of $J_n(z)$, Bessel's differential equation, differential recurrence relation, pure recurrence relation, Generating function, Bessel's integral, Index half and an odd integer.	
Unit-V	**13 Lectures**
Legendre polynomials: A Generating function, differential recurrence relation, pure recurrence relation, Legendre's differential equation, The Rodrigue's formula, Bateman's generating function, Additional generating functions, Hypergeometric forms of $P_n(X)$, Special properties of $P_n(X)$, More generating functions, Laplace's first integral form, Orthogonality.	

TEXT BOOKS:

1. N. Saran, S.D. Sharma and T. N. Trivedi, - Special Functions, Pragati Prakashan
2. M. D. Raisinghania, Special Functions, Kedar Nath Ram Nath Publication

REFERENCE:

1. E. D. Rainville, Special Functions, Macmillan Publication

Syllabus

M.Sc. (Mathematics) Part II – Semester III

MAT- T303 -CORE COURSE- III- INTEGRAL TRANSFORM – I

MAX.MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures-64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**13 Lectures**
Laplace Transform of the derivative of f(t), Laplace Transform of Integrals multiplication by t, Multiplication by t^n, Division by t use of Laplace transform to unit step function (Heaviside's unit functions) use of Laplace Transform to Bessel function, Inverse Laplace Transform of derivatives, Convolution, Heaviside's expansion theorem, Problem depends on Convolution.	
Unit-II	**12 Lectures**
Application of Laplace Transform to Solution of Ordinary Differential Equations with Constant Coefficients.	
Unit-III	**12 Lectures**
Solution of Simultaneous Ordinary Differential Equations by Laplace Transform. Solution of Ordinary Differential Equations with variable coefficients by Laplace Transform.	
Unit-IV	**13 Lectures**
Solution of Partial differential Equations by Laplace transforms, Application of Laplace Transform to Integral Equation.	
Unit-V	**14 Lectures**
Heat Conduction equations. Problems based on Heat Conduction equation using Laplace Transform.	

BOOKS:

1. Integral Transforms by Goyal & Gupta
2. Integral Transforms by Vasishtha & Gupta, Krishna Publication

Syllabus
M.Sc. (Mathematics) Part II – Semester III

MAT-T304- CORE COURSE- IV- OPERATIONS RESEARCH –I

MAX.MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 04 Hours **Total Lectures-64**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**13 Lectures**
Operations Research – Introduction. Origin and Development of Operations Research, Nature and Features of Operations Research, Models in Operations Research, General Solution Methods for Operation Research, Phases of Operations Research, Uses and Limitations of Operations, Linear Programming Problems : Introduction Mathematical Formulation, Graphical Solution Method	
Unit-II	**13 Lectures**
General Linear Programming Problem, Theory of Simplex Method, Computational Procedure, Numerical Problems, Solutions of simultaneous linear equations, inverse of a matrix using simplex method.	
Unit-III	**12 Lectures**
Use of artificial variables, Big-M method, Two phase method, Problem of degeneracy and resolution of degeneracy, Applications of simplex method.	
Unit-IV	**13 Lectures**
Concept of duality: Introduction, General Primal-Dual pair, formulating a dual problem, primal-dual pair in matrix form, economic interpretation of duality, duality and simplex method, Fundamental Properties and Theorems of duality, complementary slackness, dual simplex method.	
Unit-V	**13 Lectures**
Integer programming, revised simplex method.	

BOOKS:

1. Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi

REFERENCE BOOKS:-

1 S.D, Sharma, Operation Research, S.chand and Company Limited
2 H.A. Taha, Operations Research - An introduction, Macmillan Publishing co. Inc. New york.
3 Prem Kumar Gupta and D.S. Hira, Operation Research, An Introduction, S. Chand & Company Ltd. New Delhi.

Syllabus
M.Sc. (Mathematics) Part II – Semester III

MAT-T/P305A - CORE ELECTIVE COURSE-
FUNDAMENTALS OF COMPUTER SCIENCE (THEORY AND PRACTICAL) - I

MAX. MARKS: 70 + 30 — **MIN. PASS MARKS: 28 + 12**

PART A : THEORY - MAX. MARKS: 50 + 30 — **MIN. PASS MARKS: 20 + 12**

No. of Lectures per week : 02 Hours — **Total Lectures: 32**

PART B : PRACTICALS - MAX. MARKS: 20 — **MIN. PASS MARKS: 08**

No. of Laboratory per week: 02 Hours — **Total Lectures: 32**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**06 Lectures**
Introduction to Object Oriented Programming Introduction to object oriented programming in C++, Need of object oriented programming, Characteristics of object oriented Languages, Object oriented v/s Procedure oriented programming languages, Class and Object, Encapsulation, Abstraction, Data types, Variables, Constants, keywords.	
Unit-II	**06 Lectures**
Basic Constructs of Programming **Decision Control Statements:** if, if-else, Nested if else, switch-case statement. **Repetitive or Loop Control Statements:** for, while and do-while statements. **Jump Statements:** break, continue, goto and exit. **Constructor and Destructor:** Definition, Types of Constructor. Scope Resolution operator & its uses.	
Unit-III	**06 Lectures**
Pointers: Introduction to Pointers, Pointers to Object. Virtual Functions and Friend Functions. Use of Friend Function, **Polymorphism:** Compile time and Run time polymorphism, advantages of polymorphism. **Overloading:** Function overloading and Operator overloading.	
Unit-IV	**06 Lectures**
Class Inheritance and their types: Single, Multiple, Multilevel, Hierarchical, Hybrid Inheritance and Advantages of inheritance. **String Handling (Basic Concepts Only):** The C-style character string, string class in C++.	
Unit-V	**08 Lectures**
Operating System: Introduction, Definition of Operating Systems, Computer System Architecture, Operating System Operations, Process management, Memory management, Protection and Security, Distributed Systems, Special Purpose Systems, Client –Server Computing, Peer to Peer Computing, Open Source Operating Systems.(Only Basic Concept of these all.	
Practicals	**32 Lectures**
The Students have to perform Laboratory work as per the syllabus requirement under the guidance of respective faculty.	

TEXT BOOKS:

1. Robert Lafore Object Programming in C++, Fourth edition , Sams Publishing Indianpolis , IN 46290 USA
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concept Wiley India Pvt. Ltd, Eighth Edition

REFERENCES:

1. S.B. LIPMAN, LAJOI, C++ PRIMER ADDISON
2. B. Stroustruo, The c++ programming languages, Addition – Westey
3. Andrew S Tanenbaum, Modern Operating System, Pearson International, Third Edition

Syllabus

M.Sc. (Mathematics) Part II – Semester III

MAT-T/P305-B-CORE ELECTIVE COURSE - ADVANCED NUMERICAL ANALYSIS - I

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

PART A : THEORY - MAX. MARKS: 50 + 30 **MIN. PASS MARKS: 20 + 12**

No. of Lectures per week : 02 Hours **Total Lectures: 32**

PART B : PRACTICALS - MAX. MARKS: 20 **MIN. PASS MARKS: 08**

No. of Laboratory per week: 02 Hours **Total Lectures: 32**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**06 Lectures**
Introduction: Interpolation, Linear Interpolation and Higher order Interpolation, Hermite Interpolation, Piecewise and Spline Interpolation, Piecewise quadratic Interpolation, Piecewise cubic interpolation, Piecewise cubic interpolation using Hermite Type Data, Quadratic Spline Interpolation, Cubic Spline Interpolation and its derivation, Problems.	
Unit-II	**07 Lectures**
Bivariate Interpolation: Lagranges and Newtons Bivariate Interpolation polynomials and their derivation, Approximation: Discrete and Continuous data, Least Square Approximation.	
Unit-III	**06 Lectures**
Orthogonal, Gram-Schmidt Orthogonalizing Process, Legendre and Chebyshev Polynomials.	
Unit-IV	**07 Lectures**
Uniform Approximation, Uniform Polynomials Approximation (Chebyshev), Chebyshev Polynomials Approximation and Lanczos Economization, Rational Approximation, Choice of Methods.	
Unit-V	**06 Lectures**
Numerical Differentiation: Method based on Interpolation, Non uniform and uniform nodal points, Quadratic interpolation, Method based on Finite Difference Operators, Methods based on undetermined Coefficient, Optimum choice of Step Length.	
Practicals	**32 Lectures**
The Students have to perform Laboratory work as per the syllabus requirement under the guidance of respective faculty.	

TEXT BOOKS:

1. Numerical Methods Jain, Iyanger and Jain, New Age International Edition 2012

Syllabus

M.Sc. (Mathematics) Part II – Semester III

MAT – 306 (SKEG) – SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC / GC) –

SKEG- T-130 – RESEARCH METHODOLOGY I

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week: 03 Hours **Total Lectures: 48**

SKEG- T-119 – PERSONALITY DEVELOPMENT

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week: 03 Hours **Total Lectures: 48**

SKEG-T116 – MANAGERIAL SKILLS

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week : 03 Hours **Total Lectures: 48**

SKEG-T108 – HEALTH EDUCATION

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week : 03 Hours **Total Lectures: 48**

Syllabus

M.Sc. (Mathematics). Part II – Semester IV

MAT-T401- CORE COURSE-I- FUNCTIONAL ANALYSIS – II

MAX.MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 03 Hours **Total Lectures - 48**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**10 Lectures**
Inner product space, Hilbert Space, Further Properties of Inner Product Spaces, Orthogonal Sets and Sequences, Schwartz triangle and Bessel Inequality.	
Unit-II	**11 Lectures**
Series related to Orthonormal Sequences & Sets, Sequences representation of Functional on Hilbert Space, Riesz's Theorem, Riesz representation theorem.	
Unit-III	**10 Lectures**
Adjoint Operator, Hilbert Adjoint Operator, Self Adjoint Operator, Unitary and Normal Operators.	
Unit-IV	**08 Lectures**
Reflexive Spaces, Category Theorem, Uniform Boundedness Theorem, Definition of Fixed Point, Banach-Fixed Point theorem.	
Unit-V	**09 Lectures**
Convergence of Sequences of Operator and Functionals, Application of summability of Sequences, Open mapping Theorem, Closed Linear Operators, Closed Graph Theorem.	

TEXT BOOKS:

1. E. Kreyszig, Introductory Functional Analysis with applications, John Wiley & Sons
2. Walter Rudin, Functional Analysis, McGraw-Hill

REFERENCE:

1. B. Choudhary and Sudarshan Nanda, Functional Analysis with applications, Wiley Eastem Ltd.
2. G. F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill

Syllabus
M.Sc. (Mathematics). Part II – Semester IV

MAT-T402- CORE COURSE-II- ADVANCED SPECIAL FUNCTION-II

MAX.MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 03 Hours **Total Lectures - 48**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**09 Lectures**
Hermite Polynomials: Definition of Hermite polynomials $H_n(x)$, Pure recurrence relations, Differential recurrence relations, Rodrigue's formula, other generating functions, Orthogonality, Expansion of polynomials, More generating functions.	
Unit-II	**10 Lectures**
Simple Laguerre Polynomials: Solution of Laguerre's differential equation, Generating functions, Rodrigue's formula, recurrence relations, Laguerre Polynomials for particular values of n and x, differential equation of $L_n(X)$, Orthogonal Properties of $L_n(X)$, other integral relation.	
Unit-III	**11 Lectures**
Generalized Laguerre Polynomials: Definition, recurrence relations, Rodrigue's formula and Orthogonality, Expansion, some special results, more generating relation.	
Unit-IV	**09 Lectures**
Chebyshev Polynomial: Independent Solution of Chebyshev's equation, expansion of $T_n(X)$ and $U_n(X)$, generating functions, recurrence relations, to determine $T_n(X)$ and $U_n(X)$ for given value of n, orthogonal properties of $T_n(X)$ and $U_n(X)$.	
Unit-V	**09 Lectures**
The Jacobi Polynomials: The Jacobi Polynomials, Bateman's generating function, The Rodrigue's formula, Orthogonality, differential recurrence relation, Pure recurrence relation.	

TEXT BOOKS:

1. N. Saran, S.D. Sharma and T. N. Trivedi, - Special Functions, Pragati Prakashan
2. M. D. Raisinghania, Special Functions, Kedar Nath Ram Nath Publication

REFERENCE:

1. E. D. Rainville, Special Functions, Macmillan Publication

Syllabus

M.Sc. (Mathematics). Part II – Semester IV

MAT-T403- CORE COURSE-III- INTEGRAL TRANSFORM – II

MAX.MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 03 Hours **Total Lectures-48**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**09 Lectures**
Laplace Wave Equations, Problems based on wave equations using Laplace Transform.	
Unit-II	**11 Lectures**
Electric Circuits, Applications to Beams, Problems base on it using Laplace Transform	
Unit-III	**08 Lectures**
The Complex Fourier Transform, Inversion Formula, Fourier cosine and sine Transform.	
Unit-IV	**09 Lectures**
Properties of Fourier Transforms, Convolution & Parseval's Identity.	
Unit-V	**11 Lectures**
Fourier Transform of the derivatives, Finite Fourier Sine & Cosine Transform, Inversion formula for Sine & Cosine Transform, Operational and Combined Properties of Finite Sine & Cosine Fourier Transform. Application of Infinite Fourier Transform	

BOOKS:

1. Goyal & Gupta Integral Transforms
2. Vasishtta & Gupta ,Integral Transforms ,Krishna Publication

Syllabus

M.Sc. (Mathematics). Part II – Semester IV

MAT-T404-CORE COURSE-IV- OPERATIONS RESEARCH

MAX.MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per Week: 03 Hours **Total Lectures-48**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**11 Lectures**
Transportation problems: Introduction, General transportation problem, duality in TP, Transportation Table, LP formulation of T.P., Initial solution of transportation problem: North – West Corner Method, Least – Cost method, Vogel's Approximation Method, test for optimality by MODI (u-v method) method, economic interpretation, and degeneracy in transportation problems. Unbalanced transportation problems.	
Unit-II	**12 Lectures**
Assignment problem: Introduction, Mathematical formulation of assignment problem, Solution of assignment problem: Hungarian Method, Special Cases: Unbalanced Assignment Problem, Maximization Assignment Problems, Prohibited A.P., Dual of the assignment problem Travelling Salesman problem. Dynamic Programming: Introduction, Characteristics, Dynamic Programming Algorithms.	
Unit-III	**09 Lectures**
Network analysis: Introduction, Basic Terminology/Components, Rules of network construction, Critical Path Method (CPM), PERT Calculation, Difference between CPM/PERT.	
Unit-IV	**08 Lectures**
Game Theory: Introduction, Two - person Zero - Sum Game, Basic Terms, the Maximix – Minimax principle, games without saddle points – Mixed strategies, dominance property, Graphical solution of 2xm and mx2 games, Arithmetic method for n x n games, solution of m x n games by Linear Programming, Limitations.	
Unit-V	**08 Lectures**
Non-Linear programming Techniques Kuhn–Tucker Conditions with Non- negative Constraints, Quadratic Programming, Wolfe's simplex method, Beal's method, Separable Convex Programming, Separable Programming algorithm.	

BOOKS:

1. Kanti Swarup, P.K. Gupta and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi.

REFERENCE BOOKS:

1. S.D, Sharma, Operation Research, S. Chand & Company Ltd. New Delhi
2. H.A. Taha, Operations Research - An introduction, Macmillan Publishing Co. Inc. New York
3. Prem Kumar Gupta and D.S. Hira, Operation Research, an Introduction, S. Chand & Company Ltd. New Delhi

Syllabus
M.Sc. (Mathematics). Part II – Semester IV

MAT-T/P405A - CORE ELECTIVE COURSE-
FUNDAMENTALS OF COMPUTER SCIENCE (THEORY AND PRACTICAL) - II

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

PART A : THEORY - MAX. MARKS: 50 + 30 **MIN. PASS MARKS: 20 + 12**

No. of Lectures per week : 02 Hours **Total Lectures: 32**

PART B : PRACTICALS - MAX. MARKS: 20 **MIN. PASS MARKS: 08**

No. of Laboratory per week: 02 Hours **Total Lectures: 32**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**08 Lectures**
Introduction to Data Structures, Types of Data Structures. **Algorithm:** Definition, Analysis of Algorithms time and space Complexity, Standards Notation Big O, Big θ(Theta),Big Ω (Omega) (Definition Only). **Stacks:** Definition, PUSH, POP, TRAVERSE algorithms/functions (using array), applications of Stack. **Queues:** Definition, INSERT, DELETE, TRAVERSE algorithms/functions (using array), applications of Queue.	
Unit-II	**06 Lectures**
Linked Lists: Definition, Single Linear Linklist, Single Circular Linklist, Double Linear Linklist, Double Circular Linklist and their Operations algorithms/functions, applications of linklist. **Tree:** Basic Definitions, Binary Trees, Binary Search Tree, Binary tree traversal: Preorder, Inorder, Postorder (only recursive function). **Advance Tree (Definition only):** Extended, Threaded, AVL Tree, B-Tree.	
Unit-III	**06 Lectures**
Hashing –Definition of hashing, hash table, Open and Closed hashing, Hash Functions. **Sorting techniques:** Selection sort, Quick Sort, Heap Sort, Bubble sort .	
Unit-IV	**06 Lectures**
An Introduction to database system, Purpose and role of database system, database Architecture, database Users and Administrators, Structure of Relation database Schema, Keys, Schema Diagrams. Introduction to the Relational Model.	
Unit-V	**06 Lectures**
Introduction to SQL: Overview of the SQL Query language, SQL data definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Modification of the Database. Join Expressions, Views, Transaction, Integrity Constraints, SQL Data Types and Schemas, Authorization. Relational Database design Normalization upto BCNF.	
Practicals	**32 Lectures**
The Students have to perform Laboratory work as per the syllabus requirement under the guidance of respective faculty.	

BOOKS:

1. Yedidyah Langsam, Moshe J., A.M. Tanenbaum ,Data Structure Using C and C++, , Pearson Education
2. Yashwant Kanetkar, BPB publications Ltd. New Delhi, 1st Edition
3. Abraham Silberschatz, Henery F. Korth, S. Sudarshan Publishe ,Database System Concepts, McGraw-Hill Sixth Edition
4. Robert L. Bruce P. Leung, Clovis L. Tondo, Data Structure and Programming design in C, Prentice-Hall of India , New Delhi

Syllabus

M.Sc. (Mathematics). Part II – Semester IV

MAT-T/P405-B-CORE ELECTIVE COURSE - ADVANCED NUMERICAL ANALYSIS - II

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

PART A: THEORY - MAX. MARKS: 50 + 30 **MIN. PASS MARKS: 20 + 12**

No. of Lectures per week : 02 Hours **Total Lectures: 32**

PART B: PRACTICALS - MAX. MARKS: 20 **MIN. PASS MARKS: 08**

No. of Laboratory per week: 02 Hours **Total Lectures: 32**

The Question Paper will contain questions equally distributed in all Units. The Internal Choice will be given in all Questions.

Unit-I	**06 Lectures**
Extrapolation methods (Richardson Extrapolation), Partial Differentiation and its estimations, Ordinary Differential Equations: Initial Value Problems, Reduction of Higher order equation, Existence and Uniqueness, Test Equations, System of Linear First Order Differential Equation with constant coefficients and its theorem, Multi step Methods, Various Types of Explicit and Implicit Multistep Methods, General Multi Methods. Examples.	
Unit-II	**07 Lectures**
Maximum Order of k-step methods and theorems, Convergence of Multi Step Methods, Predicator and correctors Method, Modified Predicator and correctors Method, Stability Analysis of Multistep Methods and theorems: First Order and Second Order differential equations.	
Unit-III	**06 Lectures**
Ordinary Differential Equation, Boundary Value Problems: Shooting Method, Alternate method, Nonlinear Second Order Differential Equation.	
Unit-IV	**07 Lectures**
Finite Difference Methods Linear Second Order Differential Equations, Local Truncation Error, Derivative Boundary Conditions, Solutions of Tridiagonal System, Nonlinear Second Order Differential Equation, Convergence of Difference Schemes and Theorems, Stability of Finite Difference Schemes.	
Unit-V	**06 Lectures**
Finite Element Method, Solution of the Variation Problem, Ritz Method (Galerkin equations), Finite Elements, Linear Lagrange Polynomial, Ritz Finite Element Method, Finite element solution of Linear Boundary Value Problems, Assembly of Element Equations, Mixed Boundary Conditions	
Practicals	**32 Lectures**
The Students have to perform Laboratory work as per the syllabus requirement under the guidance of respective faculty.	

TEXT BOOKS:

1. Jain,Iyanger and Jain ,Numerical Methods, New Age International Edition 2012

Syllabus

M.Sc. (Mathematics). Part II – Semester IV

MAT – 406 (SKEG) – SKILL ENHANCEMENT / GENERIC COURSE - ANY ONE (SEC / GC) –

SKEG- T-131 – RESEARCH METHODOLOGY II

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week: 03 Hours **Total Lectures: 48**

SKEG- T-119 – PERSONALITY DEVELOPMENT

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week: 03 Hours **Total Lectures: 48**

SKEG-T103 – COMMUNICATIVE ENGLISH

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week : 03 Hours **Total Lectures: 48**

SKEG-T108 – HEALTH EDUCATION

MAX. MARKS: 70 + 30 **MIN. PASS MARKS: 28 + 12**

No. of Lectures per week : 03 Hours **Total Lectures: 48**

MAT-P406 – PROJECT / INTERNSHIP

MAX.MARKS: 100 **MIN. PASSING MARKS: 40**

Total Credits: 32

The Students have to prepare a Project/Internship Report under the guidance of respective faculty.

MAT-P407 – COMPREHENSIVE VIVA-VOCE

MAX.MARKS: 100 **MIN. PASSING MARKS: 40**

Total Credits: 32
