Re-Accredited 'B++' 2.86 CGPA by NAAC
VEER NARMAD SOUTH GUJARAT UNIVERSITY
University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી
યુનિવર્સિટી કેમ્પસ, ઉધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.
Tel : +91 - 261 - 2227141 to 2227146, Toll Free : 1800 2333 011, Digital Helpline No.- 0261 2388888
E-mail : info@vnsgu.ac.in, Website : www.vnsgu.ac.in

-:પરિપત્ર:-

યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા હેઠળના તમામ શૈક્ષણિક વિભાગોના વડાશ્રીઓ અને યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓને જણાવવાનું કે, NEP-2020 અંતર્ગત શૈક્ષણિક વર્ષ ૨૦૨૬–૨૭ થી અમલમાં આવનાર 2 Year PG- M.Sc. Mathematics Sem.-1 & 2 નો અભ્યાસક્રમ ગણિતશાસ્ત્ર વિષયની અભ્યાસ સમિતિના ચરેમેનશ્રીએ અભ્યાસ સમિતિવતી મંજૂર કરી વિજ્ઞાન વિદ્યાશાખાને કરેલ ભલામણ વિજ્ઞાન વિદ્યાશાખાની તા.૦૪/૬/૨૦૨૬ની સભાના ઠરાવ ક્રમાંકઃ૩૭થી મંજૂર કરવા એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૧૮/૦૬/૨૦૨૬ ની સભાના ઠરાવ ક્રમાંકઃ૨૫ થી મંજૂર કરેલ છે. જેનો અમલ કરવા આથી જાણ કરવામાં આવે છે.

(બિડાણઃઉપર મુજબ)

ક્રમાંકઃઓથો./પરિપત્ર/૧૩૬૫૪/૨૦૨૬
તા.૨૩/૦૬/૨૦૨૬

કુલસચિવ

પ્રતિ,
(૧) યુનિવર્સિટીના વિજ્ઞાન વિદ્યાશાખા હેઠળના તમામ શૈક્ષણિક વિભાગોના વડાશ્રીઓ.
(૨) યુનિવર્સિટી સંલગ્ન વિજ્ઞાન વિદ્યાશાખા હેઠળની તમામ કોલેજોનાં આચાર્યશ્રીઓ.
... આપશ્રીના વિભાગ/કોલેજના સંબંધિત શિક્ષકો/વિદ્યાર્થીઓને જાણ કરી અમલ કરવા સારૂ.
(૩) અધ્યક્ષશ્રી, વિજ્ઞાન વિદ્યાશાખા.
(૪) પરીક્ષા નિયામકશ્રી,પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.
.....તરફ જાણ તેમજ અમલ સારૂ.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
SURAT

A Proposed Syllabus for

2 years PG Programme with Course work Only

Semester – I

M.Sc. (Mathematics) Programme

Effective from: Academic Year: 2026-27

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT	
Name of Program	**Master of Science in Mathematics (Course-work)**
Program Abbreviation	**M.Sc. – Mathematics (Course-work)**
Duration	**2 years**
Eligibility Criteria	**B.Sc. (Mathematics as major subject)**
Pre-requisite	**Aptitude for Physical Sciences**
Medium of Instruction	**English**
Objective of Program	• Advanced Theoretical Foundations: To provide students with a deep understanding of core algebraic, analytical, metric, and topological structures. • Analytical & Computational Skills: To equip students to formulate and solve complex physical and analytical problems using differential equations, complex variables, and advanced transforms. • Historical & Contextual Integration: To bridge traditional Indian mathematical evolution from Vedic geometry to the Kerala School with modern analysis. • Modeling & Quantitative Proficiency: To foster logical reasoning, financial arithmetic, and optimization tools required for competitive exams and commercial sectors. • Research & Independent Learning Readiness: To cultivate rigorous mathematical proof-writing capabilities, collaborative communication, and a lifelong learning mindset.
Program Outcome (PO)	Upon successful completion of the M.Sc. Mathematics program, graduates will be able to: **PO1:** Apply advanced concepts of pure and applied mathematics to solve complex structural, quantitative, and analytical problems. **PO2:** Identify, formulate, and analyze mathematical problems reaching substantiated conclusions using fundamental principles of analysis, algebra, and topology. **PO3:** Select, adapt, and apply modern analytical methods, computational transforms, and practical mathematical software simulations to investigate mathematical models. **PO4:** Demonstrate a comprehensive understanding of mathematical proof frameworks, evaluate historical foundations, and synthesise specialized theoretical systems to undertake higher research. **PO5:** Employ mathematical techniques efficiently in interdisciplinary domains such as data management, digital logic optimization, and commercial financial structures, demonstrating agility in competitive professional fields. **PO6:** Communicate complex mathematical ideas, structured proofs, and project outcomes effectively to the scientific community and society at large through seminars, discussions, and technical reports. **PO7:** Recognize the necessity of, and possess the preparation and ability to engage in, independent and life-long learning in the broadest context of expanding mathematical and technological landscapes.

Program Specific Outcomes (PSO)

Based on the explicit distribution of courses, the following 8 Program Specific Outcomes (PSOs) define what students will achieve upon graduation:

PSO1: Master algebraic structures including rings, fields, groups, homomorphisms, Sylow theorems, and Galois theory through rigorous structural proofs.

PSO2: Command vector spaces, linear transformations, matrix representations, inner product spaces, and the Gram-Schmidt orthogonalization process.

PSO3: Analyze sequence summability, pointwise/uniform convergence, Riemann integration, and the analytic properties of complex functions.

PSO4: Comprehend structural set properties (openness, compactness, connectedness) in metric and topological spaces, applying separation axioms to validate core analytical theorems.

PSO5: Formulate and solve higher-order linear ordinary differential equations, power series solutions (Bessel, Legendre), and first-order linear systems using fundamental matrices.

PSO6: Apply Laplace, Z, and Mellin transform to differential, difference, and integral equations, alongside evaluating Gamma, Beta, and Hypergeometric functions.

PSO7: Analyze arithmetical functions, modular arithmetic, and reciprocity laws while integrating traditional Indian mathematics from Vedic geometry to the Kerala School.

PSO8: Apply lattice frameworks, Boolean algebra, logic gates, and quantitative/financial mathematical principles to solve commercial and competitive examination challenges.

Mapping between POs and PSOs

The matrix below establishes the logical correlation between the high-level Program Outcomes (POs) and the subject-focused Program Specific Outcomes (PSOs) based on the depth and scope of the syllabus.

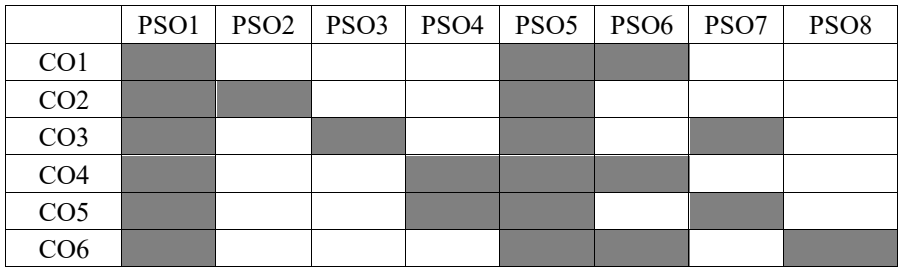
The correlation levels are defined as:

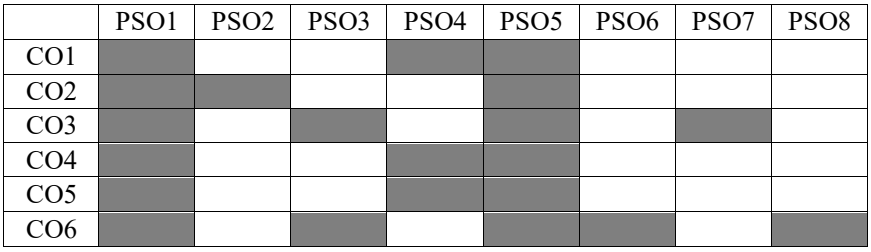
1: Slight (Low) Correlation
2: Moderate (Medium) Correlation
3: Substantial (High) Correlation

Program Outcomes	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**
PO1: Mathematical Knowledge	3	3	3	3	3	3	2	2
PO2: Problem Analysis	3	3	3	2	3	2	3	3
PO3: Analytical Tools	1	2	2	1	3	3	2	3
PO4: Research and Rigor	3	2	3	3	2	2	3	1
PO5: Professional Readiness	1	2	1	1	2	2	2	3
PO6: Communication & Collaboration	2	2	2	2	2	2	1	2
PO7: Life-long Learning	2	2	2	2	2	2	2	2

Structure of a two-year PG with Course-work only Program (Semester-I) (22 Credits)

Course Category	Course Code	Course Title	Course Credits	Teaching Hours / Week	Exam Duration (Hrs)	Internal Marks	External Marks	Total Marks
Major	MT-1001	Ring Theory	2	2	1	25	25	50
	MTP-1001	Practical based on MT-1001	2	4	2	25	25	50
Major	MT-1002	Linear Algebra	2	2	1	25	25	50
	MTP-1002	Practical based on MT-1002	2	4	2	25	25	50
Major	MT-1003	Real Analysis	2	2	1	25	25	50
	MTP-1003	Practical based on MT-1003	2	4	2	25	25	50
Major (Subject Specific)	MT-1004	Bhartiya Knowledge System **and** Metric Space	4	4	2	50	50	100
Generic Elective	MT-10051	Integral Transforms – I	4	4	2	50	50	100
	MT-10052	Elementary Number Theory						
	MT-10053	Special Functions-I						
Skill Enhancement Course	MT-10061	Discrete Mathematics (Lattice Theory)	2	2	1	25	25	50
	MT-10062	Mathematics for Competitive Exam						

<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">I</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Major</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 1001</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Ring Theory</td></tr>
<tr><td>Credits</td><td>Theory: 2</td><td>Practical: 0</td><td>Total: 2</td></tr>
<tr><td>Effective Form</td><td colspan="3">Academic Year: 2026 – 27</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To make students acquainted with the fundamental concepts of Ring theory.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Concepts of rings, integral domains, fields and Boolean rings.
CO2 – Ring homomorphisms and isomorphisms with examples.
CO3 – Ideals, principal ideals, maximal ideals and quotient rings.
CO4 – Divisibility and Euclidean rings.
CO5 – Concepts of GCD, units and associates in rings.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Definition of a Ring, Examples of Ring, Integral Domain, Field, Boolean Ring, Ring Homomorphism and Isomorphism, Ideals & Quotient rings, Maximal Ideal, Principal Ideal.
Unit 2: Euclidean rings, Divisibility in commutative ring, GCD of two elements in a ring, Units and Associates in rings, Prime element in a Euclidean Ring, Unique factorization theorem in a Euclidean ring, Ring of Gaussian integers, Fermat’s Theorem.</td></tr>
<tr><td>Reference Books</td><td colspan="3">1. I. N. Herstein: Topics in Algebra, Wiley Eastern Ltd. New Delhi, 1983.
2. I. H. Sheth: Abstract Algebra, Nirav Prakashan, Ahmedabad.
3. N. S. Gopal Krishnan: University Algebra, Wiley Eastern Ltd.
4. P. R. Bhattacharya, S. K. Jain and S. R. Nagpaul: Basic Abstract Algebra, Cambridge University Press, Indian Edition,1997.
5. Shantinarayan: Modern Algebra, S. Chand & Co.</td></tr>
</table>

Program Name	**M.Sc. (Mathematics)**		
Semester	**I**		
NCrF Credit Level	**6**		
Course Type	**Major**		
Course Subtype	**Discipline Specific**		
Course Code	**MTP – 1001**		
Course Title	**Practical based on MT – 1001**		
Credits	**Theory: 0**	**Practical: 2**	**Total: 2**
Effective Form	**Academic Year: 2026 – 27**		
Teaching Methodology	Classwork, Discussions, Seminars and Assignment.		
Evaluation Method	50%: Internal assessment based on class attendance, viva, journal and internal examinations. 50%: External assessment based on the semester-end university examination.		
Course Objectives	To develop computational skills and understanding of ring theoretic concepts through problems		
Course Outcomes	The course will enable student to understand: CO1 – Examples of rings and related structures CO2 – Properties of homomorphisms and isomorphisms CO3 – Problems related to ideals and quotient rings CO4 – Computations in Euclidean rings CO5 – GCD, units and associates in rings CO6 – Ring of Gaussian integers and Fermat's theorem		
Mapping between COs and PSOs			
Course Content	**Practical-1:** Practical based on examples of Ring, Integral Domain, Boolean Ring. **Practical-2:** Practical based on Ring Homomorphism and Isomorphism. **Practical-3:** Practical based on Ideals-I. **Practical-4:** Practical based on Ideals-II. **Practical-5:** Practical based on Euclidean rings. **Practical-6:** Practical based on divisibility and GCD of two elements in a ring. **Practical-7:** Practical based on Units and Associates in rings. **Practical-8:** Practical based on ring of Gaussian integers, Fermat's Theorem.		
Reference Books	1. I. N. Herstein: Topics in Algebra, Wiley Eastern Ltd. New Delhi, 1983. 2. I. H. Sheth: Abstract Algebra, Nirav Prakashan, Ahmedabad. 3. N. S. Gopal Krishnan: University Algebra, Wiley Eastern Ltd. 4. P. R. Bhattacharya, S. K. Jain and S. R. Nagpaul: Basic Abstract Algebra, Cambridge University Press, Indian Edition, 1997. 5. Shantinarayan: Modern Algebra, S. Chand & Co.		

Instruction: There should not be more than 10 students per batch as per NEP 2020 guidelines.

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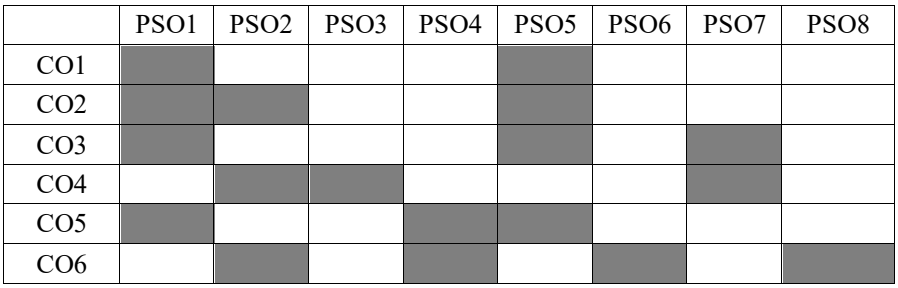
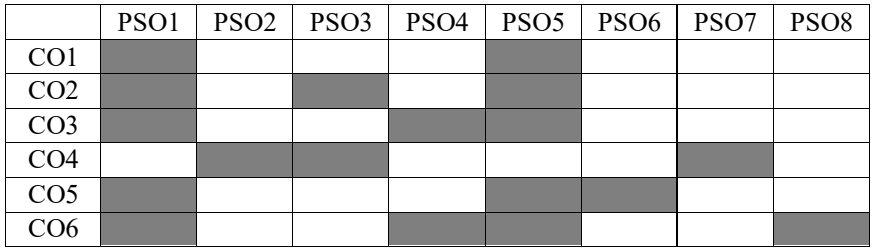
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">I</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Major</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 1002</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Linear Algebra</td></tr>
<tr><td>Credits</td><td>Theory: 2</td><td>Practical: 0</td><td>Total: 2</td></tr>
<tr><td>Effective Form</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To introduce students to the theory of linear transformations and inner product spaces, including matrix representations and orthonormalization.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable students to:
CO1 – Understand basis and dimension of vector spaces.
CO2 – Explain linear transformations and their properties.
CO3 – Describe kernel, range and Rank-Nullity Theorem.
CO4 – Interpret matrix representation of linear transformations.
CO5 – Understand inner product spaces, norm and orthogonality.
CO6 – Explain Gram-Schmidt process and orthonormal sets.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Dimension and Basis of a vector space, Extension of a linearly independent set to a basis, Dimension of sum, Linear transformation, Range and kernel of a linear transformation, Rank-Nullity Theorem, Inverse of a linear transformation, Consequences of Rank-Nullity Theorem, Composition of linear transformations.
Unit 2: Matrix associated with Linear transformations, Linear transformation associated with a matrix, Application of Rank-Nullity Theorem for matrix, Inner product spaces, Norm of a vector, Cauchy-Schwarz’s inequality, Triangular inequality, Orthogonal vectors, Vector Projection, Gram-Schmidt Orthogonalization Process, Orthonormal Set.</td></tr>
<tr><td>Reference Books</td><td colspan="3">1. V. Krishnamurthy, V. P. Mainra & J. L. Arora: An Introduction to Linear Algebra, Affiliated East-West Press Pvt. Ltd., New Delhi.
2. I. H. Sheth: Linear Algebra, Nirav Prakashan.
3. S. Kumaresan: Linear Algebra, Prentice Hall of India, 2000.
4. Serge Lang: Linear Algebra, Addition-Wesley Pub. Co. (Student Ed.).
5. Balakrishnan: Linear Algebra, Tata-McGraw Hill Ed.</td></tr>
</table>

Program Name	**M.Sc. (Mathematics)**		
Semester	**I**		
NCrF Credit Level	**6**		
Course Type	**Major**		
Course Subtype	**Discipline Specific**		
Course Code	**MTP – 1002**		
Course Title	**Practical based on MT – 1002**		
Credits	**Theory: 0**	**Practical: 2**	**Total: 2**
Effective Form	**June 2026**		
Teaching Methodology	Classwork, Discussions, Seminars and Assignment.		
Evaluation Method	50%: Internal assessment based on class attendance, viva, journal and internal examinations. 50%: External assessment based on the semester-end university examination.		
Course Objectives	To enhance problem-solving skills in linear algebra through practical computations		
Course Outcomes	The course will enable students to: CO1 – Determine basis and dimension of finite dimensional vector spaces through examples CO2 – Compute kernel and range of linear transformations using standard methods CO3 – Verify Rank-Nullity Theorem for given linear transformations CO4 – Construct and interpret matrix representation of linear transformations CO5 – Compute inner product, norm, orthogonality and vector projections CO6 – Apply Gram-Schmidt orthogonalization process to obtain orthonormal sets		
Mapping between COs and PSOs			
Course Content	**Practical-1:** Practical based on Dimension and Basis of a vector space. **Practical-2:** Practical based on Linear transformation. **Practical-3:** Practical based on Range and kernel of a linear transformation. **Practical-4:** Practical based on Rank-Nullity Theorem. **Practical-5:** Practical based on Matrix associated with Linear transformations. **Practical-6:** Practical based on Linear transformation associated with a matrix. **Practical-7:** Practical based on Inner product spaces. **Practical-8:** Practical based on Gram-Schmidt Orthogonalization Process.		
Reference Books	1. V. Krishnamurthy, V. P. Mainra & J. L. Arora: An Introduction to Linear Algebra, Affiliated East-West Press Pvt. Ltd., New Delhi. 2. I. H. Sheth: Linear Algebra, Nirav Prakashan. 3. S. Kumaresan: Linear Algebra, Prentice Hall of India, 2000. 4. Serge Lang: Linear Algebra, Addition-Wesley Pub. Co. (Student Ed.). 5. Balakrishnan: Linear Algebra, Tata-McGraw Hill Ed.		

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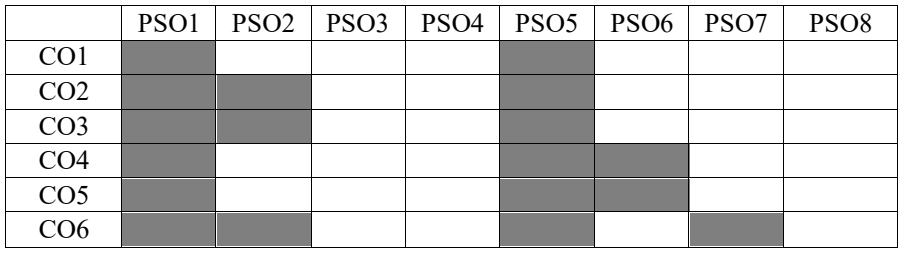
<tr><td>Course Type</td><td colspan="3">Major</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 1003</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Real Analysis</td></tr>
<tr><td>Credits</td><td>Theory: 2</td><td>Practical: 0</td><td>Total: 2</td></tr>
<tr><td>Effective Form</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To study summability of sequences, convergence of sequences of functions and Riemann integration</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Summability of sequences and series.
CO2 – Pointwise convergence of sequences of functions.
CO3 – Uniform convergence of sequences of functions.
CO4 – Sets of measure zero.
CO5 – Properties of Riemann integral.
CO6 – Fundamental and mean value theorems of integral calculus.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Summability of sequences, Addition and subtraction of (C, 1) summable sequences, (C, 2) summable sequences, (C, 1) Summability of series. Sequences of functions, Pointwise convergence of Sequences of functions, Uniform convergence of Sequences of functions.
Unit 2: Sets of measure zero, Definition of the Riemann Integral, Algebraic properties of Riemann Integral, Non-Algebraic properties of Riemann Integral, Fundamental theorems of Integral Calculus, Mean-value Theorems of Integral Calculus.</td></tr>
</table>

Reference Books	1. R. R. Goldberg: Method of Real Analysis, Oxford & IBH Pub. Co. Ltd., New Delhi. 2. T. M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985. 3. S. Lang: Undergraduate Analysis, Springer-Verlag, New York, 1983. 4. S. C. Malik: Real Analysis, Wiley-Eastern Pub. Co., New Delhi. 5. W. Rudin: Principles of Mathematical Analysis, McGraw Hill book Company.

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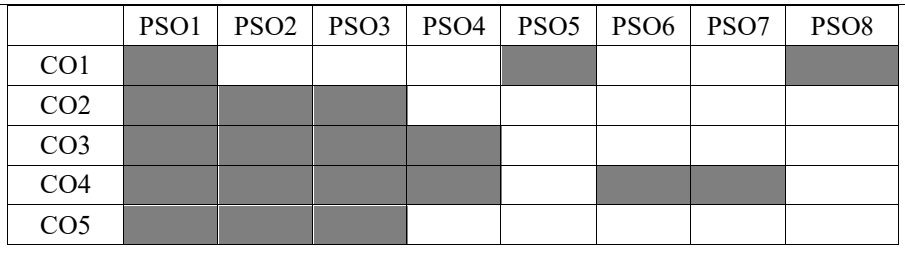
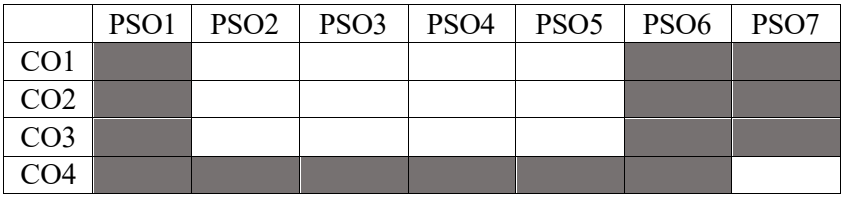
<tr><td>Semester</td><td colspan="3">I</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Major</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MTP – 1003</td></tr>
<tr><td>Course Title</td><td colspan="3">Practical based on MT – 1003</td></tr>
<tr><td>Credits</td><td>Theory: 0</td><td>Practical: 2</td><td>Total: 2</td></tr>
<tr><td>Effective Form</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on class attendance, viva, journal and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To develop understanding of summability, convergence and Riemann integration through problem solving.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Solve problems on summability of sequences and series
CO2 – Analyze pointwise convergence of sequences of functions
CO3 – Analyze uniform convergence of sequences of functions
CO4 – Identify sets of measure zero through examples
CO5 – Solve problems on Riemann integrable functions
CO6 – Apply fundamental and mean value theorems of integral calculus</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3">
<table>
<tr><th></th><th>PSO1</th><th>PSO2</th><th>PSO3</th><th>PSO4</th><th>PSO5</th><th>PSO6</th><th>PSO7</th><th>PSO8</th></tr>
<tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Course Content</td><td colspan="3">Practical-1: Practical based on (C,1) summability of sequences
Practical-2: Practical based on (C,2) summability of sequences
Practical-3: Practical based on (C,1) summability of series
Practical-4: Practical based on pointwise convergence of sequences of functions
Practical-5: Practical based on uniform convergence of sequences of functions
Practical-6: Practical based on sets of measure zero
Practical-7: Practical based on Riemann integrable functions
Practical-8: Practical based on fundamental and mean value theorems of integral calculus</td></tr>
</table>

Reference Books	1. R. R. Goldberg: Method of Real Analysis, Oxford & IBH Pub. Co. Ltd., New Delhi. 2. T. M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi, 1985. 3. S. Lang: Undergraduate Analysis, Springer-Verlag, New York, 1983. 4. S. C. Malik: Real Analysis, Wiley-Eastern Pub. Co., New Delhi. 5. W. Rudin: Principles of Mathematical Analysis, McGraw Hill book Company.

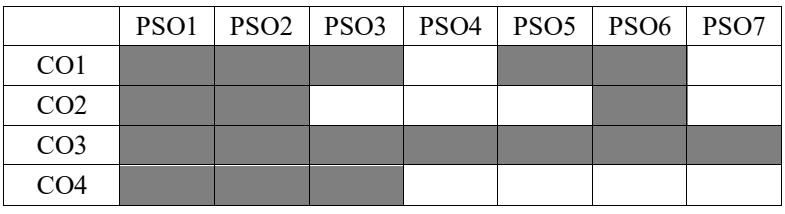
Instruction: There should not be more than 10 students per batch as per NEP 2020 guidelines.

Program Name	**M.Sc. (Mathematics)**		
Semester	**I**		
NCrF Credit Level	**6**		
Course Type	**Major**		
Course Subtype	**Subject Specific**		
Course Code	**MT – 1004**		
Course Level	**400 – 499**		
Course Title	**Bhartiya Knowledge System and Metric Space**		
Credits	**Theory: 4**	**Practical: 0**	**Total: 4**
Effective Form	**June 2026**		
Teaching Methodology	Classwork, Discussions, Seminars and Assignment.		
Evaluation Method	50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations. 50%: External assessment based on the semester-end university examination.		
Course Objectives	This course bridges traditional Indian mathematics with modern analytical frameworks, exploring the evolution from Vedic geometry to the Kerala School. It develops a rigorous understanding of the structural properties of metric spaces, preparing students for advanced mathematical analysis and fixed-point theorems.		
Course Outcomes	The course will enable student to understand: CO1 – Trace Indian mathematical evolution from Vedic geometry to the Kerala School's pre-calculus foundations. CO2 – Analyze convergence, Cauchy sequences, and continuous functions within various metric spaces. CO3 – Classify structural set properties including openness, closedness, connectedness, and denseness. CO4 – Apply completeness, contraction mappings, and Picard's fixed-point theorem to analytical problems. CO5 – Evaluate the characteristics and geometric implications of compact and totally bounded spaces.		
Mapping between COs and PSOs			
Course Content	**Unit 1:** Evolution of Indian mathematics: from Vedic geometry (Śulba Sūtras) and place-value systems to classical algorithms (Āryabhaṭa, Brahmagupta, Bhāskara II). Emphasizes the Kerala School's infinite series (Mādhava) and pre-calculus foundations bridging into modern analytical spaces. **Unit 2:** Metric spaces, Limit, Convergence and Cauchy sequence in metric space, Equivalent metrics, Functions continuous on metric spaces. **Unit 3:** Open sets, More about open sets, Closed sets, Homeomorphism, Dense set, Connected sets, Bounded sets, Totally bounded sets.		

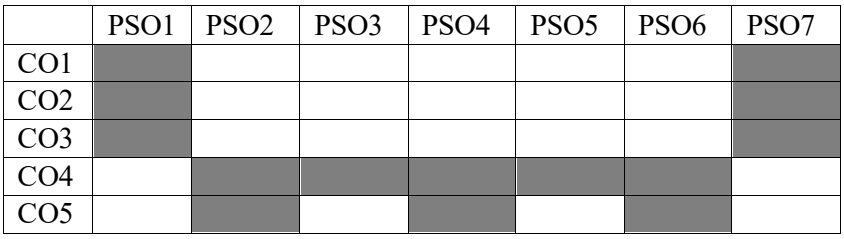
	Unit 4: Complete metric spaces, Contraction mapping, Picard's fixed-point theorem, Compact metric spaces.
Reference Books	1. Dani, S. G.: Ancient Indian mathematics – A conspectus. Resonance: Journal of Science Education, 17(3), 236–246, 2012 https://doi.org/10.1007/s12045-012-0022-y 2. Dutta, A. K., & Sriram, M. S.: Mathematics and Astronomy in India before 300 BCE, Indian Statistical Institute / University of Madras Archives, 1–28, 2016 https://www.ms.uky.edu/~sohum/ma330/files/DuttaSriramarticle.pdf 3. Sahu, C. K.: Aryabhatt: A beacon of mathematics, International Journal of Multidisciplinary Educational Research, 10 (10-2), 1–3, 2021. http://s3-ap-southeast-1.amazonaws.com/ijmer/pdf/volume10/volume10-issue10(2)/1.pdf 4. R. R. Goldberg: Method of Real Analysis, Oxford & IBH Pub. Co. Ltd., New Delhi. 5. T. M. Apostol: Mathematical Analysis, Narosa Publishing House, New Delhi,1985. 6. S. Lang: Undergraduate Analysis, Springer-Verlag, New York, 1983. 7. S. Kumaresan: Topology of Metric Spaces, Narosa Publishing House, New Delhi, 2014 8. W. Rudin: Principles of mathematical Analysis, McGraw Hill

<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">I</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Generic Elective</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 10051</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Integral Transforms – I</td></tr>
<tr><td>Credits</td><td>Theory: 4</td><td>Practical: 0</td><td>Total: 4</td></tr>
<tr><td>Effective Form</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To provide practice of solving the real problem in scientific way using techniques of various types of Transforms. To gain command of using the transform, both specific techniques and general principles.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Students will learn about the concepts of Laplace Transforms, Inverse Laplace Transforms, Finite Laplace Transforms.
CO2 – Students learns about applications of Laplace transforms.
CO3 – Students will be able to solve the Ordinary and Partial differential equations using Laplace transforms.
CO4 – Students will be able to solve initial and boundary value problems and integral equations.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Laplace Transform: Definition of Laplace transform with examples, Existence condition for Laplace transform, Basic properties of Laplace transform, the convolution theorem and properties of convolution.
Unit 2: Laplace Transform: Differentiation and integration of Laplace transform, the inverse Laplace transform and examples.
Unit 3: Finite Laplace Transform: Introduction, Definition of finite Laplace transform and examples, Basic operational properties of finite Laplace transform, Applications to Finite Laplace Transform,
Unit 4: Applications of Laplace Transform: Solution of ordinary differential equations, Partial differential equations, Initial and boundary value problems, Solutions to Integral equations.</td></tr>
</table>

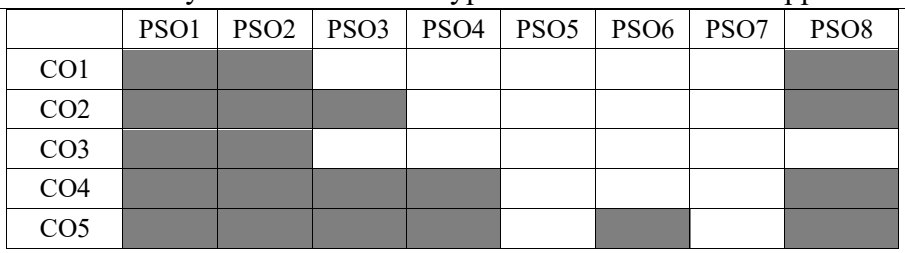
Reference Books	1. Lokenath Debnath: Integral Transform and their applications, CRC Pub., 1995. 2. Ian Sneddon: The use of Integral Transform, TMIH, 1979. 3. B. Davies: Integral Transforms and their applications, Springer - Verlag, 1978. 4. Boss M. L.: Mathematical Methods in Physical Sciences, John Wiley & Sons, 1983. 5. Andrews, L. G. & Shivamoggi B. K.: Integral Transforms for Engineers, PHI, 2003.

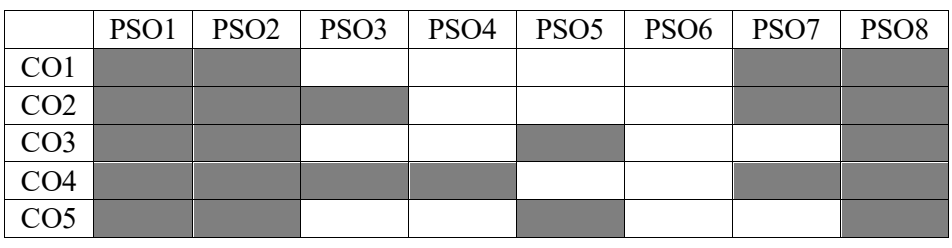
<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">I</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Generic Elective</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 10052</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Elementary Number Theory</td></tr>
<tr><td>Credits</td><td>Theory: 4</td><td>Practical: 0</td><td>Total: 4</td></tr>
<tr><td>Effective Form</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">The course objectives are to enable students to understand foundational concepts of modular arithmetic and classical theorems, analyze the properties and inversions of multiplicative arithmetic functions, utilize primitive roots and indices to solve non-linear congruences, and master quadratic residues and the Quadratic Reciprocity Law to evaluate the solvability of quadratic congruences.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Solve systems of linear congruences using the Chinese Remainder Theorem and applications of Fermat’s and Wilson’s theorem
CO2 – Evaluate arithmetic functions and apply the Möbius Inversion Formula and Euler’s Theorem to simplify complex modular expressions.
CO3 – Determine the order of integers, identify primitive roots, and utilize the theory of indices to solve non-linear congruences.
CO4 – Apply Euler’s criterion, Gauss’ Lemma, and the Quadratic Reciprocity Law to determine the existence of solutions for quadratic congruences.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Computation of the solutions of linear congruence, Chinese Remainder Theorem, Fermat’s little theorem, Pseudo-primes, Wilson’s theorem.
Unit 2: The number of positive divisors and sum of all positive divisors of an integer, Basic properties and multiplicative nature of these functions, The Möbius Inversion formula, Greatest integer function, Introduction of Euler’s Phi-function, Multiplicative nature, Euler’s Theorem.
Unit 3: The order of an integer modulo n, Primitive roots for primes, Composite numbers having primitive roots, The theory of indices, Applications in solving the congruences of the type $x^n \equiv a \ (mod\ n), \gcd(a, n) = 1$.</td></tr>
</table>

	Unit 4: Quadratic Congruence, Euler's criterion, Quadratic residues, Legendre symbol and its properties, Gauss' Lemma, Law of quadratic reciprocity.
Reference Books	1. David M. Burton: Elementary Number Theory, McGraw Hill Education (India) Pvt. Ltd., New Delhi, 7th edition, 2012. 2. S. G. Talang: Number Theory, The Tata McGraw Hill Co. Ltd., New Delhi. 3. Neville Robbins: Beginning Number Theory, Narosa Pub. House, New Delhi, 2nd edition., 2006. 4. George Andrews: Number Theory, The Hindustan Pub. Corp., New Delhi.

<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">I</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Generic Elective</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 10053</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Special Functions – I</td></tr>
<tr><td>Credits</td><td>Theory: 4</td><td>Practical: 0</td><td>Total: 4</td></tr>
<tr><td>Effective Form</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To Learn the concept of Infinite product, Gamma and Beta functions and Hypergeometric functions. To analyse properties of Special Functions by their integral representations and symmetries.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – The fundamentals concept of infinite product, Gamma, Beta functions.
CO2 – The structure of the Gamma and Beta functions.
CO3 – Gamma function, Beta function and special functions are used to evaluate different types of integral calculus problems.
CO4 – Get profound knowledge of Hypergeometric function and its properties.
CO5 – Able to give the rigorous proof of various theorems.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3">  </td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Definition of an Infinite product, A necessary condition for convergence, The associated series of logarithms, Absolute convergence, Uniform convergence.
Unit 2: The Euler or Mascheroni constant γ, The Gama function, A series for Γ(z), Γ’(z), Evaluation of Γ(1) and Γ’(1), The Euler product for Γ(z), The difference equation Γ(z+1) = z Γ(z), The order symbols o and 0, Evaluation of certain infinite products, Euler integral for Γ(z).
Unit 3: The Beta function, The value of Γ(z), Γ(1-z), The factorial function, Legendre’s duplication formula, Gauss’ multiplication theorem, A summation formula due to Euler, The behaviour of log Γ(z), for large z.
Unit 4: The function F(a, b; c; z), A simple integral form, F(a, b; c; 1) as a function of the parameters, Evaluation of F(a, b; c; 1), the contiguous</td></tr>
</table>

	function relations, The hypergeometric differential equation, Logarithmic solutions of the hypergeometric equation, F(a, b; c; z) as a function of its parameters, Simple transformations, Relation between functions of z and 1-z, A quadratic transformation, other quadratic transformations, a theorem due to Kummer, Additional properties.
Reference Books	1. E. D. Rainville: Special Functions, McMillan, New York, 1990. 2. I. N. Sneddon: Special functions of Mathematical Physics and Chemistry, Oliver Boyd. 3. N. N. Lebdev: Special Functions and their applications, Dover Pub. 1972. 4. R. K. Saxena and D. C. Gokhroo: Special Functions, Khanna Pub.

Program Name	**M.Sc. (Mathematics)**		
Semester	**I**		
NCrF Credit Level	**6**		
Course Type	**Skill Enhancement Course**		
Course Subtype	**Discipline Specific**		
Course Code	**MT – 10061**		
Course Level	**400 – 499**		
Course Title	**Discrete Mathematics (Lattice Theory)**		
Credits	**Theory: 2**	**Practical: 0**	**Total: 2**
Effective Form	**June 2026**		
Teaching Methodology	Classwork, Discussions, Seminars and Assignment.		
Evaluation Method	50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations. 50%: External assessment based on the semester-end university examination.		
Course Objectives	Introduce fundamental concepts of relations and partial orderings to construct and analyze Hasse diagrams. Develop an understanding of lattice structures, their algebraic properties, homomorphisms, and specialized lattice types.		
Course Outcomes	The course will enable student to understand: CO1 – Analyze binary relations to identify equivalence and partial orderings. CO2 – Construct Hasse diagrams and determine bounds, GLB, and LUB. CO3 – Differentiate totally ordered and well-ordered mathematical structures. CO4 – Apply algebraic properties and evaluate lattice homomorphisms. CO5 – Classify various advanced types of lattices and their applications.		
Mapping between COs and PSOs			
Course Content	**Unit 1:** Binary relations, Properties of binary relations, Equivalence relation, Partial ordered relation, Partially ordered sets, Upper bounds, Lower bounds, GLB & LUB of sets, Totally ordered sets, Well-ordered sets, Hasse Diagram. **Unit 2:** Lattices and its properties, Lattices as Algebraic Systems, Lattice Homomorphism, Different types of lattices.		
Reference Books	1. J. P. Tremblay & R. Manohar: Discrete mathematical Structures with Applications to Computer Science., McGraw Hill Book Co., 1999. 2. B. Kolman, R. C. Busby & S. Ross: Discrete Mathematical Structures, Prentice Hall of India Pvt. Ltd., 3rd ed., 2001. 3. C. L. Liu & D. P. Mohapatra: Elements of Discrete Mathematics, Tata McGraw Hill, 2008. 4. T. Koshy: Discrete Mathematics with Applications, Academic Press, 2004.		

Program Name	**M.Sc. (Mathematics)**		
Semester	**I**		
NCrF Credit Level	**6**		
Course Type	**Skill Enhancement Course**		
Course Subtype	**Discipline Specific**		
Course Code	**MT – 10062**		
Course Level	**400 – 499**		
Course Title	**Mathematics for Competitive Exam**		
Credits	**Theory: 2**	**Practical: 0**	**Total: 2**
Effective Form	**June 2026**		
Teaching Methodology	Classwork, Discussions, Seminars and Assignment.		
Evaluation Method	50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations. 50%: External assessment based on the semester-end university examination.		
Course Objectives	This course aims to build strong foundational quantitative skills by mastering essential arithmetic, algebraic, and geometric concepts required for competitive examinations. It focuses on developing logical reasoning, problem-solving speed, and analytical thinking to efficiently crack diverse numerical aptitude challenges.		
Course Outcomes	The course will enable student to understand: CO1 – Apply fundamental arithmetic principles, including HCF, LCM, fractions, and averages, to solve rapid computational problems. CO2 – Analyze and solve real-world quantitative challenges related to age, time and work, and time and distance. CO3 – Evaluate advanced algebraic expressions using rules of surds, indices, and principles of permutations and combinations. CO4 – Utilize concepts of percentages, ratios, and proportions to solve commercial arithmetic and data-driven problems. CO5 – Compute areas, volumes, surface areas, and solve trigonometric heights and distances for geometric problem-solving.		
Mapping between COs and PSOs			
Course Content	**Unit 1:** HCF and LCM of numbers, Decimal Fractions, Average, Surds and Indices, Problems on Ages, Time and Work, Time and Distance. **Unit 2:** Permutation and Combination, Percentage, Ratio and Proportion, Area, Volume, Surface areas, Heights and Distances.		
Reference Books	1. R. S. Aggrawal: Quantitative Aptitude, S. Chand Co., 2022. 2. Mamta Patel: Text book for Competitive Examinations, Victor Publications, Surat, 2001.		

	3. Arun Sharma, Madhukar Kumar Bhagat, Abhijit Guha: General Studies for Civil Services Preliminary Examination, GS Paper-II, McGraw Hill Edu (India) Pvt. Ltd., Chennai, 2019. 4. R. S. Aggrawal: Arithmetic, Subjective and Objective for Competitive Examinations, S. Chand, April 2017. 5. Disha Experts: Speedy Arithmetic for all Competitive Exams, Disha Pub. Inc., 2021.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
SURAT

A Proposed Syllabus for

2 years PG Programme with Course work Only

Semester – II

M.Sc. (Mathematics) Programme

Effective from: Academic Year: 2026-27

VEER NARMAD SOUTH GUJARAT UNIVERSITY, SURAT	
Name of Program	**Master of Science in Mathematics (Course-work)**
Program Abbreviation	**M.Sc. – Mathematics (Course-work)**
Duration	**2 years**
Eligibility Criteria	**B.Sc. (Mathematics as major subject)**
Pre-requisite	**Aptitude for Physical Sciences**
Medium of Instruction	**English**
Objective of Program	• Advanced Theoretical Foundations: To provide students with a deep understanding of core algebraic, analytical, metric, and topological structures. • Analytical & Computational Skills: To equip students to formulate and solve complex physical and analytical problems using differential equations, complex variables, and advanced transforms. • Historical & Contextual Integration: To bridge traditional Indian mathematical evolution from Vedic geometry to the Kerala School with modern analysis. • Modeling & Quantitative Proficiency: To foster logical reasoning, financial arithmetic, and optimization tools required for competitive exams and commercial sectors. • Research & Independent Learning Readiness: To cultivate rigorous mathematical proof-writing capabilities, collaborative communication, and a lifelong learning mindset.
Program Outcome (PO)	Upon successful completion of the M.Sc. Mathematics program, graduates will be able to: **PO1:** Apply advanced concepts of pure and applied mathematics to solve complex structural, quantitative, and analytical problems. **PO2:** Identify, formulate, and analyze mathematical problems reaching substantiated conclusions using fundamental principles of analysis, algebra, and topology. **PO3:** Select, adapt, and apply modern analytical methods, computational transforms, and practical mathematical software simulations to investigate mathematical models. **PO4:** Demonstrate a comprehensive understanding of mathematical proof frameworks, evaluate historical foundations, and synthesise specialized theoretical systems to undertake higher research. **PO5:** Employ mathematical techniques efficiently in interdisciplinary domains such as data management, digital logic optimization, and commercial financial structures, demonstrating agility in competitive professional fields. **PO6:** Communicate complex mathematical ideas, structured proofs, and project outcomes effectively to the scientific community and society at large through seminars, discussions, and technical reports. **PO7:** Recognize the necessity of, and possess the preparation and ability to engage in, independent and life-long learning in the broadest context of expanding mathematical and technological landscapes.

Program Specific Outcomes (PSO)

Based on the explicit distribution of courses, the following 8 Program Specific Outcomes (PSOs) define what students will achieve upon graduation:

PSO1: Master algebraic structures including rings, fields, groups, homomorphisms, Sylow theorems, and Galois theory through rigorous structural proofs.

PSO2: Command vector spaces, linear transformations, matrix representations, inner product spaces, and the Gram-Schmidt orthogonalization process.

PSO3: Analyze sequence summability, pointwise/uniform convergence, Riemann integration, and the analytic properties of complex functions.

PSO4: Comprehend structural set properties (openness, compactness, connectedness) in metric and topological spaces, applying separation axioms to validate core analytical theorems.

PSO5: Formulate and solve higher-order linear ordinary differential equations, power series solutions (Bessel, Legendre), and first-order linear systems using fundamental matrices.

PSO6: Apply Laplace, Z, and Mellin transform to differential, difference, and integral equations, alongside evaluating Gamma, Beta, and Hypergeometric functions.

PSO7: Analyze arithmetical functions, modular arithmetic, and reciprocity laws while integrating traditional Indian mathematics from Vedic geometry to the Kerala School.

PSO8: Apply lattice frameworks, Boolean algebra, logic gates, and quantitative/financial mathematical principles to solve commercial and competitive examination challenges.

Mapping between POs and PSOs

The matrix below establishes the logical correlation between the high-level Program Outcomes (POs) and the subject-focused Program Specific Outcomes (PSOs) based on the depth and scope of the syllabus.

The correlation levels are defined as:

1: Slight (Low) Correlation

2: Moderate (Medium) Correlation

3: Substantial (High) Correlation

Program Outcomes	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**
PO1: Mathematical Knowledge	3	3	3	3	3	3	2	2
PO2: Problem Analysis	3	3	3	2	3	2	3	3
PO3: Analytical Tools	1	2	2	1	3	3	2	3
PO4: Research and Rigor	3	2	3	3	2	2	3	1
PO5: Professional Readiness	1	2	1	1	2	2	2	3
PO6: Communication & Collaboration	2	2	2	2	2	2	1	2
PO7: Life-long Learning	2	2	2	2	2	2	2	2

Structure of a two-year PG with Course-work only Program (Semester-II) (22 Credits)

Course Category	Course Code	Course Title	Course Credits	Teaching Hours / Week	Exam Duration (Hrs)	Internal Marks	External Marks	Total Marks
Major	MT-2001	Advanced Abstract Algebra	2	2	1	25	25	50
	MTP-2001	Practical based on MT-2001	2	4	2	25	25	50
Major	MT-2002	Ordinary Differential Equations	2	2	1	25	25	50
	MTP-2002	Practical based on MT-2002	2	4	2	25	25	50
Major	MT-2003	Topology	4	4	2	50	50	100
Vocational Course	MT-2004	Introductory Complex Analysis	2	2	1	25	25	50
	MTP-2004	Practical based on MT-2004	2	4	2	25	25	50
Generic Elective	MT-20051	Integral Transforms – II	4	4	2	50	50	100
	MT-20052	Analytic Number Theory						
	MT-20053	Special Functions – II						
Skill Enhancement Course	MT-20061	Discrete Mathematics (Boolean Algebra)	2	2	1	25	25	50
	MT-20062	Basics of Financial Mathematics						

<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">II</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Major</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 2001</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Advanced Abstract Algebra</td></tr>
<tr><td>Credits</td><td>Theory: 2</td><td>Practical: 0</td><td>Total: 2</td></tr>
<tr><td>Effective From</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To introduce advanced concepts in group theory, polynomial rings and field theory</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Class equation and Cauchy theorem.
CO2 – Sylow theorems.
CO3 – Structure of finite abelian groups.
CO4 – Polynomial rings and Eisenstein criterion.
CO5 – Field extensions and degree of extensions.
CO6 – Splitting fields and Galois groups.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3">
<table>
<tr><th></th><th>PSO1</th><th>PSO2</th><th>PSO3</th><th>PSO4</th><th>PSO5</th><th>PSO6</th><th>PSO7</th><th>PSO8</th></tr>
<tr><td>CO1</td><td>■</td><td>■</td><td></td><td></td><td>■</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td>■</td><td>■</td><td></td><td></td><td>■</td><td></td><td>■</td><td></td></tr>
<tr><td>CO3</td><td>■</td><td>■</td><td></td><td></td><td>■</td><td>■</td><td></td><td></td></tr>
<tr><td>CO4</td><td>■</td><td></td><td></td><td>■</td><td>■</td><td></td><td></td><td></td></tr>
<tr><td>CO5</td><td>■</td><td></td><td></td><td></td><td>■</td><td>■</td><td></td><td>■</td></tr>
<tr><td>CO6</td><td>■</td><td>■</td><td></td><td></td><td>■</td><td>■</td><td></td><td>■</td></tr>
</table>
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Class equations, Cauchy theorem, Sylow’s theorem, Fundamental theorem of abelian groups, Polynomial rings, Eisenstein Criterion for irreducibility of polynomials.
Unit 2: Field extensions, degree of extension field, Splitting field, Galois group.</td></tr>
<tr><td>Reference Books</td><td colspan="3">1. I. N. Herstein: Topics in Algebra 4thEd., John Wiley Sons.
2. P. B. Bhattacharya, S. K. Jain, S. R. Nagpaul: Basic Abstract Algebra, 2nd Ed., Cambridge University Press.
3. M. Artin: Algebra, Prentice Hall, Englewood, Cliffs NJ.
4. J. A. Gallian: Contemporary Abstract Algebra, Narosa Publishing House.</td></tr>
</table>

Program Name	**M.Sc. (Mathematics)**		
Semester	**II**		
NCrF Credit Level	**6**		
Course Type	**Major**		
Course Subtype	**Discipline Specific**		
Course Code	**MTP – 2001**		
Course Title	**Practical based on MT-2001**		
Credits	**Theory: 0**	**Practical: 2**	**Total: 2**
Effective From	**June 2026**		
Teaching Methodology	Classwork, Discussions, Seminars and Assignment.		
Evaluation Method	50%: Internal assessment based on class attendance, viva, journal and internal examinations. 50%: External assessment based on the semester-end university examination.		
Course Objectives	To develop understanding of concepts in group theory, polynomial rings and field theory through problem solving.		
Course Outcomes	The course will enable student to understand: CO1 – Apply class equation and Cauchy theorem in problems CO2 – Solve problems based on Sylow theorems CO3 – Determine structure of finite abelian groups CO4 – Apply Eisenstein criterion to check irreducibility of polynomials CO5 – Work with field extensions and compute their degrees CO6 – Determine splitting fields and construct Galois groups		
Mapping between COs and PSOs			
Course Content	**Practical-1:** Practical based on Conjugate classes and Class equation **Practical-2:** Practical based on Sylow's theorem **Practical-3:** Practical based on finite abelian groups and irreducibility of polynomials **Practical-4:** Practical based on extension field – 1 **Practical-5:** Practical based on extension field – 2 **Practical-6:** Practical based on splitting field **Practical-7:** Practical based on normal extension of a field **Practical-8:** Construction of Galois Group		

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	■	■			■			
CO2	■	■		■				
CO3	■		■		■			
CO4	■			■	■			
CO5	■	■				■		
CO6	■		■				■	■

Reference Books	1. I. N. Herstein: Topics in Algebra, 4th Ed., John Wiley Sons. 2. P. B. Bhattacharya, S. K. Jain, S. R. Nagpaul: Basic Abstract Algebra, 2nd Ed., Cambridge University Press. 3. M. Artin: Algebra, Prentice Hall, Englewood, Cliffs NJ. 4. J. A. Gallian: Contemporary Abstract Algebra, Narosa Publishing House.

Instruction: There should not be more than 10 students per batch as per NEP 2020 guidelines.

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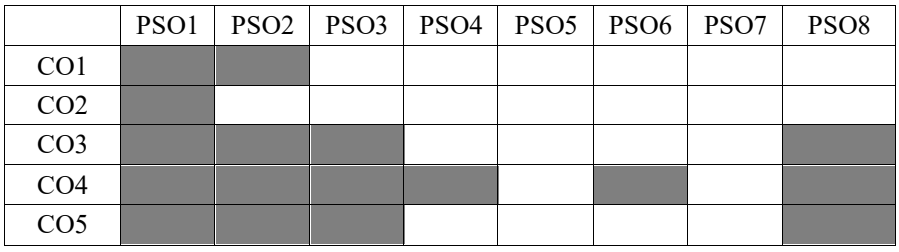
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">II</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Major</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 2002</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Ordinary Differential Equations</td></tr>
<tr><td>Credits</td><td>Theory: 2</td><td>Practical: 0</td><td>Total: 2</td></tr>
<tr><td>Effective From</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">This course teaches analytical and series methods for solving higher-order linear differential equations with variable coefficients and also covers matrix-based techniques for analyzing and solving systems of linear differential equations.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Solve higher-order linear differential equations using analytic methods.
CO2 – Analyze solution linear independence using the Wronskian framework.
CO3 – Compute power series solutions around ordinary and singular points.
CO4 – Apply Legendre polynomials and Bessel functions to differential problems.
CO5 – Solve first-order differential systems using fundamental matrix methods.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Linear Differential Equations of Higher Order: Equations with Variable Coefficients, Wronskian, Variation of Parameters, Method of Undetermined Coefficients. Solutions in Power Series: Introduction, Second Order Linear Equations with Ordinary Points, Legendre Equation and Legendre Polynomials, Second Order Equation with Regular Singular Point, Properties of Bessel Functions.
Unit 2: Systems of Linear Differential Equations: Introduction, Systems of First Order Equations, Existence and Uniqueness Theorem, Fundamental Matrix, Non-homogeneous Linear Systems.</td></tr>
<tr><td>Reference Books</td><td colspan="3">1. S. G. Deo, V. Lakshmikantham, V. Raghvendra: Text Book of Ordinary Differential Equations (Second Edition), Tata McGraw Hill Pub. Co. Ltd, New Delhi, 1997.
2. Somasundaram D.: Ordinary Differential Equations, Narosa, 2001.</td></tr>
</table>

	3. Coddington E. A., Levinson N.: Theory of Ordinary Differential Equations, Mc Graw Hill, 1955. 4. Hartmann P.: Ordinary Differential Equations, John Wiley International, 1964. 5. Mandal C. R.: Ordinary Differential Equations, PHI, 2003. 6. Rai B., Freedmanm H. I., Chaudhary D. P.: A Course in Ordinary Differential Equations, Narosa, 2002.

<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">II</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Major</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MTP – 2002</td></tr>
<tr><td>Course Title</td><td colspan="3">Practical based on MT-2002</td></tr>
<tr><td>Credits</td><td>Theory: 0</td><td>Practical: 2</td><td>Total: 2</td></tr>
<tr><td>Effective From</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on class attendance, viva, journal and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To bridge theoretical differential equations with practical, computational application. Also to develop skills for solving higher-order linear differential equations with variable coefficients.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1: Use the Wronskian to verify solution independence in higher-order linear differential equations.
CO2: Apply Variation of Parameters and Undetermined Coefficients to find particular solutions.
CO3: Construct power series solutions around ordinary and regular singular points.
CO4: Solve first-order linear systems using fundamental matrices and non-homogeneous components.
CO5: Formulate and solve constant-coefficient linear systems representing physical models.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"><table><tr><th></th><th>PSO1</th><th>PSO2</th><th>PSO3</th><th>PSO4</th><th>PSO5</th><th>PSO6</th><th>PSO7</th><th>PSO8</th></tr><tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>CO5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table></td></tr>
<tr><td>Course Content</td><td colspan="3">Practical-1: Practical based on examples of Linear Differential Equations of Higher Order with Variable Coefficients, Wronskian.
Practical-2: Practical based on examples of Variation of Parameters, Method of Undetermined Coefficients
Practical-3: Practical based on Solutions in Power Series of Second Order Linear Equations with Ordinary Points
Practical-4: Practical based on Solutions in Power Series of Second Order Equation with Regular Singular Point
Practical-5: Practical based on examples of Systems of First Order Equations
Practical-6: Practical based on examples of Fundamental Matrix.</td></tr>
</table>

	Practical-7: Practical based on examples of Non homogeneous Linear Systems **Practical-8:** Practical based on examples of Linear Systems with Constant Coefficients.
Reference Books	1. S. G. Deo, V. Lakshmikantham, V. Raghvendra: Text Book of Ordinary Differential Equations (Second Edition), Tata McGraw Hill Pub. Co. Ltd, New Delhi, 1997. 2. Somasundaram D.: Ordinary Differential Equations, Narosa, 2001. 3. Coddington E. A., Levinson N.: Theory of Ordinary Differential Equations, Mc Graw Hill, 1955. 4. Hartmann P.: Ordinary Differential Equations, John Wiley International, 1964. 5. Mandal C. R.: Ordinary Differential Equations, PHI, 2003. 6. Rai B., Freedmanm H. I., Chaudhary D. P.: A Course in Ordinary Differential Equations, Narosa, 2002.

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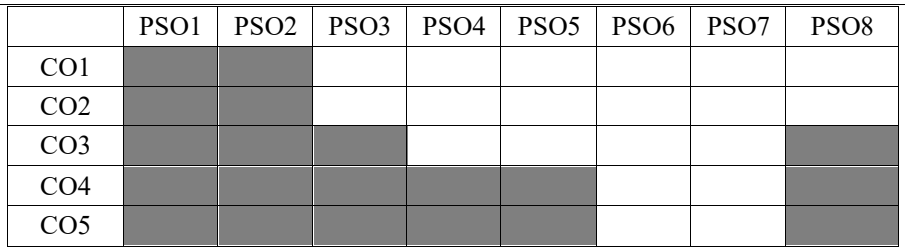
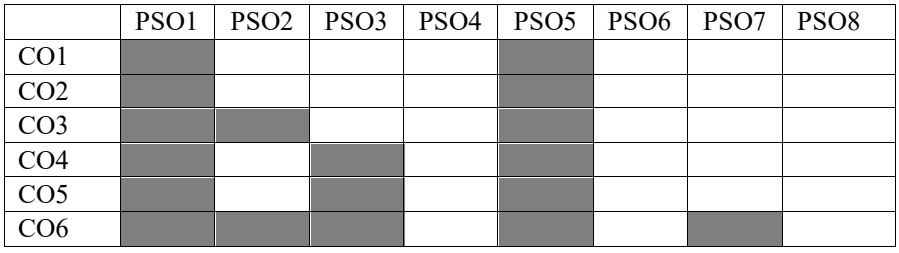
<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">II</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Major</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 2003</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Topology</td></tr>
<tr><td>Credits</td><td>Theory: 4</td><td>Practical: 0</td><td>Total: 4</td></tr>
<tr><td>Effective From</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To introduce topological spaces, continuity, and compactness to abstract geometric and analytical properties. Also, to develop mathematical reasoning using separation axioms, countability, and core topological theorems.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Define topological spaces, relative topologies, and evaluate continuity and homeomorphisms.
CO2 – Analyze set properties like closures, interiors, boundaries, and density.
CO3 – Apply countability axioms, bases, sub-bases, and Lindelöf’s theorem.
CO4 – Evaluate compactness, product topologies, and local compactness.
CO5 – Use separation axioms to prove Urysohn’s lemma and Tietze’s extension theorem.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Topological Spaces: Definition and some examples, Metrizable space, Relative Topology, Continuity and Homeomorphism.
Some elementary concepts: Open and Closed sets, Closure of a set, Isolated point, limit point, Derived set.
Unit 2: Interior of a set, Boundary of a set, Perfect set, Dense and Nowhere dense sets. Open base and Open sub-base, First and second countable spaces, Lindelof’s theorem, Separable spaces.
Unit 3: Compact space, Continuity and compactness, Finite intersection property, Heine-Borel theorem, product topology and projection mapping, Tychnoff’s theorem, Locally compact space.</td></tr>
</table>

	Unit 4: Separation Axioms: T_1 and T_2 Spaces, Regular, completely regular and Normal spaces, Urysohn's lemma, Tietze's extension theorem.
Reference Books	1. George F. Simmons: Introduction to Topology and Modern Analysis, McGraw-Hill Book Co., 1963. 2. James R. Munkres: Topology: A First Course, Prentice Hall of India Pvt. Ltd., New Delhi, 2000. 3. J. Dugundji: Topology, Allyn and Bacon, 1966 (Reprinted in India by Prentice Hall of India Pvt. Ltd.). 4. K. D. Joshi: Introduction to General Topology, Wiley Eastern Ltd., 1983. 5. J. Hocking and G. Young: Topology, Addison-Wesley, Reading, 1961.

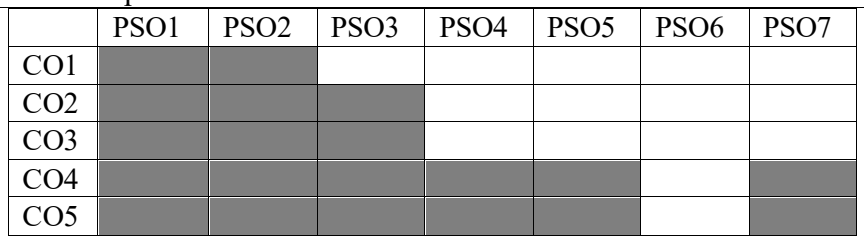
<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">II</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Vocational Course</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 2004</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Introductory Complex Analysis</td></tr>
<tr><td>Credits</td><td>Theory: 2</td><td>Practical: 0</td><td>Total: 2</td></tr>
<tr><td>Effective From</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To introduce functions of a complex variable and study their properties and integration.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Complex numbers in polar and exponential forms, powers and roots.
CO2 – Limits, continuity and differentiability of complex functions.
CO3 – Cauchy-Riemann equations and analytic functions.
CO4 – Harmonic and elementary functions.
CO5 – Contour integrals and ML-inequality.
CO6 – Cauchy-Goursat theorem and Cauchy integral formula.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3">
<table>
<tr><th></th><th>PSO1</th><th>PSO2</th><th>PSO3</th><th>PSO4</th><th>PSO5</th><th>PSO6</th><th>PSO7</th><th>PSO8</th></tr>
<tr><td>CO1</td><td>■</td><td></td><td></td><td></td><td>■</td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td>■</td><td></td><td></td><td>■</td><td>■</td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td>■</td><td>■</td><td></td><td></td><td>■</td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td>■</td><td></td><td></td><td></td><td></td><td>■</td><td></td><td></td></tr>
<tr><td>CO5</td><td>■</td><td></td><td>■</td><td></td><td>■</td><td></td><td></td><td></td></tr>
<tr><td>CO6</td><td>■</td><td>■</td><td></td><td></td><td></td><td></td><td>■</td><td>■</td></tr>
</table>
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Complex Numbers, Polar and Exponential forms, Powers and Roots, Functions of a Complex variable, Limits, Continuity, Differentiability, Cauchy-Riemann Equations, Analytic functions, Harmonic functions.
Unit 2: Elementary functions: Exponential, Trigonometric, Hyperbolic, Complex Integration, Contour Integral, ML-inequality, Cauchy-Goursat theorem, Extension of Cauchy-Goursat Theorem, Winding Number, Cauchy Integral formula.</td></tr>
</table>

Reference Books	1. H. S. Kasana: Complex Variables – Theory and Applications, 2nd Edition, PHI, N. Delhi, 2006. 2. Brown and Churchill: Complex Variables and Applications, McGraw Hill, 2009. 3. S. Ponnuswamy: Foundation of Complex Analysis, Narosa Publishing House, 1997. 4. S. Lang: Complex Analysis, Addison Wesley, 1997. 5. J. B. Conway: Functions of one Complex Variable, Springer-Verlag, 1980

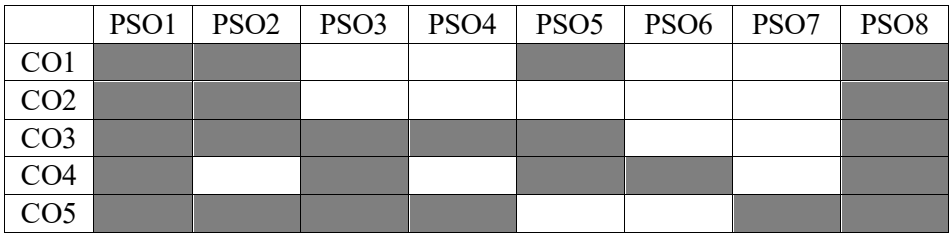
Program Name	**M.Sc. (Mathematics)**		
Semester	**II**		
NCrF Credit Level	**6**		
Course Type	**Vocational Course**		
Course Subtype	**Discipline Specific**		
Course Code	**MTP – 2004**		
Course Title	**Practical based on MT – 2004**		
Credits	**Theory: 0**	**Practical: 2**	**Total: 2**
Effective From	**June 2026**		
Teaching Methodology	Classwork, Discussions, Seminars and Assignment.		
Evaluation Method	50%: Internal assessment based on class attendance, viva, journal and internal examinations. 50%: External assessment based on the semester-end university examination.		
Course Objectives	To develop understanding of functions of a complex variable through problem solving.		
Course Outcomes	The course will enable student to understand: CO1 – Compute properties of complex numbers in polar and exponential forms CO2 – Compute powers and roots of complex numbers CO3 – Solve problems on limits, continuity and differentiability of complex functions CO4 – Verify Cauchy-Riemann equations and identify analytic functions CO5 – Solve problems on harmonic and elementary functions CO6 – Evaluate complex integrals and contour integrals		
Mapping between COs and PSOs			
Course Content	**Practical-1:** Practical based on properties of complex numbers, polar and exponential forms. **Practical-2:** Practical based on powers and roots of complex numbers. **Practical-3:** Practical based on limits, continuity, differentiability of functions of complex variable. **Practical-4:** Practical based on Cauchy-Riemann Equations, Analytic functions. **Practical-5:** Practical based on Harmonic functions. **Practical-6:** Practical based on Elementary functions. **Practical-7:** Practical based on Complex Integration-I. **Practical-8:** Practical based on Complex Integration-II.		
Reference Books	1. H. S. Kasana: Complex Variables – Theory and Applications, 2nd Edition, PHI, N. Delhi, 2006.		

	2. Brown and Churchill: Complex Variables and Applications, McGraw Hill, 2009. 3. S. Ponnuswamy: Foundation of Complex Analysis, Narosa Publishing House, 1997. 4. S. Lang: Complex Analysis, Addison Wesley, 1997. 5. J. B. Conway: Functions of one Complex Variable, Springer-Verlag, 1980

Instruction: There should not be more than 10 students per batch as per NEP 2020 guidelines.

<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">II</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Generic Elective</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 20051</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Integral Transforms – II</td></tr>
<tr><td>Credits</td><td>Theory: 4</td><td>Practical: 0</td><td>Total: 4</td></tr>
<tr><td>Effective From</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To introduce the concepts, definitions, and operational properties of Z-transforms and Mellin transforms. Also, to enable students to apply these advanced transform techniques to solve finite difference equations, boundary value problems, and integral equations.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Compute Z-transforms and Mellin transforms for standard discrete and continuous functions.
CO2 – Apply operational properties and convolution theorems of Z and Mellin transforms.
CO3 – Evaluate inverse Z-transforms and inverse Mellin transforms using mathematical techniques.
CO4 – Solve finite difference equations in discrete systems using Z-transform methods.
CO5 – Use Mellin transforms to solve boundary value problems and integral equations.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Z-Transforms: Introduction, Definition of the Z-transforms and examples, Basic operational properties.
Unit 2: Inverse Z Transforms and Applications of Z-Transforms: The inverse Z-transform and examples, Application of Z-transforms to finite difference equations.
Unit 3: Mellin Transforms: Introduction and definition of Mellin transforms with examples, Basic operational properties. Inverse Mellin transforms, Convolution theorems for Mellin Transforms.
Unit 4: Applications of Mellin Transforms: Applications of the Mellin transforms to solve Boundary Value Problems, Application of Mellin transforms to solve Integral Equations.</td></tr>
</table>

Reference Books	1. Lokenath Debnath: Integral Transforms and their applications, CRC Pub., 1995. 2. Ian Sneddon: The use of Integral Transforms. TMIH, 1979. 3. B. Davies: Integral Transforms and their applications, Springer - Verlag, 1978. 4. Boss M. L.: Mathematical Methods in Physical Sciences, John Wiley & Sons, 1983. 5. Andrews, L. G. & Shivamoggi B. K.: Integral Transforms for Engineers, PHI, 2003.

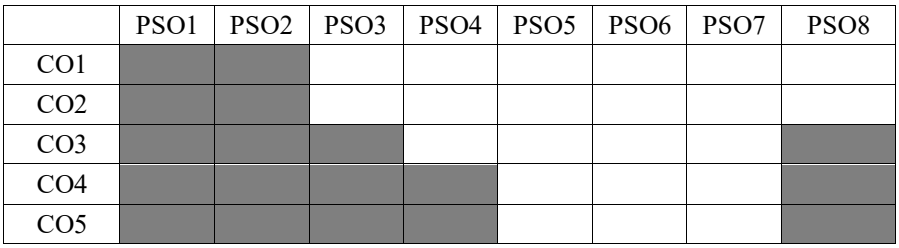
<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">II</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Generic Elective</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 20052</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Analytic Number Theory</td></tr>
<tr><td>Credits</td><td>Theory: 4</td><td>Practical: 0</td><td>Total: 4</td></tr>
<tr><td>Effective From</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To introduce the foundational concepts of arithmetical functions, Dirichlet multiplication, and their algebraic structures. Also, to develop analytical skills for evaluating the average orders, asymptotic behavior, and distribution of prime numbers using classical number-theoretic techniques.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Analyze core arithmetical functions including $\mu(n), \phi(n)$ and $\Lambda(n)$.
CO2 – Evaluate the algebraic group structure of functions under Dirichlet product.
CO3 – Apply asymptotic notations and Euler’s formula to find average orders.
CO4 – Estimate lattice point distribution and analyze Chebyshev’s functions.
CO5 - Prove Prime Number Theorem equivalents and bound prime counting functions.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Arithmetical functions and Dirichlet multiplication: Basic introduction of the functions $\mu(n)$ and the Euler totient function $\phi(n)$, relation connecting μ and ϕ, the Dirichlet product of two arithmetical functions (a.f.) and group structure w.r.t. this product, the Mangöldt function $\Lambda(n)$, Multiplicative a.f., the inverse of a completely multiplicative a.f.
Unit 2: Dirichlet multiplication and averages of Arithmetical functions: Liouville’s function $\lambda(n)$, the divisor functions $d(n)$ and $\sigma_\alpha(n)$, the generalized convolutions, the big oh notation, Euler’s summation formula, some elementary asymptotic formulas, the average order of</td></tr>
</table>

	divisor functions $d(n)$ and $\sigma_\alpha(n)$, the average order of functions $\phi(n), \mu(n), \Lambda(n)$. **Unit 3: Averages of Arithmetical Functions and Chebyshev's functions:** Distribution of lattice points visible from the origin, the partial sums of a Dirichlet product, applications to $\mu(n)$ and $\Lambda(n)$, Chebyshev's functions $\psi(x)$ and $\vartheta(x)$, relation between $\psi(x), \pi(x)$ and $\vartheta(x)$, Abel's identity. **Unit 4: Elementary theorems on the distribution of prime numbers:** Equivalent forms of prime number theorem, lower and upper bounds for $\pi(n)$ and p_n, Shapiro's Tauberian theorem and its applications, an asymptotic formula for the partial sums $\sum_{p \le x} \left(\frac{1}{p}\right)$.
Reference Books	1. Tom M. Apostol: Introduction to Analytic Number Theory, Narosa Pub. House, New Delhi, 1998. 2. Mc Carthy P. J.: Introduction to Arithmetical function, Springer-Verlag, New York, 1986. 3. K. Chandrashekharan: Introduction to Analytic Number Theory, Springer-Verlag, New York, 1968. 4. Hua L. K.: Introduction to Number Theory, Springer-Verlag, New York, 1982.

Program Name	**M.Sc. (Mathematics)**		
Semester	**II**		
NCrF Credit Level	**6**		
Course Type	**Generic Elective**		
Course Subtype	**Discipline Specific**		
Course Code	**MT – 20053**		
Course Level	**400 – 499**		
Course Title	**Special Functions – II**		
Credits	**Theory: 4**	**Practical: 0**	**Total: 4**
Effective From	**June 2026**		
Teaching Methodology	Classwork, Discussions, Seminars and Assignment.		
Evaluation Method	50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations. 50%: External assessment based on the semester-end university examination.		
Course Objectives	This course aims to provide a comprehensive understanding of orthogonal polynomials, their structural properties, and standard recurrence relations. It equips students with the analytical tools necessary to apply Legendre, Hypergeometric, and Hermite functions to solve complex differential equations and expansion problems in mathematical physics and engineering.		
Course Outcomes	The course will enable student to understand: CO1 – Analyze core properties, zeros, and structural inequalities of orthogonal polynomials. CO2 – Evaluate Legendre polynomials using generating functions and recurrence relations. CO3 – Apply hypergeometric forms and integral representations to expand functions. CO4 – Solve mathematical problems using Hermite polynomials and ${}_2F_0$ forms. CO5 – Construct polynomial expansions and verify specific orthogonality conditions.		
Mapping between COs and PSOs			
Course Content	**Unit 1:** Orthogonal polynomials, Simple set of polynomials, Orthogonality, an equivalent condition for Orthogonality, zeros of orthogonal polynomials, Expansion of polynomials, The three term recurrence relations, The Christoffel-Darboux formula, Normalization; Bessel's inequality. **Unit 2:** Legendre polynomials, A generating function, differential recurrence relations, The pure recurrence relations, Legendre's differential equation,		

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	■	■			■			■
CO2	■	■						■
CO3	■	■	■	■	■			■
CO4	■		■		■	■		■
CO5	■	■	■	■			■	■

	The Rodrigues formula, Bateman's generating function, Additional generating functions. **Unit 3:** Hypergeometric forms of Pn(X), Brafman's generating functions, Special properties of Pn(X), More generating functions, Laplace's first integral form, Some bounds on Pn(X), Orthogonality, An expansion theorem, Expansion of X^n, Expansion of analytic functions. **Unit 4:** Hermite polynomials: Definition of Hn(x), Recurrence relations, The Rodrigues formula, Other generating functions, Integrals, The Hermite polynomial as a ${}_2F_0$, Orthogonality, Expansion of polynomials, More generating functions.
Reference Books	1. E. D. Rainville, Special Functions, McMillan, New York, 1990. 2. I. N. Sneddon, Special functions of Mathematical Physics and Chemistry, Oliver Boyd. 3. N. N. Lebdev, Special Functions and their applications, Dover Pub. 1972. 4. R. K. Saxena and D. C. Gokhroo, Special Functions, Khanna Pub.

<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">II</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Skill Enhancement Course</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 20061</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Discrete Mathematics (Boolean Algebra)</td></tr>
<tr><td>Credits</td><td>Theory: 2</td><td>Practical: 0</td><td>Total: 2</td></tr>
<tr><td>Effective From</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">To understand the fundamentals of Boolean algebra and the logic gates used to design digital switching circuits. To master the techniques of minimizing Boolean functions using Karnaugh Maps and the Quine-McCluskey algorithm for efficient circuit reduction.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Simplify complex logic expressions using Boolean algebra principles.
CO2 – Convert Boolean functions into standard Canonical SOP and POS forms.
CO3 – Minimize Boolean functions efficiently using Karnaugh Maps.
CO4 – Optimize multi-variable expressions using the Quine-McCluskey algorithm.
CO5 – Design and reduce switching circuits using basic logic gates.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3"> 
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Boolean Algebra as an algebraic system, Boolean expressions (forms), Sum of Products Canonical form and Product of Sums Canonical forms of Boolean expressions.
Unit 2: Representation and Minimization of Boolean functions by Karnaugh Map method and Quine- McCluskey Algorithm, AND, OR & NOT gates, Reduction of switching circuit diagram.</td></tr>
</table>

Reference Books	1. J. P. Tremblay & R. Manohar: Discrete mathematical Structures with Applications to Computer Science., McGraw Hill Book Co., 1999. 2. B. Kolman, R. C. Busby & S. Ross: Discrete Mathematical Structures, Prentice Hall of India Pvt. Ltd., 3rd ed., 2001. 3. C. L. Liu & D. P. Mohapatra: Elements of Discrete Mathematics, Tata McGraw Hill, 2008. 4. T. Koshy: Discrete Mathematics with Applications, Academic Press, 2004.

<table>
<tr><td>Program Name</td><td colspan="3">M.Sc. (Mathematics)</td></tr>
<tr><td>Semester</td><td colspan="3">II</td></tr>
<tr><td>NCrF Credit Level</td><td colspan="3">6</td></tr>
<tr><td>Course Type</td><td colspan="3">Skill Enhancement Course</td></tr>
<tr><td>Course Subtype</td><td colspan="3">Discipline Specific</td></tr>
<tr><td>Course Code</td><td colspan="3">MT – 20062</td></tr>
<tr><td>Course Level</td><td colspan="3">400 – 499</td></tr>
<tr><td>Course Title</td><td colspan="3">Basics of Financial Mathematics</td></tr>
<tr><td>Credits</td><td>Theory: 2</td><td>Practical: 0</td><td>Total: 2</td></tr>
<tr><td>Effective From</td><td colspan="3">June 2026</td></tr>
<tr><td>Teaching Methodology</td><td colspan="3">Classwork, Discussions, Seminars and Assignment.</td></tr>
<tr><td>Evaluation Method</td><td colspan="3">50%: Internal assessment based on the class attendance, class assignments, home assignments and internal examinations.
50%: External assessment based on the semester-end university examination.</td></tr>
<tr><td>Course Objectives</td><td colspan="3">This course provides foundational skills in financial mathematics to analyze interest, present values, and annuities. Students will learn to compute and interpret real-world taxes and utility bills for effective decision-making.</td></tr>
<tr><td>Course Outcomes</td><td colspan="3">The course will enable student to understand:
CO1 – Explain simple and compound interest concepts alongside the time value of money.
CO2 – Evaluate present, net present, and future values for investment decisions.
CO3 – Compute regular annuities and apply them to short-term financial planning.
CO4 – Calculate income tax and goods and services tax using current regulations.
CO5 – Analyze and interpret utility bills, including fixed charges and surcharges.</td></tr>
<tr><td>Mapping between COs and PSOs</td><td colspan="3">
<table>
<tr><th></th><th>PSO1</th><th>PSO2</th><th>PSO3</th><th>PSO4</th><th>PSO5</th><th>PSO6</th><th>PSO7</th><th>PSO8</th></tr>
<tr><td>CO1</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO2</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>CO5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>
</td></tr>
<tr><td>Course Content</td><td colspan="3">Unit 1: Interest and interest rate: Origin of the concept of interest, Various forms of interest rate.
Accumulation with simple and compound interest: Meaning and significance of simple and compound interest, formulae, Calculations under simple and compound interest rates, simple and compound interest rates with equivalency, effective rate of interest.
Present value: Present value, net present value and future value, their interpretation.
Unit 2: Annuities: Annuities, Calculating value of regular annuity, simple applications of regular annuities (up to 3 periods).
Tax: Tax, Calculation of tax and simple application of tax calculation in goods and service tax, income tax.</td></tr>
</table>

	Bills: Bills, Tariff rates, fixed charge, surcharge, service charge, GST, Calculation and interpretation of electricity bill, water supply and other supply bills.
Reference Books	1. John McCutcheon, William F. Scott: An introduction to the mathematics of finance, Elsevier Butterworth-Heinemann, Burlington, 2005. 2. S. Chandra, S. Dharmaraja, Aparna Mehra, R. Khemchandani: Financial Mathematics: An Introduction, Narosa Book Distributors Pvt. Ltd., Bengaluru, 2013. 3. Mark H. A. Davis: Mathematical Finance: A Very Short Introduction, OUP Oxford, 2019.