M. C. E. Society's
Abeda Inamdar Senior College
Of Arts, Science and Commerce, Camp, Pune-1
(Autonomous) Affiliated to SavitribaiPhule Pune University
NAAC accredited 'A' Grade

Three-Year B.Sc. Major Degree Program in
Mathematics (Faculty of Science & Technology)

Syllabus of

F.Y. B.Sc. Mathematics

Choice Based Credit System Syllabus
To be implemented from the academic year 2026-2027

Title of the Course: B. Sc (Mathematics)

Preamble:

Department of Mathematics, Abeda Inamdar Senior College is implementing the first syllabus of B.Sc. under NEP from June 2023. Taking into consideration the rapid changes in Science and Technology and new approaches in different areas of Mathematics and related subjects, the Board of Studies in Mathematics has prepared the syllabus of B.Sc Semester-I and Semester-II (w.e.f. 2025-26) Mathematics course under the Choice Based Credit System (CBCS).
The model curriculum was developed by U.G.C. is used as a guideline for the present syllabus.

Program Objectives for Science Graduates

1. To develop fundamental knowledge of scientific principles in their chosen discipline and apply it to solve real-world problems in laboratories, industry, or the community.

2. To develop logical reasoning, problem-solving, and decision-making skills using scientific methods and evidence-based approaches among graduates.

3. To develop capability to practice professional ethics, show sensitivity towards environmental and societal issues, and contribute positively to sustainable development.

4. To inculcate effective communication skills to express scientific ideas in written and oral forms and collaborate efficiently in multidisciplinary teams.

5. To develop proficiency in digital tools and be prepared for continuous learning to meet global scientific and technological challenges.

6. To inculcate research Aptitude and Research ethics in science students.

7. Promoting Physical Activity and Mental Wellbeing

Program Outcomes for Science Programs (3+2 or 4 +1)

PO1. Academic expertise:

- Exhibit knowledge of the discipline
- Identify and explain pivotal pieces of work in the area
- Conduct guided academic inquiries in various areas of interest in the chosen discipline
- Apply theoretical notions into practice in different forms

PO2. Critical Thinking and ethical decision making:

- Analyze and engage with their social surroundings, identify problems and raise questions based on academic scientific knowledge.
- Identify the implications of the same in our existence
- Propose corrective measures for their solutions
- Follow the norms of academic integrity
- Take cognizance of the moral implications of our decisions

PO3. Environment, Sustainability and lifelong learning:

- Demonstrate awareness of local, regional, national, and global needs
- Engage with their socio-cultural contexts along with environmental needs and concerns
- Engage in lifelong learning
- Work on career enhancement and adapt to changing professional and societal needs.
- Integrate scientific advancements with social, environmental, and economic considerations for inclusive and sustainable development.

PO4. Research Aptitude:

- Develop Scientific Temperament
- Identify research gaps, formulate hypotheses, and generate original contributions to scientific knowledge.

- Apply advanced research tools, techniques, and theoretical frameworks to conduct rigorous and ethical scientific investigation
- Mentoring peers and contributing to institutional and societal growth.

PO5. Holistic Development for society and Employability

- Improve overall well-being by addressing both physical and mental health.
- Develop emotional resilience and enrich cognitive function
- Constructive Social interaction and Operate effectively in multicultural spaces
- Recognize and respect different value systems including one's own
- Communicate effectively based on the context within which one is operating
- Develop soft skills required for teamwork and collaboration/leader in multidisciplinary settings

Mapping of Graduate Attributes with Program Outcomes

Description of PO	Mapped with GA
PO1. Academic expertise: ● Exhibit knowledge of the discipline ● Identify and explain pivotal pieces of work in the area ● Conduct guided academic inquiries in various areas of interest in the chosen discipline ● Apply theoretical notions into practice in different form	GA 1: Capable of Independent learning: GA 7: Critical Thinking and Problem Solving GA 8: Quest for Excellence:

PO2. Critical Thinking and ethical decision making: ● Analyze and engage with their social surroundings, identify problems and raise questions based on academic scientific knowledge. ● Identify the implications of the same in our existence ● Propose corrective measures for their solutions ● Follow the norms of academic integrity ● Take cognizance of the moral implications of our decisions	GA 1: Capable of Independent learning: GA 2: Strong sense of civic responsibility GA 3: Environmental consciousness: GA 4: Patriotism and Tolerance GA 7: Critical Thinking and Problem Solving GA 8: Quest for Excellence:
PO3. Environment, Sustainability and lifelong learning: ● Demonstrate awareness of local, regional, national, and global needs ● Engage with their socio-cultural contexts along with environmental needs and concerns ● Engage in lifelong learning ● Work on career enhancement and adapt to changing professional and societal needs. ● Integrate scientific advancements with social, environmental, and economic	GA 1: Capable of Independent learning: GA 2: Strong sense of civic responsibility GA 3: Environmental consciousness: GA 4: Patriotism and Tolerance GA 5: Soft Skills and Life Skills: GA 7: Critical Thinking and Problem Solving

considerations for inclusive and sustainable development.	
PO4. Research Aptitude: ● Develop Scientific Temperament ● Identify research gaps, formulate hypotheses, and generate original contributions to scientific knowledge. ● Apply advanced research tools, techniques, and theoretical frameworks to conduct rigorous and ethical scientific investigation ● Mentoring peers and contributing to institutional and societal growth.	GA 1: Capable of Independent learning: GA 3: Environmental consciousness: GA 6: Leadership qualities and Teamwork: GA 7: Critical Thinking and Problem Solving GA 8: Quest for Excellence:
PO5. Holistic Development for society and Employability ● Improve overall well-being by addressing both physical and mental health. ● Develop emotional resilience and enrich cognitive function ● Constructive Social interaction and operate effectively in multicultural spaces ● Recognize and respect different value systems, including one's own ● Communicate effectively based on the context within which one is operating	GA 1: Capable of Independent learning: GA 2: Strong sense of civic responsibility GA 4: Patriotism and Tolerance GA 5: Soft Skills and Life Skills: GA 6: Leadership qualities and Teamwork: GA 7: Critical Thinking and Problem Solving GA 9: Physical and Emotional Health:

• Develop soft skills required for teamwork and collaboration/leader in multidisciplinary settings	

Sr. No.	Programme Specific Outcomes of B.Sc. Mathematics
1	**Demonstrate Fundamental Knowledge:** Recall essential facts and foundational principles of mathematics, including appropriate use of mathematical notations, terminology, and conventions. Recognize basic geometric figures and graphical representations, and articulate key outcomes derived from mathematical studies.
2	**Apply Mathematical Reasoning:** Develop a relational understanding of mathematical concepts and reasoning patterns. Cultivate the ability to logically question assumptions, identify core aspects of problems, and collaborate effectively, fostering responsible engagement in a dynamic, interconnected world.
3	**Pursue Interdisciplinary Studies:** Build a strong foundation for higher education in mathematics, with opportunities for interdisciplinary learning and application in allied fields such as statistics and computer science.
4	**Strengthen Problem-Solving and Communication Skills:** Enhance personal and intellectual development through mathematical modeling, critical problem-solving, creative thinking, and effective communication skills.
5	**Improve Career Readiness and Employability:** Acquire skills relevant for diverse career opportunities in government services, banking, insurance, and investment sectors, as well as roles in data analysis and various public and private enterprises.

PO-PSO Mapping

PSO	Related PO(s)	Nature of Relationship	Explanation
PSO1: Demonstrate Fundamental Knowledge	PO1, PO2, PO4, PO5	**Strong:** PO1 **Moderate:** PO2 & PO4 **Low:** PO5	PO1: Builds deep academic knowledge in mathematics. PO2: Helps analyze problems through foundational understanding. PO4: Supports basic research formulation using mathematical concepts. PO5: Contributes marginally to employability through core content.
PSO2: Apply Mathematical Reasoning	PO1, PO2, PO3, PO4, PO5	**High:** PO2 & PO5 **Moderate:** PO1, PO3, PO4	PO2: Enhances logical thinking, questioning, and ethical reasoning. PO5: Develops teamwork, communication, and social adaptability. PO1: Applies Mathematical Theory to solve problems PO3: Supports lifelong learning via critical thinking. PO4: Encourages forming hypotheses using reasoning skills.
PSO3: Pursue Interdisciplinary Studies	PO1, PO2, PO3, PO4, PO5	**High:** PO1, PO3, PO4 **Moderate:** PO2 & PO5	PO1: Applies mathematical knowledge to other sciences. PO3: Engages with wider academic and environmental contexts.

PSO	Related PO(s)	Nature of Relationship	Explanation
			PO4: Promotes cross-disciplinary research. PO5: Expands career options by connecting to other fields.
PSO4: Strengthen Problem-Solving and Communication Skills	PO2, PO3, PO4, PO5	**High:** PO2, PO4, PO5 **Moderate:** PO3	PO2: Facilitates critical analysis and ethical problem-solving. PO5: Develops soft skills needed for workplace success. PO4: Enhances research design and execution. PO3: Promotes self-directed learning and communication.
PSO5: Improve Career Readiness and Employability	PO3, PO5, PO1, PO4	**High:**PO5 **Moderate:** `PO3, PO1, PO4	PO5: Directly relates to developing skills for jobs and entrepreneurship. PO3: Encourages adapting to societal needs and lifelong learning. PO1: Uses subject expertise in professional settings. PO4: Applies research ability in industry and services.

SEM	MAJOR		MINOR	VSC	SEC	CC	VEC	AEC	IKS	INT/FP/ CEP/OJT	OE	TOTAL	No.of Practical
	Core	Elective											
1	6= 4T +2 P	-	4= 2T+ 2P	2P (M)	2P (Mn)	0	2	2	2	-	2	22	4
2	6= 4T +2 P	-	4= 2T+ 2P	2P (Mn)	0	2	2	2	-	-	4	22	3
3	8= 6T +2 P	-	4= 2T+ 2P	2P (Mn)	0	2	-	2	-	FP-2	2	22	3
4	8= 4T+4P	-	6= 4T+ 2P	-	0	2	-	2	-	CEP-2	2	22	3
5	10= 6T + 4 P	4	2T	2P (M)	2P (Mn)	2	-	-	-			22	4
6	10= 6T + 4 P	4	0	2P (Mn)	2P (Mn)	0	-		-	OJT-4		22	4
3-year course	48	8	20	10	6	8	4	8	2	8	10	132	

Structure of the B.Sc Mathematics Course:

Sem	Offered as	Course code	Title of course	No. of Credits
First Year				
I	Major	26SBMT11MM	Foundations of Mathematics	2
I	Major	26SBMT12MM	Calculus-I	2
I	Major	26SBMT13MM	Practical on Foundations of Mathematics and Calculus-I	2
I	VSC	26SBMT11VS		2
II	Major	26SBMT21MM	Co-ordinate Geometry	2
II	Major	26SBMT22MM	Calculus-II	2
II	Major	26SBMT23MM	Practical on Co-ordinate Geometry and Calculus-II	2
Second Year				
III	Major	26SBMT31MM	Calculus of Several Variables	2
III	Major	26SBMT32MM	Laplace Transform	2
III	Major	26SBMT33MM	Numerical Methods and Software Sage	2
III	Major	26SBMT31IK	History and Development of Mathematics in India	2

III	Major FP	26SBMT3FP	Field Project	2
IV	Major	26SBMT41MM	Linear Algebra	2
IV	Major	26SBMT42MM	Vector Calculus	2
IV	Major	26SBMT43MM	Ordinary Differential Equation and Sage	2
IV	Major	26SBMT44MM	Programming with Python	2
IV	Major CEP	26SBMT4CEP	Community Engagement Program	2
B.Sc. Degree				
V	Major (Theory)	26SBMT51MM	Metric Spaces	2
V	Major (Theory)	26SBMT52MM	Real Analysis-I	2
V	Major (Theory)	26SBMT53MM	Group Theory	2
V	Major (Practical)	26SBMT54MM	Practical on Metric Spaces and Real Analysis-I	2
V	Major (Practical)	26SBMT55MM	Practical on Advanced Ordinary Differential Equations and Group Theory	2
Any one of the three elective below				
V	Major (Elective)	26SBMT51MEA	Operations Research -I	2
V	Major (Elective)	26SBMT51MEB	Computational Geometry	2
V	Major (Elective)	26SBMT51MEC	Course from Swayam /NPTEL / E Pathashala etc.	2
Any one of the three elective below				
V	Major (Elective)	26SBMT51MEA	Operations Research -I	2
V	Major (Elective)	26SBMT51MEB	Computational Geometry	2
V	Major (Elective)	26SBMT51MEC	Course from Swayam /NPTEL / E Pathashala etc.	2
V	VSC	26SBMT51VS	Mathematical Computing Using Python	2
VI	Major (Theory)	26SBMT61MM	Complex Analysis	2
VI	Major (Theory)	26SBMT62MM	Real Analysis-II	2
VI	Major (Theory)	26SBMT63MM	Ring Theory	2
VI	Major (Practical)	26SBMT64MM	Practical on Complex Analysis and Real Analysis-II	2
VI	Major (Practical)	26SBMT65MM	Practical on Partial Differential Equations and Ring Theory	2
Any one of the three elective below				
VI	Major (Elective)	26SBMT61MEA	Operations Research -II	2

VI	Major (Elective)	26SBMT61MEB	Cryptography	2
VI	Major (Elective)	26SBMT61MEC	Course from Swayam /NPTEL / E Pathashala etc.	2
Any one of the three elective below				
VI	Major (Elective)	26SBMT62MEA	Graph Theory	2
VI	Major (Elective)	26SBMT62MEB	Lebesgue Integration	2
VI	Major (Elective)	26SBMT62MEC	Course from Swayam /NPTEL / E Pathashala etc.	2
VI	Major OJT	26SBMT61OJT	On Job Training	4
B.Sc. Honors				
VII	**Same as Sem-I of M.Sc-I**			
VIII	**Same as Sem-II of M.Sc-I**			

Evaluation Process:

Evaluation process for each paper of 2 credit comprises of Continuous Internal Evaluation (CIE) for 20 marks and End Semester Examination (ESE) for 30 marks.

For Continuous Internal Evaluation (CIE), evaluation will be done continuously. Internal assessment will be of **20** marks for a paper of 50 Marks. These 20 marks are divided as follows:

CIE for 2 Credits Theory Paper: It will be divided as follows:

Sr. No.	**Components**		**Marks**
1.	CIE I	Mid Sem Exam of 20 Marks converted to 10 Marks.	10
2.	CIE II	Compulsory Test on Demand MCQ Examination	5
3.	CIE III	Assignment/Seminar/Quiz/ Open Book Test/Project	5
		Total	20

CIE for 2 Credits Practical Paper: There will be a compulsory Mock Practical Examination, Viva Voce of the subjects mentioned for **20 Marks**

Offered as	Major
Course/ Paper Title	Foundations of Mathematics
Course Code	26SBMT11MM
Semester	I
No. of Credits	2

Course Outcomes (COs)

CO No.	Course Outcome Statement	Bloom's Level
CO1	Recall and describe basic concepts of sets, relations, functions, and complex numbers.	1 – Remembering
CO2	Explain properties of functions, equivalence relations, and arithmetic operations on integers, including the binomial theorem and division algorithm.	2 – Understanding
CO3	Apply the Euclidean algorithm to find the gcd and solve problems related to divisibility and congruence.	3 – Applying
CO4	Analyze prime factorization and congruence properties, including Fermat's theorem and modular arithmetic.	4 – Analyzing
CO5	Evaluate expressions in complex numbers using De Moivre's theorem and roots of unity; interpret regions in the complex plane.	5 – Evaluating
CO6	Construct proofs/examples and solve advanced problems involving relations, congruence, and complex numbers.	6 – Creating

Unit No	Title with Contents	No. of Lectures
Unit I	**Sets Relations and Functions**	**08**
	1. Basic terminologies of sets, Operations on sets, Family of sets, Power sets, Cartesian product of sets.	2

	2. Basic definitions of functions, One-one, onto functions and bijections, Composition of functions, Inverse of a function, Image of subsets under functions, Inverse image of subsets under functions. (Excluding theorem only examples) 3. Relations on sets, Types of relations, Equivalence relations, Equivalence classes, and partitions of sets.	3 3
Unit II	**Divisibility Theory in the Integers**	**07**
	1. Binomial Theorem 2. The Division Algorithm, The Greatest Common Divisor, The Euclidean Algorithm.	3 4
Unit III	**Primes and the theory of Congruence**	**08**
	1. The Fundamental Theorem of Arithmetic: Prime Numbers, Euclid's Lemma. 2. Basic Properties of Congruence. 3. Fermat's Theorem.	3 2 2
Unit IV	**Complex Numbers**	**07**
	1. Sums and Products, Basic Algebraic Properties, Moduli, Complex Conjugates, Exponential Form, Products and Quotients, De- Moivre's theorem 2. Roots of Complex Numbers: The n^{th} roots of unity. 3. Regions in Complex Plane	4 2 1

Textbooks:

1. A Foundation Course in Mathematics, Ajit Kumar, S. Kumaresan and Bhaba KumarSarma, Narosa Publication House.
   Unit I: Chapter 2: Sec. 2.1 to 2.5, Chapter 3: Sec. 3.1 to 3.6, Chapter 4: Sec. 4.1 to 4.4.

   2. Elementary Number Theory, David M. Burton, Tata McGraw Hill, Sixth Edition Unit II: Chapter 1: Sec. 1. 1
   Chapter 2: Sec. 2.2 to 2.4.
   Unit III: Chapter 3: Sec. 3.1, Chapter 4: Sec. 4.1, 4.2, Chapter 5: Sec. 5.2.

3. Complex Variables and Applications, James Ward Brown and Ruel V. Churchill, Mc-GrawHill, Seventh Edition**.**
   Unit IV: Chapter 1: Sec 1 to 10

Reference Books:

1. Textbook of Algebra, S. K. Shah and S. C. Garg, Vikas Publishing House Pvt. Ltd. Edition2017.
2. Introduction to Real Analysis by R.G. Bartle and D.R. Sherbert, John Wiley and SonsInc, Fourth Ed.

Website:

1. https://www.youtube.com/watch?v=md5UCR7mcIY

CO–PO / CO–PSO Mapping Matrix for 26SBMT11MM- Foundations of Mathematics
Scale: 3 = Strongly Related, 2 = Moderately Related, 1 = Slightly Related, 0 = Not Related

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2	1	0	3	2	1	2	2
CO2	3	3	1	2	2	2	0	3	3	1	3	2
CO3	3	3	1	2	2	2	0	3	3	1	3	3
CO4	3	3	2	2	3	2	1	3	3	2	3	3
CO5	3	3	2	2	3	3	1	3	3	2	3	3
CO6	3	3	2	2	3	3	1	3	3	2	3	3

Offered as	Major
Course/ Paper Title	Calculus-I
Course Code	26SBMT12MM
Semester	I
No. of Credits	2

Course Outcomes (COs)

CO No.	Course Outcome Statement	Bloom's Level
CO1	Recall and explain algebraic and order properties of real numbers, including inequalities and completeness property.	1 – Remembering
CO2	Describe absolute value properties, neighborhoods, supremum/infimum, and applications such as the density theorem.	2 – Understanding

CO3	Apply limit definitions and limit theorems for sequences and functions to solve standard problems.	3 – Applying
CO4	Analyze the behavior of sequences using the monotone convergence theorem, the Bolzano–Weierstrass theorem, and the Cauchy criterion.	4 – Analyzing
CO5	Evaluate limits and continuity of functions using sequential criterion and theorems (squeeze theorem, IVT, boundedness, min-max).	5 – Evaluating
CO6	Construct rigorous proofs/examples and solve advanced problems involving real numbers, convergence, limits, and continuity.	6 – Creating

Unit No	Title with Contents	No. of Lectures
Unit I	**Real Numbers**	**08**
	1. The Algebraic and Order properties of R: Algebraic properties of R, Order properties of R, Well-Ordering Property of N. Arithmetic mean- Geometric mean inequality, Bernoulli's inequality. (Revision: essential properties should be revised with illustrative examples)	2
	2. Absolute Value and the Real Line: Absolute value function and its properties, triangle inequality and its consequences, a neighborhood of a point on a real line.	2
	3. The Completeness Property of R: Definitions of Upper bound, Lower bound, supremum, infimum of subsets of R, completeness property of R.	2
	4. Applications of the Supremum Property: property and its consequences, The density theorem (without proof).	2
Unit II	**Sequences**	**07**
	1. Sequences and Their Limits: Definition and examples of sequences of real numbers, Definition of the limit of sequence and uniqueness of limit, Examples on the limit of a sequence.	2
	2. Limits Theorems: Definition of bounded sequence, Every	2

	convergent sequence is bounded, Algebra of limits. 3. Monotone Sequences: Definition and examples of monotone sequences, Monotone convergence theorem, and examples 4. Subsequences and Bolzano -Weierstrass Theorem: Definition of subsequence and examples, Divergence criteria, Monotone Subsequence theorem (without proof), Bolzano –Weierstrass theorem (first proof). 5. Cauchy Criterion: Definition and examples.	 1 1 1
Unit III	**Limits**	**08**
	1. Functions and their Graphs: Functions, domain and range, graphs of functions, representing a function numerically, and Vertical line test, Piecewise defined functions, increasing and decreasing functions, even and odd functions symmetry, common functions. 2. Limits of Functions: Definition of cluster point and examples, the definition of the limit of a function, the sequential criterion for limits, divergence criteria. 3. Limit Theorems: Algebra of limits (proofs using sequential criterion), Squeeze theorem. 4. Some extension of limit concepts: One-sided limits, infinite limits (without proof).	2 2 2 2
Unit IV	**Continuity**	**07**
	1. Continuous Functions: Definition of continuous function at a point, the sequential criterion for continuity, Divergence criterion, combination ofcontinuous functions. 2. Continuous Functions on Intervals: Properties of continuous functions on an interval, Boundedness theorem (without proof), The minimum-maximum theorem (without proof), Location of root theorem (Without proof), Bolzano's intermediate value theorem. Continuous function maps closed boundedinterval to closed bounded interval, Preservation of interval theorem.	4 3

Textbooks:

1. Introduction to Real Analysis by R.G. Bartle and D.R. Sherbert, John Wiley and SonsInc,Fourth Edition.
   Unit I: Chapter 2: Sec 2.1 (2.1.1 to 2.1.13), Sec. 2.2 (2.2.1 to 2.2.9), Sec. 2.3, Sec. 2.4 (2.4.1, 2.4.3 to 2.4.6, 2.4.8, 2.4.9).
   Unit II: Chapter 3: Sec. 3.1 (3.1.1 to 3.1.7, 3.1.10, 3.1.11), Sec. 3.2 (3.2.1 to 3.2.11), Sec. 3.3 (3.3.1, 3.3.4), Sec. 3.4 (3.4.1 to 3.4.3, 3.4.5 to 3.4.8), Sec. 3.5.
   Unit III: Chapter 4: Sec. 4.1 (4.1.1, 4.1.3 to 4.1.9), Sec. 4.2 (4.2.1 to 4.2.8), Sec. 4.3 (4.3.1 to 4.3.9).
   Unit IV: Chapter 5: Sec. 5.1, Sec. 5.2, Sec 5.3 (5.3.1 to 5.3.5, 5.3.7 to 5.3.10).
2. Thomas'Calculus, Fourteenth edition, Pearson Publication.
   Unit III: Chapter 1: Sec. 1.1.

Reference Books:

1 Introduction to Real analysis, William F.Trench, Free edition, 2010.

2 Calculus of a single variable Ron Larson, Bruce Edwards, tenth edition. Brooke Cole. Cengage Learning

2. Elementary Analysis, The Theory of Calculus, Kenneth A. Ross, Springer Publication, second edition.
3. Calculus and its Applications, Marvin L. Bittinger, David J. Ellenbogen andScott A. Surgent, Addison-Wesley, tenth edition

Website: 1. https://www.youtube.com/watch?v=fCzS8y4SBtE

2. https://www.youtube.com/watch?v=wzFc9us78sM

CO–PO / CO–PSO Mapping Matrix for 26SBMT12MM- Calculus-II
Scale: 3 = Strongly Related, 2 = Moderately Related, 1 = Slightly Related, 0 = Not Related

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	1	1	2	1	0	3	3	1	2	2
CO2	3	3	1	1	2	1	0	3	3	1	3	2
CO3	3	3	1	2	2	2	0	3	3	1	3	3
CO4	3	3	2	2	2	2	1	3	3	2	3	3
CO5	3	3	2	2	3	3	1	3	3	2	3	3
CO6	3	3	2	2	3	3	1	3	3	2	3	3

Offered as	Major
Course/ Paper Title	Practical Course based on Foundations of Mathematics and Calculus-I
Course Code	26SBMT13MM
Semester	I
No. of Credits	2

Course Outcomes (COs) – Practical Course

CO No.	Course Outcome Statement	Bloom's Level
CO1	Identify and perform basic operations on sets, relations and functions using appropriate examples and representations.	2 – Understanding
CO2	Apply properties of relations and functions to classify them (one-one, onto, bijective) and compute images/inverse images.	3 – Applying
CO3	Use divisibility rules and Euclidean algorithm to compute gcd/lcm and solve related practical problems.	3 – Applying
CO4	Solve congruences using modular arithmetic and apply Chinese Remainder Theorem in practical cases.	4 – Analyzing
CO5	Perform computations on complex numbers (modulus, conjugate, De Moivre, roots) and represent regions in the complex plane.	4 – Analyzing
CO6	Verify completeness property and use supremum/infimum for real numbers; analyze sequences, limits, and continuity through examples and computations.	5 – Evaluating

Practical number	Title	No. of Practical
Practicals based on Foundations of Mathematics		
I	Sets Relations and Functions-I	1
II	Sets Relations and Functions-II	1
III	Divisibility	1
IV	Congruence	1
V	Divisibility and congruence	1
VI	Complex Numbers	1
Practicals based on Calculus-I		
I	Real Numbers	1

II	Sequences-I	1
III	Sequences-II	1
IV	Limits	1
V	Continuity	1
VI	Limits and Continuity	1

CO–PO / CO–PSO Mapping Matrix for 26SBMT13MM- Practical based on Foundations of Mathematics and Calculus-I

Scale: 3 = Strongly Related, 2 = Moderately Related, 1 = Slightly Related, 0 = Not Related

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	0	2	1	1	1	3	2	1	2	2
CO2	2	3	0	2	2	1	1	3	3	1	3	2
CO3	3	3	0	1	2	1	1	3	2	1	3	3
CO4	3	3	0	1	2	2	1	3	3	1	3	3
CO5	3	3	0	1	2	1	1	3	3	1	3	3
CO6	3	3	1	2	2	2	1	3	3	1	3	3

Offered as	Vocational Skill Course
Course/ Paper Title	Front End Development and MySQL
Course Code	26SBMT11VS
Semester	I
No. of Credits	2

Course Outcomes (COs)

CO No.	Course Outcome Statement	Bloom's Level
CO1	Recall and explain HTML elements, attributes, formatting tags, and basic webpage structure.	1 – Remembering
CO2	Use CSS to style webpages, including colors, fonts, layout, grids, and form designs.	3 – Applying
CO3	Develop interactive webpages using JavaScript, including variables, functions, events, objects, and DOM manipulation.	4 – Analyzing
CO4	Implement client-side validation and develop a small web-based project that integrates HTML, CSS, and JavaScript.	5 – Evaluating
CO5	Create and manage databases using MySQL, including DDL, DML, constraints, and SQL functions.	3 – Applying
CO6	Design and execute advanced SQL queries using joins, views, subqueries, triggers, and window functions, ensuring ACID properties.	6 – Creating

Unit No	Title with Contents	No. of Lectures
	Front End Development	
Unit I	**HTML5**	**08**
	1. HTML Elements, Attributes, Headings, Paragraphs, Styles, Colors 2. Working with Div, Text Formatting, Links, Images 3. Working with HTML Table 4. HTML Layout Elements and Techniques	2 2 2
Unit II	**CSS**	**10**
	1. CSS Introduction, Syntax, Comments, Colors, Backgrounds, Borders 2. CSS Margins, Padding, Outline, Fonts, Icons, Table Style 3. CSS Layout 4. CSS Pseudo-elements, Opacity / Transparency 5. CSS Forms, Counters, Grid	2 2 2 2 2 2
Unit III	**JavaScript**	**10**
	1. JavaScript Statements, Variables, Operators and Functions 2. JavaScript Objects, Events, Strings, Arrays, Methods, Loops, Conditions 3. JavaScript Client-Side Validation, DoM 4. Small Project	2 2 2 2 2
	Structured Query Language using MySQL	
Unit IV	**Introduction to MySQL**	**10**
	1. What is a Database; Types of Databases; DBMS Vs, RDMS; Why SQL 2. MySQL Installation, SQL Data Definition Language (DDL) 3. CREATE, ALTER, DROP, RENAME, TRUNCATE, COMMENT 4. SQL Data Manipulation Language (DML), SELECT 5. INSERT, UPDATE, DELETE, MERGE, TCL COMMIT, ROLLBACK, SAVEPOINT, DCL-GRANT REVOKE	2 2 2 2 2
Unit V	**Clauses and MySQL Functions**	10

	1. Where Clause and conditions, constraints, NOT_NULL, UNIQUE, CHECK, DEFAULT 2. Keys, Primary Key, Foreign key, Composite key, Unique Key 3. Distinct, Order By, Group by, and Having, Group By, Order By, EXISTS 4. Functions in SQL, String, Numeric, Date, SQL Advanced functions	2 2 2 2
Unit VI	**Joins, Views, Subquery, and Trigger**	10
	1. SQL Joins- Inner, Left, Right, Cross, Self-Join, SQL Views - Create, Delete, Update View 2. ACID Properties- Atomicity, Consistency, Isolation, Durability 3. SQL Common Table Expressions (CTE)- WITH Clause, SQL Subquery 4. SQL Triggers, SQL Window Functions- Aggregate, Value, Ranking	2 2 2 2 2

Textbooks:

1. Jennifer Niederst Robbins **Learning Web Design**, O'Reilly
2. Lynn Beighley, **Head First SQL**, O'Reilly

References:

1. Wendy Willard, HTML: A Beginner's Guide, McGraw-Hill
2. David Sawyer McFarland **CSS: The Missing Manual**, O'Reilly
3. JavaScript & jQuery: Interactive Front-End Web Development – Jon Duckett, Wiley

CO–PO / CO–PSO Mapping Matrix

Scale: 3 = Strongly Related, 2 = Moderately Related, 1 = Slightly Related, 0 = Not Related

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	2	0	2	2	1	0	1	2	1	2	2
CO2	2	2	0	2	3	1	0	1	2	1	2	3
CO3	2	3	0	2	3	2	0	1	2	1	3	3
CO4	2	3	1	3	3	2	1	1	2	2	3	3
CO5	2	3	1	2	3	2	0	1	2	2	3	3
CO6	2	3	1	2	3	3	0	1	2	2	3	3

Offered as	Major
Course/ Paper Title	Co-ordinate Geometry
Course Code	26SBMT21MM
Semester	II
No. of Credits	2

Course Outcomes (COs)

CO No.	Course Outcome Statement	Bloom's Level
CO1	Recall and describe coordinate transformations (translation, rotation) and general second-degree equations for conic sections.	1 – Remembering
CO2	Explain reduction of general conics to standard forms and interpret geometric parameters such as the center and nature of conics.	2 – Understanding
CO3	Apply direction cosines/ratios to obtain equations of planes and lines in 3D and solve related geometric problems.	3 – Applying
CO4	Analyze systems of planes, bisector planes, distances and angles between planes/lines, and coplanarity conditions.	4 – Analyzing
CO5	Evaluate equations and properties of spheres, including tangent planes, intersections, and spheres through circles.	5 – Evaluating
CO6	Construct and solve advanced geometry problems using conics, planes, lines and spheres; develop mathematical models for 2D/3D configurations.	6 – Creating

Unit No	Title with Contents	No. of Lectures
Unit I	**Analytical Geometry of Two Dimensions**	**06**
	1. Change of axes: translation and rotation. 2. Conic Sections: General equation of the second degree in twovariables 3. Reduction to standard form, the center of the conic, and the nature of the conic.	2 2 2
Unit II	**Planes**	**10**
	1. Direction cosines and direction ratios, Equation of a plane, Normal form, Transform to the normal form, Plane passing through three non-collinear points, Intercept form, Angle between two planes. 2. Distance of a point from a plane, Distance betweenparallel planes, Systems of planes, two sides of planes, Bisector planes.	5 5
Unit III	**Lines in three dimensions**	**08**
	1. Equations of a line in Symmetric and unsymmetrical forms, Line passing through two points, Angle between a line and a	4

	plane. 2. Perpendicular distance of a point from a plane, Condition for two lines to be coplanar(without proof).	4
Unit IV	**Sphere**	**06**
	1. Equation of a sphere in different forms, plane section of a sphere. 2. Equation of a circle, sphere through a given circle 3. Intersection of a sphere and a line, Equation of tangent plane to a sphere.	2 2 2

Textbooks:

1. Analytic Geometry in Two and Three Dimensions: Von Steuben.
   Unit I: Chapter 8: Sec, 8.4.
2. Analytical Solid Geometry: Shantinarayan; S. Chand and Company Ltd, New Delhi,1998.
   Unit II: Chapter 1: Sec. 1.6, 1.7, Chapter 2: Sec. 2.1 to 2.7.
   Unit III: Chapter 3: Sec. 3.1 to3.4, 3.7.
   Unit IV: Chapter 6: Sec. 6.1 to 6.6.

Reference Book:

1. P.K.Jain and Khalil Ahmad, A Text Book of Analytical Geometry of Three Dimensions, Wiley Eastern Ltd. 1999.

Website: https://www.youtube.com/watch?v=HyWagR_

CO–PO / CO–PSO Mapping Matrix 26SBMT21MM- Coordinate Geometry
Scale: 3 = Strongly Related, 2 = Moderately Related, 1 = Slightly Related, 0 = Not Related

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	0	1	1	1	0	3	2	1	2	2
CO2	3	3	0	1	1	1	0	3	3	1	3	2
CO3	3	3	0	2	2	1	0	3	3	1	3	3
CO4	3	3	0	2	2	2	0	3	3	1	3	3
CO5	3	3	0	2	2	2	0	3	3	1	3	3
CO6	3	3	1	2	2	2	1	3	3	2	3	3

Offered as	Major
Course/ Paper Title	Calculus-II
Course Code	26SBMT22MM
Semester	II
No. of Credits	2

Course Outcomes (COs)

CO No.	Course Outcome Statement	Bloom's Level
CO1	Recall and explain the definition of derivative, rules of differentiation, and standard results such as continuity of differentiable functions.	1 – Remembering
CO2	Explain mean value theorems and interpret their consequences such as monotonicity and extrema tests.	2 – Understanding
CO3	Apply L'Hospital's rule, Taylor/Maclaurin expansions, and successive differentiation techniques to compute limits and derivatives.	3 – Applying
CO4	Analyze first-order differential equations (linear, separable) and study existence and uniqueness of solutions.	4 – Analyzing
CO5	Evaluate solutions of exact differential equations and use integrating factors and transformations to solve nonlinear equations.	5 – Evaluating
CO6	Construct mathematical models and solve advanced problems using differentiation techniques and differential equations in applied contexts.	6 – Creating

Unit No	Title with Contents	No. of Lectures
Unit I	**Differentiation**	**07**
	1. The Derivatives: Definition of the derivative of a function at a point, every differentiable function is continuous, Rules ofdifferentiation, Cara theodary's theorem (without proof), The chain rule, Derivative of inverse function (without proof, only examples).	4
	2. The Mean Value Theorems: Interior extremum theorem, MeanValue theorems, and their Consequences, Intervals of increasing and decreasing of a function, first derivative test for extrema.	3
Unit II	**L'Hospital Rule and Successive Differentiation**	**07**
	1. L` Hospital Rule: Indeterminate forms, L'Hospital Rules(without proof).	3
	2. Taylor's theorem: Taylor's theorem and Maclaurin's theorem with Lagrange's form ofthe remainder (Without proof).	3
	3. Successive Differentiation: The nthderivative and Leibnitz theorem for Successive differentiation.	1
Unit III	**Ordinary Differential Equations**	**08**

	1. Linear first order equations. 2. Separable equations. 3. Existence and Uniqueness of solutions of nonlinear equations.	3 3 2
Unit IV	**Exact Differential Equations**	**08**
	1. Transformation of nonlinear equations to separable equations. 2. Exact differential equations. 3. Integrating factors.	2 2 4

Textbooks:

1. Introduction to Real Analysis by R.G. Bartle and D.R. Sherbert, John Wiley and Sons, Inc,Fourth Edition.
Unit I: Chapter 6: Sec. 6.1(6.1.1 to 6.1.8), Sec 6.2(6.2.1 to 6.2.8).

Unit II: Chapter 6: Sec 6.3(6.3.1 to 6.3.7), Sec 6.4(6.4.1 to 6.4.3).

2. Differential Calculus by Shanti Narayan, Tenth Revised Edition.Unit II: Chapter 5: Sec. 5.1 to 5.6.
3. Elementary Differential equations, William F. Trench, E-book (Free download)Unit III: Chapter 2: Sec 2.1 to 2.3.
Unit IV: Chapter 2: Sec 2.4 to 2.6.

Reference Books:

1. Introduction to Real Analysis, William F. Trench, Free edition, 2010.
2. Calculus of a single variable, Ron Larson, Bruce Edwards, tenth edition.
3. Elementary Analysis, The Theory of Calculus, Kenneth A. Ross, SpringerPublication, second edition.
4. Calculus and its Applications, Marvin L. Bittinger, David J. Ellenbogen, andScott A. Surgent, Addison-Wesley, tenth edition.
5. Ordinary and Partial Differential Equations, M.D. Raisingania, S.Chand And Company,2009.

Website:

1. https://www.youtube.com/watch?v=FvYC5gB89Kc
2. https://www.youtube.com/watch?v=Im242eBqaxw

CO–PO / CO–PSO Mapping Matrix on 26SBMT21MM- Calculus-II
Scale: 3 = Strongly Related, 2 = Moderately Related, 1 = Slightly Related, 0 = Not Related

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	0	1	1	1	0	3	3	1	2	2
CO2	3	3	0	1	1	1	0	3	3	1	3	2
CO3	3	3	0	1	2	1	0	3	3	1	3	3
CO4	3	3	1	2	2	2	0	3	3	1	3	3
CO5	3	3	1	2	2	2	0	3	3	1	3	3
CO6	3	3	2	2	2	2	1	3	3	2	3	3

Offered as	Major
Course/ Paper Title	Practical on Coordinate Geometry and Calculus-II
Course Code	26SBMT23MM
Semester	II
No. of Credits	2

Course Outcomes (COs) – Practical Course

CO No.	Course Outcome Statement	Bloom's Level
CO1	Perform computations and solve problems on analytical geometry of two dimensions including change of axes and conic sections.	3 – Applying
CO2	Apply direction cosines and direction ratios to obtain equations of planes and compute angles and distances related to planes.	3 – Applying
CO3	Solve combined geometry problems involving conics and planes using standard methods and coordinate transformations.	4 – Analyzing
CO4	Solve problems on lines in three dimensions including line equations, coplanarity condition and angles with planes.	4 – Analyzing
CO5	Solve problems related to spheres and circles in 3D, including intersections, tangent planes and spheres through circles.	4 – Analyzing
CO6	Apply differentiation techniques, L'Hospital's rule, Taylor series, and methods of solving differential equations (linear, separable, exact) to solve practical problems.	5 – Evaluating

Practical number	Title	No. of Practical
Practicals Coordinate Geometry		
I	Analytical Geometry of Two Dimensions	1
II	Planes	1
III	Analytical Geometry of Two Dimensions And Planes	1
IV	Lines In Three Dimensions	1

V	Sphere	1
VI	Line In Three Dimensions and Sphere	1
Practicals on Calculus-II		
I	Differentiation	1
II	L'Hospital Rule and Successive Differentiation	1
III	Differentiation, L'Hospital Rule, and Successive Differentiation	1
IV	Ordinary Differential Equations	1
V	Exact Differential Equations	1
VI	Ordinary Differential Equations and Exact Differential Equations	1

CO–PO / CO–PSO Mapping Matrix 26SBMT23MM- Practical on Coordinate Geometry and Calculus-II

Scale: 3 = Strongly Related, 2 = Moderately Related, 1 = Slightly Related, 0 = Not Related

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	0	1	2	1	1	3	2	1	3	3
CO2	3	3	0	1	2	1	1	3	2	1	3	3
CO3	3	3	0	1	2	2	1	3	3	1	3	3
CO4	3	3	0	1	2	2	1	3	3	1	3	3
CO5	3	3	0	1	2	2	1	3	3	1	3	3
CO6	3	3	1	2	2	2	1	3	3	2	3	3