

NEP 2023 Pattern

T.Y.B.Sc

Mathematics



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. Degree Program in Mathematics
(Faculty of Science & Technology)**

Syllabus of T.Y. B.Sc Mathematics

Choice Based Credit System NEP 2023 Pattern

Syllabus to be implemented from the academic year 2025-2026

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-V and Semester-VI (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.

Aims:

Sr. No.	Aims
1.	Give the students a sufficient knowledge of fundamental principles, methods, and a clear perception of numerous powers of mathematical ideas and tools and know-how to use them by modeling, solving, and interpreting.
2.	Reflecting the broad nature of the subject and developing mathematical tools for Continuing further study in various fields of science and technology.
3.	Enhancing student's overall development and equipping them with mathematical Modeling abilities, problem solving skills, creative talent, and power of communication necessary for various kinds of employment.
4.	Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

Objectives:

Sr. No.	Objectives
1.	A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, and terminology recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.
2.	A student should get a relational understanding of mathematical concepts and concerned structures and should be able to follow the patterns involved, in mathematical reasoning.
3.	A student should get adequate exposure to global and local concerns that explore many aspects of Mathematical Sciences.
4.	A student should get adequate exposure to global and local concerns that explore Many aspects of Mathematical Sciences.
5.	A student should be able to apply their skills and knowledge that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques to process the information, and draw the relevant conclusion.
6.	A student should be made aware of mathematics's history and its past, present, and future role as part of our culture.

Course Outcome:

Sr. No.	Outcome
1.	The mathematical maturity of students in their current and future courses shall develop.
2.	The student develops theoretical, applied, and computational skills.
3.	The student gains confidence in proving theorems and solving problems.

Structure of the B.Sc Mathematics Course:

Sem	Offered as	Course code	Title of course	No. of Credits
First Year				
I	Major	23SBMT11MM	Foundation of Mathematics	2
I	Major	23SBMT12MM	Calculus-I	2
I	Major	23SBMT13MM	Practical Course based on 23SBMT11MM and 23SBMT12MM	2
I	VSC	23SBMT11VS	LaTeX for Scientific Writing	2
II	Major	23SBMT21MM	Co-ordinate Geometry	2
II	Major	23SBMT22MM	Calculus-II	2
II	Major	23SBMT23MM	Practical Course based on 23SBMT21MM and 23SBMT22MM	2

Sem	Offered as	Course code	Title of course	No. of Credits
Second Year				
III	Major	23SBMT31MM	Calculus of Several Variables	2
III	Major	23SBMT32MM	Laplace Transform	2
III	Major	23SBMT33MM	Numerical Methods and Software Maxima	2
III	Major	23SBMT31IK	History and Development of Mathematics in India	2
	Major FP	23SBMT31FP	Field Project	2
IV	Major	23SBMT41MM	Linear Algebra	2
IV	Major	23SBMT42MM	Vector Calculus	2
IV	Major	23SBMT43MM	Ordinary Differential Equation and Software Maxima	2
IV	Major	23SBMT44MM	Programming with Python	2
IV	Major CEP	23SBMT41CEP	Community Engagement Program	2
B.Sc. Degree				
Sem	Offered as	Course code	Title of course	No. of Credits
V	Major (Theory)	23SBMT51MM	Metric Spaces	2

V	Major (Theory)	23SBMT52MM	Real Analysis-I	2
V	Major (Theory)	23SBMT53MM	Group Theory	2
V	Major (Practical)	23SBMT54MM	Practical Course Based on 23SBMT51MM 23SBMT52MM	2
V	Major (Practical)	23SBMT55MM	Advanced Ordinary Differential Equations and Practical based on 23SBMT53MM	2
Any one of the Below				
V	Major (Elective)	23SBMT51MEA	Operations Research -I	2
V	Major (Elective)	23SBMT51MEB	Computational Geometry	2
V	Major (Elective)	23SBMT51MEC	Course from Swayam /NPTEL / E Pathashala etc.	2
Any one of the Below				
V	Major (Elective)	23SBMT52MEA	Number Theory	2
V	Major (Elective)	23SBMT52MEB	Financial Mathematics	2
V	Major (Elective)	23SBMT52MEC	Course from Swayam /NPTEL / E Pathashala etc.	2
V	VSC	23SBMT51VS	Mathematical Computing Using Python	2
Sem	Offered as	Course code	Title of course	No. of Credits
VI	Major (Theory)	23SBMT61MM	Complex Analysis	2
VI	Major (Theory)	23SBMT62MM	Real Analysis-II	2
VI	Major (Theory)	23SBMT63MM	Ring Theory	2
VI	Major (Practical)	23SBMT64MM	Practical Course Based on 23SBMT61MM 23SBMT62MM	2
VI	Major (Practical)	23SBMT65MM	Partial Differential Equations and Practical based on 23SBMT63MM	2
Any one of the Below				
VI	Major (Elective)	23SBMT61MEA	Operations Research -II	2
VI	Major (Elective)	23SBMT61MEB	Cryptography	2
VI	Major (Elective)	23SBMT61MEC	Course from Swayam /NPTEL / E Pathashala etc.	2
Any one of the Below				
VI	Major (Elective)	23SBMT62MEA	Graph Theory	2
VI	Major (Elective)	23SBMT62MEB	Lebesgue Integration	2
VI	Major (Elective)	23SBMT62MEC	Course from Swayam /NPTEL / E Pathashala etc.	2
VI	Major OJT	23SBMT61OJ	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			

Details of Syllabus:**Semester-V**

Course/ Paper Title	Metric Spaces
Course Code	23SBMT51MM
Semester	V
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Basic Notions	6
	1.1 Definition and Examples.	3
	1.2 Open Balls and Open Sets.	3
Unit II	Convergence	6
	2.1 Convergent Sequences.	1
	2.2 Limit and Cluster Points.	1
	2.3 Cauchy Sequences and Completeness.	1
	2.4 Bounded Sets.	1
	2.5 Dense Sets.	1
	2.6 Boundary of a Set.	1
Unit III	Continuity	8
	3.1 Continuous Functions.	1
	3.2 Equivalent Definitions of Continuity.	1
	3.3 Topological Property.	1
	3.4 Uniform Continuity.	2
	3.5 Limit of a Function.	1
	3.6 Open and Closed maps.	2
Unit IV	Compactness and Connectedness	10

	4.1 Compact Spaces and their Properties.	5
	4.2 Connectedness.	5

Text book:

1. Topology of Metric Spaces, S. Kumaresan, Narosa Publishing House, Second Edition, 2011.

Unit I: Chapter-1: Sec. 1.1; 1.1.14(only Statement) (Except- 1.1.9 to 1.1.12, 1.1.15 to 1.1.27, 1.1.33 to 1.1.37), Sec. 1.2; 1.2.40(only Statement), 1.2.42 (only Statement) (Except - 1.2.9 to 1.2.17, 1.2.41, 1.2.49 to 1.2.55, 1.2.57 to 1.2.60, 1.2.65, 1.2.66, 1.2.70 to 1.2.73, 1.2.76, 1.2.77, 1.2.87, 1.2.88, 1.2.107).

Unit II: Chapter -2: Sec. 2.1 (Except 2.1.7, 2.1.8, 2.1.11 to 2.1.13, 2.1.15 to 2.1.19), Sec. 2.2; 2.2.7 (on metric space), 2.2.19 (on metric space) (Except- 2.2.11, 2.2.21, 2.2.31), Sec. 2.3; 2.3.12(only statement) (Except - 2.3.4, 2.3.19, 2.3.20), Sec. 2.4 (Except 2.4.8 to 2.4.13, 2.4.16), Sec. 2.5 (Except 2.5.3, 2.5.4, 2.5.15), Sec. 2.7.

Unit III: Chapter -3: Sec. 3.1 (Except 3.1.9, 3.1.10, 3.1.12, 3.1.14, 3.1.21 to 3.1.24), Sec. 3.2; 3.2.35 (only statement), 3.2.53 (only statement), (Except- 3.2.3, 3.2.4, 3.2.6, 3.2.8, 3.2.12 to 3.2.15, 3.2.19, 3.2.29, 3.2.37 to 3.2.43, 3.2.51, 3.2.52), Sec. 3.3 (Except 3.3.5, 3.3.6, 3.3.10), Sec. 3.4 (Except 3.4.4, 3.4.5, 3.4.12 to 3.4.14, 3.4.16), Sec. 3.5, Sec. 3.6.

Unit IV: Chapter -4: Sec. 4.1; 4.1.15(only statement) (Except - 4.1.27 to 4.1.31, 4.1.35, 4.1.36), Sec. 4.2 (Except- 4.2.2, 4.2.6, 4.2.9, 4.2.12 to 4.2.14), Sec. 4.3; 4.3.1(only statement) (Except 4.3.16, 4.3.25, 4.3.26, 4.3.27).

Chapter -5: Sec. 5.1; 5.1.6(on metric space), 5.1.7(only statement) (Except - 5.1.12, 5.1.15 to 5.1.17, 5.1.23, 5.1.24, 5.1.27, 5.1.33, 5.1.34, 5.1.36, 5.1.48).

Reference books:

1. Metric Spaces, Q.H. Ansari: Narosa Publishing House, New Delhi.
2. Metric Spaces, Satish Shirali, H. Vasudeva, Springer.
3. First Course in Metric Spaces, B. K. Tyagi, Cambridge University Press.
4. Metric spaces, M. O. Searcoid, Springer, 2007.
5. Metric Spaces, E. T. Copson, University Press, Cambridge, Second edition, Mumbai, 1978.

Website:

1. <https://www.youtube.com/playlist?list=PLDzvuf9Uf4FNIIFfFIWKSBCqN3c0tkTuo>

Course/ Paper Title	Real Analysis-I
Course Code	23SBMT52MM
Semester	V
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Logic and Set Theory	8
	1.1 Introduction.	1
	1.2 “And” and “Or”.	1
	1.3 “Not” and “If - Then”.	1
	1.4 Contrapositive, Converse, and “Iff”	1
	1.5 Quantifiers.	1
	1.6 Set Theory and Venn Diagrams.	1
	1.7 Relations and Functions.	1
	1.8 Countable and Uncountable Sets.	1
Unit II	Sequences of Real Numbers	6
	2.1 Definition of Sequence and Subsequence.	1
	2.2 Limit of a Sequence.	1
	2.3 Convergent Sequences.	1
	2.4 Divergent Sequences.	1
	2.5 Bounded Sequences.	1
	2.6 Monotone Sequences.	1
Unit III	Operations on sequences, Limit superior, Limit inferior, Cauchy sequences	6
	3.1 Operations on Convergent Sequences.	1
	3.2 Operations on Divergent Sequences.	1
	3.3 Limit Superior and Limit Inferior.	2
	3.4 Cauchy Sequences.	2
Unit IV	Series of Real Numbers	10

	4.1 Convergence and Divergence.	1
	4.2 Series with nonnegative terms.	1
	4.3 Alternating series.	1
	4.4 Conditional convergence and absolute convergence.	1
	4.5 Rearrangements of series.	1
	4.6 Tests for absolute convergence.	1
	4.7 Series whose terms form a non-increasing sequence.	2
	4.8 The class l^2 .	2

Textbooks:

1. Real Analysis and Foundations, Steven G. Krantz, Second Edition Chapman and Hall/CRC.

Unit I: Chapter 1: Sec 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8.

2. Methods of Real Analysis, Richard R. Goldberg, Second Edition, John Wiley & Sons, Inc

Unit II: Chapter 2: Sec 2.1, 2.2, 2.3, 2.4, 2.5, 2.6.

Unit III: Chapter 2: Sec 2.7, 2.8, 2.9, 2.10.

Unit IV: Chapter 3: Sec 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.10.

Reference Books: -

1. Real Analysis, N.L. Carothers, Cambridge University Press
2. Introduction to Real Analysis, Robert, G. Bartle, Third edition, Donald Sherbert, John Wiley and Sons.
3. A Basic Course in Real Analysis, Ajit Kumar and S. Kumaresan, Second edition, CRC Press (Chapman and Hall).
4. A Course of Mathematical Analysis, Shanti Narayan and Mittal, S. Chand and Co. (2002).
5. Mathematical Analysis, S.C. Malik and Savita Arora, Third edition, New Age International Publications.

Website:

1. https://ocw.mit.edu/courses/18-100a-real-analysis-fall-2020/video_galleries/video-lectures

Course/ Paper Title	Group Theory
Course Code	23SBMT53MM
Semester	V
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Groups	6
	1.1 Binary Operation	2
	1.2 Isomorphic Binary Structures	2
	1.3 Groups	2
Unit II	Subgroups and Cyclic Groups	6
	2.1 Subgroups.	3
	2.2 Cyclic Groups.	3
Unit III	Permutations, Cosets, and Direct Products	9
	2.1 Groups of Permutations.	2
	2.2 Orbits.	1
	2.3 Cycles.	1
	2.4 Alternating Groups.	1
	2.5 Cosets and the Theorem of Lagrange.	2
	2.6 Direct Products.	2
Unit IV	Homomorphisms and Factor Group	9
	3.1 Homomorphisms.	3
	3.2 Factor Groups.	3
	3.3 Factor-Group Computations and Simple Groups.	3

Text book:

1. A First Course in Abstract Algebra, John B. Fraleigh, Seventh Edition, Pearson.

Unit I: Chapter 1: Sec. 2 to 4.

Unit II: Chapter 2: Sec. 5, 6.

Unit III: Chapter 3: Sec. 8 to 11 (except finitely generated Abelian Groups).

Unit IV: Chapter 3: Sec. 13 to 15.

Reference Books:

1. P.B. Bhattacharya, S.K. Jain and S.R. Nagpaul, Basic Abstract Algebra, Second Edition, Cambridge University Press.
2. I. N. Herstein, Topics in Algebra, John Wiley and Sons.
3. N.S. Gopalakrishnan, University Algebra, Second Edition, New Age International, New Delhi, 1986.
4. Joseph. A. Gallian, Contemporary Abstract Algebra, Fourth Edition, Narosa Publishing House.

Website:

1. <https://www.digimat.in/nptel/courses/video/111106113/L01.html>

Course/ Paper Title	Practical Course Based on 23SBMT51MM 23SBMT52MM
Course Code	23SBMT54MM
Semester	V
No. of Credits	2

Practical number	Title	No. of Practical
Practicals based on 23SBMT51MM		
I	Definition and examples of Metric Spaces (Unit-I)	1
II	Open and Closed sets in metric spaces-I (Unit-I)	1
III	Open and Closed sets in metric spaces-II (Unit-I)	
IV	Convergence-I (Unit II)	1
V	Continuity-I (Unit III)	1
VI	Continuity-II (Unit-III)	1
VII	Compactness (Unit IV)	1
VIII	Connectedness (Unit IV)	1
Practicals based on 21SBMT52MM		

I	Logic, Set Theory (Unit-I)	1
II	Functions and Cardinality (Unit-I)	1
III	Sequences of Real Numbers-I (Unit-II)	1
IV	Sequences of Real Numbers-II (Unit-II)	1
V	Operations on sequences, Limit superior, Limit inferior, Cauchy sequences (Unit-III)	1
VI	Series of Real Numbers-I (Unit-IV)	1
VII	Series of Real Numbers-II (Unit-IV)	1

Course/ Paper Title	Practical Course Based on 23SBMT53MM and Advanced Ordinary Differential Equations
Course Code	23SBMT55MM
Semester	V
No. of Credits	2

Syllabus of Advanced Ordinary Differential Equations to be covered

Unit No	Title with Contents	No. of Hours
Unit I	Power Series Solutions And Special Functions	9
	2.1 Second-Order Linear Equations: Ordinary Points.	1
	2.2 Regular Singular Points.	2
	2.3 More on Regular Singular Points.	3
	2.4 Gauss's Hypergeometric Equation.	3
Unit II	Numerical Methods For Differential Equations	11
	3.1 Introductory Remarks.	1
	3.2 The Method of Euler.	3
	3.3 The Error Term.	1
	3.4 An Improved Euler Method.	3
	3.5 The Runge-Kutta Method.	3
Unit III	Systems Of First-Order Equations	10

	4.1 Introductory Remarks.	2
	4.2 Linear Systems.	2
	4.3 Homogeneous Linear Systems with Constant Coefficients.	3
	4.4 Non Homogeneous Linear Systems with Constant Coefficients.	3

Text book:

1. Differential Equations, Theory, Technique, and Practice, George F. Simmons and Steven G. Krantz, Mc Graw Hill.

Unit I: Chapter 3: Sec. 3.3- 3.5.

Unit II: Chapter 4: Sec. 4.3- 4.6.

Unit III: Chapter 9: Sec. 3.1- 3.3.

Unit IV: Chapter 10 Sec. 10.1 -10.4.

Reference books:

1. Differential Equations with Applications and Historical Notes, George F. Simmons, Third Edition, CRC Press.

2. Elementary Differential Equations, Rainville and Bedient, Macmillan Publication.

3. Elementary Differential Equations with Boundary Value Problems, William F. Trench

Website:

1. <https://nptel.ac.in/courses/111106100>

Practical number	Title	No. of Practical
Practicals based on 23SBMT53MM		
I	Isomorphic Binary Structures and Groups (Unit I)	1
II	Subgroups and Cyclic Groups (Unit II)	1
III	Subgroups and Cyclic Groups (Unit II)	1
IV	Groups of Permutations, Orbits and Cycles (Unit III)	1
V	Alternating Groups, Cosets and the Theorem of Lagrange (Unit III)	1
VI	Direct Products and Homomorphisms (Unit IV)	1
VII	Factor Groups, Factor Group Computations, and Simple Groups	1

	(Unit IV)	
Practicals based on Advanced Ordinary Differential Equations		
I	Power Series Solutions And Special Functions – I (Unit I)	1
II	Power Series Solutions And Special Functions – II (Unit I)	1
III	Power Series Solutions And Special Functions – III (Unit I)	1
IV	Numerical Methods for Ordinary Differential Equations-I (Unit II)	1
V	Numerical Methods for Ordinary Differential Equations-II (Unit II)	1
VI	Numerical Methods for Ordinary Differential Equations-III(Unit II)	1
VII	System of First Order Equations-I (Unit III)	1
VIII	System of First Order Equations-II (Unit III)	1

Course/ Paper Title	Operations Research-I
Course Code	23SBMT51MEA
Semester	V
No. of Credits	2

Syllabus:

Unit No	Title with Contents	No. of Hours
Unit 1	Modeling with Linear Programming	6
	1.1 Two variable LP Model	1
	1.2 Solution of LP Model by Graphical Method	4
	1.3 Selected LP Model Applications	1
Unit II	The Simplex Method	12
	2.1 The Simplex Method.	3
	2.1.1 Iterative Nature of the Simplex Method.	
	2.1.2 Computational Details of Simplex Method.	
	2.1.3 Summary of the Simplex Method.	
	2.2 Artificial Starting Solution.	4
	2.2.1 M- Method.	

Unit-IV: Chapter 5: 5.4.

Reference books:

1. Operations Research Theory and Applications, J K Sharma, Sixth Edition, 2016, Trinity Press.
2. Operations Research, Er. Prem Kumar Gupta, Dr. D.S. Hira, Seventh Edition, S. Chand and Company.

Website:

1. <https://nptel.ac.in/courses/110106062>

Course/ Paper Title	Computational Geometry
Course Code	23SBMT51MEB
Semester	V
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Two Dimensional Transformations	16
	1.1 Introduction.	1
	1.2 Representation of points.	1
	1.3 Transformations and matrices.	1
	1.4 Transformation of – points, straight lines.	1
	1.5 Midpoint Transformation.	1
	1.6 Transformation of – parallel lines, intersecting lines.	1
	1.7 Transformation: rotations, reflections, scaling.	1
	1.8 Combined transformations.	1
	1.9 Transformation of a unit square.	1
	1.10 Solid body transformations.	1
	1.11 Translations and homogeneous coordinates.	1
	1.12 Rotation about an arbitrary point.	1
	1.13 Reflection through an arbitrary line.	1
	1.14 Projection – A Geometric Interpretation of Homogeneous	1

	Coordinates.	
	1.15 Overall Scaling.	1
	1.16 Points at Infinity.	1
Unit II	Three Dimensional Transformations	5
	2.1 Introduction.	1
	2.2 Three dimensional – Scaling, shearing, rotation, reflection, translation.	1
	2.3 Multiple transformations.	1
	2.4 Rotation about – an axis parallel to coordinate axes, an arbitrary axis in space.	1
	2.5 Reflection through an arbitrary plane.	1
Unit III	Projection	4
	3.1 Orthographic projections.	1
	3.2 Axonometric projections.	1
	3.3 Oblique projections.	1
	3.4 Perspective Transformations.	1
Unit IV	Plane and Space Curves	5
	4.1 Introduction.	1
	4.2 Curve representation.	2
	4.3 Parametric curves.	1
	4.4 Parametric representation of a circle.	1
	4.5 Bezier Curves – Introduction, definition, properties (without proof), Curve fitting (up to $n = 3$), equation of the curve in matrix form (up to $n = 3$).	1

Text book:

1. D. F. Rogers, J. A. Adams, Mathematical Elements for Computer Graphics, Tata McGraw Hill, Second Edition.

Unit 1: Chapter 2: Sec. 2.1 to 2.20

Unit 2: Chapter 3: Sec. 3.1 to 3.10.

Unit 3: Chapter 3: Sec. 3.12 to 3.15

Unit 4: Chapter 4: Sec. 4.1, 4.2, 4.4, 4.5, Chapter 5: Sec. 5.1, 5.8.

Reference books:

1. Computer Graphics with OpenGL, Donald Hearn, M. Pauline Baker, Warren Carithers, Pearson (4th Edition).
2. Schaum Series, Computer Graphics by Zhigang Xiang and Roy A. Plastock.

Website:

1. <https://www.youtube.com/playlist?list=PLDzvuf9Uf4FNIIFfFlWKSBCqN3c0tkTuo>

Course/ Paper Title	Number Theory
Course Code	23SBMT52MEA
Semester	V
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Divisibility	6
	1.1 Introduction.	2
	1.2 Divisibility.	2
	1.3 Prime.	2
Unit II	Congruences	6
	2.1 Congruences.	2
	2.2 Solution of Congruences.	2
	2.3 The Chinese Remainder Theorem.	2
Unit III	Quadratic Reciprocity	8
	3.1 Quadratic residues.	2
	3.2 Quadratic reciprocity.	2
	3.3 The Jacobi Symbol.	2
Unit IV	Greatest integer function	6
	4.1 Greatest integer function.	2
	4.2 Arithmetic functions.	2
	4.3 The Mobius Inversion formula.	2
Unit V	Diophantine Equations	4

	5.1 Diophantine equations $ax + by = c$.	2
	5.2 Pythagorean triplets.	2

Text book:

1. An Introduction to Theory of Numbers, Niven, H. Zuckerman and H.L. Montgomery, Fifth Edition, John Wiley and Sons.

Unit I: Chapter 1 Sec. 1.1- 1.3.

Unit II: Chapter 2 Sec. 2.1- 2.3.

Unit III: Chapter 3 Sec. 3.1- 3.3.

Unit IV: Chapter 4 Sec. 4.1 -4.3.

Unit V: Chapter 5 Sec. 5.1 and 5.3.

Reference books:

1. Elementary Number Theory, David M. Burton, Second Edition, Universal Book Stall, New Delhi, 1991.

Website:

1. <https://archive.nptel.ac.in/courses/111/101/111101137/>

Course/ Paper Title	Financial Mathematics
Course Code	23SBMT52MEB
Semester	V
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Mathematical models in economics, recurrences, and the elements of finance	8
	1.1 Introduction, a model of the market, market equilibrium and excise tax.	2
	1.2 The first-order recurrence, limits, special cases, and continuous compounding of interest.	3
	1.3 Interest and capital growth, income generation, the interval	3

	of compounding.	
Unit II	The Cobweb model, and Introduction to optimization	8
	2.1 Stability of market equilibrium, the general linear case and economic interpretation.	4
	2.2 Marginal cost as a derivative, Profit maximization, critical points, optimization in an interval and infinite intervals.	4
Unit III	The derivative in economics	6
	3.1 The elasticity of demand, profit maximization again	3
	3.2 Competition versus monopoly, the efficient small firm, startup and break-even points.	3
Unit IV	Linear equations and the input-output model	8
	4.1 Making money with matrices, a two-industry ‘economy’, arbitrage portfolios and state prices and IS-LM analysis.	4
	4.2 An economy with many industries and the technology matrix.	4

Text book:

1. Mathematics for Economics and Finance Methods and Modeling, Martin Anthony and Norman Biggs, Cambridge University Press, Reprint 2012.

Unit-1: Chapters-3: 3.2, 3.3, 3.4 and Chapter-4.

Unit-2: Chapter-5, Chapter-6: 6.3, Chapter-8.

Unit-3: Chapter-9, Chapter-10.

Unit-4: Chapter-15:15.3, Chapter-16:16.1, Chapter-17:17.4, Chapter-18:18.5, Chapter- 19.

Reference books:

1. Mathematical Economics, Edward T. Dowling, Second Edition, Schaum’s Outline Series, McGraw Hill International Edition.
2. Corporate Finance- Theory and Practice, Aswath Damodaran, John Wiley and Sons, Inc.
3. An Introduction to Mathematical Finance, Sheldon M. Ross, Cambridge University Press.

Course/ Paper Title	Mathematical Computing with Python
Course Code	23SBMT51VS
Semester	V
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Data Visualization with Python	4
	2.1 Seaborn.	1
	2.2 Matplotlib.	1
	2.3 Plotly.	1
	2.4 MayaVI.	1
Unit II	Dictionary and Sorting, Minimum and Maximum	6
	3.1 Introduction to Dictionary, Avoiding Key Error Exceptions, Iterating Over a Dictionary.	2
	3.2 Dictionary with default values, Merging dictionaries, Accessing keys and values, Accessing values of a dictionary, Creating dictionary, Creating an ordered dictionary, Unpacking dictionaries using the ** operator.	2
	3.3 Sorting, Minimum and Maximum: Special case: dictionaries, Using the key argument, Default argument to max, min, Getting a sorted sequence, Extracting N largest or N smallest items from an iterable, Getting the minimum or maximum of several values, Minimum and Maximum of a sequence.	2
Unit III	Ordinary Differential Equations Using Python	6

	4.1 Solving First-Order Ordinary Differential Equations Using Python	2
	4.2 Solving Second-Order Ordinary Differential Equations Using Python	2
	4.3 Solving System of Ordinary Differential Equations Using Python	2
Unit IV	Computational Geometry	10
	4.1 The distance between two points, Lists of Points – the Point List class, Integer point lists, Ordered Point sets, Extreme Points of a Point List, Random sets of Points not in general position.	1
	4.2 Displaying Points and other geometrical objects, Lines, rays, and line segments, The geometry of line segments, Displaying lines, rays and line segments.	1
	4.3 Representing polygons in Python, Triangles, Signed area of a triangle, Triangles and the relationships of points to lines, is Collinear, is Left, is Left On, is Right, is Right On, Between.	2
	4.4 Two dimensional rotation and reflection.	2
	4.5 Three dimensional rotation and reflection.	2
	4.6 Generation of Bezier curve with given control points.	2
Unit V	Study of Operations Research in Python	4
	5.1 Linear Programming in Python.	2
	5.2 Introduction to Simplex Method in Python.	2

Text books:

1. Python: Notes for Professionals, Goalkicker.com, Free Programming books.

Unit-I: Chapter-108

Unit-II: Chapter-19 Sec- 19.1 to 19.10 and Chapter-72: Sec. 72.1 to 72.8

2. Solving Ordinary Differential Equations in Python, Joakim Sundnes, Simula Open Access Springer

Unit-III: Chapter 1, Chapter 2

3. Interactive Computational Geometry in Python, Jim Arlow,

Unit-IV: Chapter-1: Sec.1 to 7, Chapter-2: Sec.1 to 2, Chapter-3: Sec.1, 3 to 11, Chapter-4: Sec.1

Operations Research: **Unit-V:** <https://pypi.org/project/PuLP>

Reference books:

1. Fundamentals of Python - First Programs, Lambert K. A. Cengage Learning India, 2015.
2. Introduction to Computing and Programming in Python, Guzdial, M. J., Pearson India.
3. Introduction to Scientific Computing Using Python, Application Development Focus, Ljjobomir Perkovic, second edition, Wiley Publication.
4. Jim Arlow, Interactive Computational Geometry in Python.
5. Python Programming Using Problem Solving Approach, Reema Thareja, Oxford University Press.

Website:

1. <https://www.geeksforgeeks.org/geometric-algorithms/>
2. <https://towardsdatascience.com/using-python-and-operational-research-to-optimize-your-happiness- d96ab12bfb7b>

Practical number	Title	No. of Practical
Practicals based on 23SBMT51VS		
I	Graphics Using Turtle	1
II	Data Visualization (Unit I)	1
III	Dictionary, Sorting, Minimum and Maximum (Unit II)	1
IV	Ordinary Differential Equations Using Python-I	1
V	Ordinary Differential Equations Using Python-II	1
VI	Ordinary Differential Equations Using Python-III	1
VII	Application of Computational Geometry-I (Unit IV)	1
VIII	Application of Computational Geometry-II (Unit IV)	1
IX	Application of Computational Geometry-III (Unit IV)	1

X	Study of graphical aspects of two-dimensional transformation matrix using Matplotlib (Unit IV)	1
XI	Study of graphical aspects of three-dimensional transformation matrix using Matplotlib (Unit IV)	1
XII	Study of graphical aspects of three-dimensional transformation matrix using Matplotlib and Study of effect of the concatenation of two-dimensional and three-dimensional transformations (Unit IV)	1
XIII	Generation of Bezier curve using given control points (Unit IV)	1
XIV	Study of Operational Research in Python-I (Unit V)	1
XV	Study of Operational Research in Python-II (Unit V)	1

Semester-VI

Course/ Paper Title	Complex Analysis
Course Code	23SBMT61MM
Semester	VI
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	Analytic Functions	8
	1.1 Functions of a Complex Variables.	1
	1.2 Limits, Theorems on limits, Limits involving the point at infinity, Continuity, Derivatives, Differentiation formulas.	2
	1.3 Cauchy- Riemann Equations, Sufficient Conditions for Differentiability.	2
	1.4 Polar coordinates, Analytic functions, Harmonic functions.	3

Unit II	Elementary Functions	6
	2.1 The Exponential functions.	1
	2.2 The Logarithmic function, Branches and derivatives of logarithms, Some identities Involving logarithms.	3
	2.3 Complex exponents, Trigonometric functions.	2
Unit III	Integrals	8
	3.1 Derivatives of functions, Definite integrals of functions.	1
	3.2 Contours, Contour integral, Examples.	2
	3.3 Upper bounds for Moduli of contour integrals, Anti-derivatives.	2
	3.4 Cauchy-Goursat Theorem (without proof), Simply and multiply Connected domains, Cauchy integral formula, An extension of Cauchy integral formula, Some consequences of extension, Liouville's Theorem and Fundamental Theorem of Algebra.	3
Unit IV	Series	3
	4.1 Convergence of sequences and series (Theorems without proof).	1
	4.2 Taylor's series (without proof), Laurent series (without proof), examples only.	2
Unit V	Residues and Poles	5
	5.1 Isolated singular points, Residues.	1
	5.2 Cauchy residue theorem, residue at infinity, types of isolated singular points, residues at poles.	2
	5.3 Zeros of analytic functions, zeros and poles.	2

Text book:

1. Complex Variables and Applications, J. W. Brown and R.V. Churchill, International Student Edition, Eighth Edition, 2009.

Unit-I: Chapter 2: Sec.12, 15 to 26.

Unit-II: Chapter 3: Sec.29 to 34.

Unit-III: Chapter 4: Sec. 37 to 45, 46 and 48 to 53.

Unit-IV: Chapter 5: Sec. 55 to 57, 59, 60, 62.

Unit -V: Chapter 6: Sec. 68 to 76.

Reference books:

1. Complex Analysis, S. Ponnusamy, Second Edition, Narosa Publication.
2. Complex Analysis, S. Lang, Springer Verlag.
3. An Introduction to Complex Analysis, A.R. Shastri, MacMillan.
4. Complex Analysis, L.V. Ahlfors, Third Edition, McGraw Hill, 2000.
5. Introduction to Complex Analysis, H. A. Priestley, Second Edition (Indian), Oxford, 2006.

Website:

1. <https://youtube.com/c/kumarhcu>

Course/ Paper Title	Real Analysis-II
Course Code	23SBMT62MM
Semester	VI
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	Riemann Integration	10
	1.1 Sets of Measure zero.	1
	1.2 Definition of the Riemann Integral.	2
	1.3 Existence of the Riemann Integral.	2
	1.4 Properties of the Riemann Integral.	2
	1.5 Fundamental Theorems of Calculus.	3
Unit II	Improper Integrals	8
	2.1 Improper Integrals on Closed and Bounded Intervals.	2
	2.2 Tests for Convergence of Positive Integrands.	2
	2.3 Improper Integrals on Unbounded Intervals and Tests	2

	for their Convergence. 2.4 Tests for Convergence of the Integral of Product.	2
Unit III	Sequences of Functions	6
	3.1 Point wise Convergence of Sequences of Functions.	2
	3.2 Uniform Convergence of Sequences of Functions.	2
	3.3 Consequences of Uniform Convergence.	2
Unit IV	Series of Functions	6
	4.1 Convergence and Uniform Convergence of Series of Functions.	4
	4.2 Integration and Differentiation of Series of Functions.	2

Text book:

1. Methods of Real Analysis, Richard R. Goldberg, Second Edition, John Wiley & Sons, Inc

Unit -I: Chapter -7: Sec. 7.1, 7.2, 7.3, 7.4, 7.8.

Unit -III: Chapter - 9: Sec. 9.1, 9.2, 9.3.

Unit -IV: Chapter - 9: Sec. 9.4, 9.5.

2. Introduction to Real Analysis, Eighth Edition, S.K. Mapa, Sarat Book House

Unit-II: Chapter - 12: Sec. 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, 12.7, 12.8, 12.9, 12.10

Reference books:

1. Real Analysis, N.L. Carothers, Cambridge University Press.

2. Introduction to Real Analysis, Robert G. Bartle, Donald Sherbert, Third Edition, John Wiley and Sons.

3. A Basic Course in Real Analysis, Ajit Kumar and S. Kumaresan, Second Indian, CRC Press (Chapman and Hall)

4. A Course of Mathematical Analysis, Revised edition, Shanti Narayan and Mittal - S. Chand and Company (2002).

5. Mathematical Analysis, S.C. Malik and Savita Arora, Third Edition, New Age International Publications.

Website:

1. https://www.youtube.com/watch?v=F1ojdxtN__4

2. <https://nptel.ac.in/courses/111106053>

Course/ Paper Title	Ring Theory
Course Code	23SBMT63MM
Semester	VI
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Lectures
Unit I	Rings and Fields	6
	1.1 Rings and Fields. 1.1.1 Definitions and Basic Properties. 1.1.2 Homomorphisms and Isomorphisms. 1.1.3 Fields.	2
	1.2 Integral Domains. 1.2.1 Divisors of Zeros and Cancellation. 1.2.2 Integral Domains. 1.2.3 The Characteristics of a Ring.	2
	1.3 The Field of Quotients in an Integral Domain.	2
Unit II	Rings of Polynomials	8
	2.1 Polynomials in an indeterminate.	2
	2.2 The Evaluation Homomorphisms	2
	2.3 Factorization of Polynomial over a Field; The Division Algorithm in $F[X]$.	2
	2.4 Irreducible Polynomials, Uniqueness of Factorization in $F[X]$.	2
Unit III	Ideals and Factor Rings	6

Reference books:

1. Contemporary Abstract Algebra, Joseph A. Gallian, Seventh Edition Pearson
2. Abstract Algebra, David S. Dummit and Richard M. Foote, Third Edition, Prentice Hall of India.
3. Abstract Algebra, I. N. Herstein, Third Edition, Prentice Hall of India.
4. Abstract Algebra, P.B. Bhattacharya, S.K. Jain, and S.R. Nagpaul, Second Edition, Cambridge University Press.

Website:

1. <https://nptel.ac.in/courses/111106131>

Course/ Paper Title	Practical Course based on 23SBMT61MM and 23SBMT62MM
Course Code	23SBMT64MM
Semester	VI
No. of Credits	2

Practical number	Title	No. of Practical
Practicals based on 23SBMT61MM		
I	Analytic Functions-I (Unit I)	1
II	Analytic Functions-I (Unit I)	1
III	Elementary Functions (Unit II)	1
IV	Integrals - I (Unit III)	1
V	Integrals - II (Unit III)	1
VI	Series-I (Unit IV)	1
VII	Series-II (Unit IV)	1
VIII	Residues and Poles (Unit IV)	1
Practicals based on 23SBMT62MM		
I	Definition and Existence of Riemann Integral (Unit I)	1
II	Properties of Riemann Integrals and Applications (Unit I)	1
III	Improper Integrals (Unit II)	1

IV	Pointwise Convergence of Sequences of Functions (Unit III)	1
V	Uniform Convergence of Sequences of Functions (Unit III)	1
VI	Series of Functions: Convergence and Divergence-I (Unit IV)	1
VII	Series of Functions: Convergence and Divergence-II (Unit IV)	1

Course/ Paper Title	Practical Course Based on 23SBMT63MM and Partial Differential Equations
Course Code	23SBMT65MM
Semester	VI
No. of Credits	2

Syllabus of Partial Differential Equations to be covered

Unit No	Title with Contents	No. of Hours
Unit I	Pfaffian Differential Equations	6
	1.1 Surfaces and Curves in Three Dimensions.	1
	1.2 Simultaneous Differential Equations of the First Order and the First Degree in Three Variables.	1
	1.3 Methods of solution of $dx/P = dy/Q = dz/R$.	1
	1.4 Pfaffian Differential Forms and Equations.	1
	1.5 Solution of Pfaffian Differential Equations in Three Variables.	2
Unit II	First Order Partial Differential Equations	8
	2.1 Introduction to Partial Differential Equations.	2
	2.2 Origin of First Order Partial Differential Equations.	2
	2.3 Linear Equations of First Order.	2
	2.4 Integral Surfaces Passing through a Given Curve.	2
Unit III	Second Order Partial Differential Equations	8
	3.1 Origin of Second Order Partial Differential Equations.	1
	3.2 Linear Partial Differential Equations with Constant	2

	Coefficients. 3.3 Methods of Solving Linear Partial Differential Equations 3.3.1. Solution of Reducible Equations. 3.3.2. Solution of Irreducible Equations with Constant Coefficients. 3.3.3. Rules for Finding Complementary Functions. 3.3.4. Rule for Finding Particular Integrals.	5
Unit IV	Classification of Partial Differential Equations	8
	4.1 Classification of Second Order Partial Differential Equations. 4.1.1 Canonical forms.	2
	4.2 Solution of Laplace Equation by Separation of Variables Method.	2
	4.3 Solution of One-Dimensional Heat Equation by Separation of Variables Method.	2
	4.4 Solution of One-Dimensional Wave Equation by Separation of Variables Method.	2

Text book:

1. Elements of Partial Differential Equations, Ian Sneddon, McGraw-Hill Book Company, McGraw-Hill Book Company.

Unit-I: Chapter-1: Sec. 1, 2,3,5

Unit-II: Chapter-2 : Sec. 1,2,4,5,

Unit-III: Chapter-3: Sec. 1, 4, 5

2. Partial Differential Equations for Engineers and Scientists, J.N. Sharma, Kehar Singh, Second Edition, Narosa Publications.

Unit-IV: Chapter-3: Sec. 3.3, Chapter- 4: Sec. 4.3, Chapter - 5: Sec. 5.5

Reference books:

1. An Elementary Course in Partial Differential Equations, T. Amaranath, Narosa Publishing, House, Second Edition, 2003 (Reprint, 2006).
2. Introduction to Partial Differential Equations, K. Sankara Rao, Third Edition, PHI.

Website:

<https://archive.nptel.ac.in/courses/111/101/111101153/>

Practical number	Title	No. of Practical
Practicals based on 23SBMT63MM		
I	Rings and Fields-I (Unit I)	1
II	Rings and Fields-II (Unit I)	1
III	Rings of Polynomials (Unit II)	1
IV	Homomorphism and Factor Rings-I (Unit III)	1
V	Ideals in a Ring (Unit III)	1
VI	Unique Factorization Domain (Unit IV)	1
VII	Euclidean Domain and Gaussian Integers (Unit IV)	1
Practicals based on Partial Differential Equations		
I	Simultaneous Differential Equations of the First Order and the First Degree in Three Variables (Unit I)	1
II	Pfaffian Differential Equations and their Solution (Unit I)	1
III	Solution of First order Partial Differential Equations (Unit II)	1
IV	Linear Equations of First order equations and Integral surfaces passing through a given curve (Unit II)	1
V	Solution of Second-order Partial Differential Equations-I (Unit III)	1
VI	Solution of Second-order Partial Differential Equations-II (Unit III)	1
VII	Canonical Forms and Solution of Second-order Partial Differential Equations by Separation Variables Method-I (Unit IV)	1
VIII	Canonical Forms and Solution of Second-order Partial Differential Equations by Separation Variables Method-II (Unit IV)	1

Course/ Paper Title	Operations Research-II
Course Code	23SBMT61MEA
Semester	VI
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Network Models	10
	1.1 CPM and PERT, Network Representation, Critical Path Computations.	5
	1.2 Construction of the Time Schedule, PERT Networks.	5
Unit II	Game Theory	8
	2.1 Game Theory, Some Basic Terminologies.	2
	2.2 Optimal Solution of Two Person Zero Sum Game.	3
	2.3 Solution of Mixed Strategy Game (Graphical solution of games only).	3
Unit III	Replacement and Maintenance Model	6
	3.1 Introduction, Types of Failure.	2
	3.2 Replacement of Items Whose Efficiency Deteriorates with Time.	4
Unit IV	Sequencing Problems	4
	4.1 Introduction, Notation, Terminology and Assumption.	1
	4.2 Processing n Jobs Through Two machines, Processing n Jobs Through Three Machines.	3
Unit-V	Classical Optimization Theory	4
	5.1 Unconstrained Problems, Necessary and sufficient Conditions.	2
	5.2 Newton Raphson Method, Constrained Problems, Equality Constraints (Lagrangian Method only).	2

Text book:

1. Operations Research, Hamdy A. Taha, Eight Edition, 2009, Prentice Hall of India.

Unit I: Chapter 6: Sec. 6.5 (6.5.1 to 6.5.3, 6.5.5).

Unit II: Chapter 13: Sec.13.4 (13.4.1, 13.4.2, 13.4.3).

Unit IV: Chapter 18: Sec. 18.1 (18.1.1, 18.1.2).

2. Operations Research Theory and Applications, J.K. Sharma, Second Edition, 2006.

Unit-III: Chapter 17: Sec. 17.1, 17.2, 17.3

Unit-V: Chapter 20: Sec. 20.1, 20.2, 20.3, 20.4.

Reference books:

1. Introduction to Operations Research, Fredrick S. Hiller, Gerald J. Lieberman, Eight Edition, Tata McGraw Hill.

2. Operations Research, Er. Prem Kumar Gupta, Dr. D.S. Hira, Seventh Edition, S. Chand and Company.

Website:

1. <https://nptel.ac.in/courses/111105039>

Course/ Paper Title	Cryptography
Course Code	23SBMT61MEB
Semester	VI
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Finite Fields	2
	1.1 Finite Fields.	2
Unit II	Cryptography	4
	1.1 Some Simple Cryptosystems.	2

	1.2 Enciphering Matrices.	2
Unit III	Public Key	12
	3.1 The Idea of Public Key Cryptography.	3
	3.2 RSA.	3
	3.3 Discrete Log.	3
	3.4 Knapsack.	3
Unit IV	Primality and Factoring	12
	4.1 Pseudoprimes.	3
	4.2 The Rho Method.	3
	4.3 Fermat Factorization and Factor Bases.	3
	4.4 The Continued Fraction Method.	3

Text book:

1. A Course in Number Theory and Cryptography, Neal Koblitz, Second Edition, Springer

Unit I: Chapter II: Sec. 1.

Unit II: Chapter III: Sec. 1, 2.

Unit III: Chapter IV: Sec. 1, 2, 3, 4.

Unit IV: Chapter V: Sec. 1, 2, 3, 4.

Reference books:

1. Introduction to Cryptography, Johannes A. Buchmann, Second Edition, Springer (Indian Reprint).

2. Cryptography Theory and Practice, Douglas R Stinson, Maura B. Paterson, Fourth Edition, CRC Press.

Website:

1. <https://nptel.ac.in/courses/106107155>

Course/ Paper Title	Graph Theory
Course Code	23SBMT62MEA
Semester	VI
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	An Introduction to Graphs	14
	1.1 The Definition of a Graph.	1
	1.2 Graphs as Models.	1
	1.3 More Definitions.	2
	1.4 Vertex Degrees.	2
	1.5 Subgraphs.	2
	1.6 Paths and Cycles.	2
	1.7 The Matrix Representation of Graphs.	2
	1.8 Fusion.	2
Unit II	Trees	9
	2.1 Definition and Simple Properties.	2
	2.2 Bridges.	3
	2.3 Spanning Trees.	4
Unit III	Connectivity	9
	3.1 Connector Problems.	3
	3.2 Shortest Path Problems	3
	3.3 Cut Vertices and Connectivity.	3
Unit IV	Euler Tours	4
	4.1 Euler Tours.	4

Text book:

1. A First Look At Graph Theory, John Clark, Derek Allan Holton, Allied Publishers Ltd., 1991.

Unit-I: Chapter- 1: Sec. 1.1- 1.8.

Unit-II: Chapter- 2: Sec. 2.1-2.3.

Unit-III: Chapter- 2: Sec. 2.4-2.6,

Unit-IV: Chapter- 3: Sec. 3.1.

Reference books:

1. Introduction to Graph Theory, R. J. Wilson, Fourth Edition, Pearson Education, 2003.

2. Graph Theory, Hararay, Narosa Publishers, New Delhi (1989).
3. Graph Theory, Narsing Deo, Prentice Hall of India Pvt. Ltd. (1987).

Website:

1. <https://nptel.ac.in/courses/111106102>

Course/ Paper Title	Lebesgue Integration
Course Code	23SBMT62MEB
Semester	VI
No. of Credits	2

Syllabus

Unit No	Title with Contents	No. of Hours
Unit I	Measurable Sets	10
	1.1 Length of Open Sets and Closed Sets.	3
	1.2 Inner and Outer Measure.	2
	1.3 Measurable Sets.	3
	1.4 Properties of Measurable Sets.	2
Unit II	Measurable Functions	10
	2.1 Definition of Measurable Functions and Other Equivalent Criteria for Measurability of a function.	3
	2.2 Sums and Products of Measurable Functions.	3
	2.3 Sequences of Measurable Functions.	4
Unit III	The Lebesgue Integrals	10
	3.1 Definition and Existence of the Lebesgue Integrals for Bounded Measurable Functions.	2
	3.2 Properties of Lebesgue Integrals for Bounded Measurable Functions.	3
	3.3 The Lebesgue Integral for Unbounded Functions.	3
	3.4 Lebesgue Dominated Convergence Theorem and Fatou's Lemma	4

Text book:

1. Methods of Real Analysis, Richard R. Goldberg, Oxford and IBH Publishing Co. Pvt Ltd.

Unit I: Chapter 11: Sec. 11.1 to 11.3 (Theorem 11.1 B and Theorem 11.1C Statements only).

Unit II: Chapter 11: Sec. 11.4.

Unit III: Chapter 11: Sec. 11.5 - 11.8

Reference books:

1. Mathematical Analysis, Tom M. Apostol, Second Edition, Narosa Publishing House.

2. A First Course in Mathematical Analysis, D. Somasundaram, B. Chaudhari, Narosa Publishing House.

3. Introduction to Real Analysis, R.G. Bartle, D.R. Sherbert, Fourth Edition, Wiley India Edition.

4. An Introduction to Measure and Integration, Inder K. Rana, Second Edition, Narosa Publishing House.

5. Measure Theory and Integration, G. de Barra, New age International (P) Limited, Publishers

6. Measure theory, Krishna B. Athreya and Soumendra Lahiri, Hindustan Book Agency

7. H. L. Royden, P. M Fitzpatrick, Real Analysis, Fourth Edition, PHI

Website: 1. <https://nptel.ac.in/courses/111106161>