

Lesson Plan for Course: B.Sc(H) Sem-II Code: MTMACOR03T Credit: 6

- Course Name: Real Analysis
- Course coordinator: Sudip Mondal
- Course Outcomes:
 - CO-1. To understand some elementary concepts in set theory.
 - CO-2. To understand the concepts of countability and uncountability.
 - CO-3. To apply Archimedean property and its application to find limit points of a set.
 - CO-4. To recognize bounded, convergent, divergent, Cauchy and monotonic.
 - CO-5. To apply the ratio, root, alternating series and limit comparison tests for convergence and absolute convergence of an infinite series of real numbers.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*	
January	Unit-1: Review of Algebraic and Order Properties of \mathbb{R} , ε -neighbourhood of a point in \mathbb{R} . Idea of countable sets, uncountable sets and uncountability of \mathbb{R} . Bounded above sets, Bounded below sets, Bounded Sets, Unbounded sets. Suprema and Infima. Completeness Property of \mathbb{R} and its equivalent properties.	PD	06	Theoretical-05 Tutorial-01	
	Unit-2: Sequences, Bounded sequence, Convergent sequence, Limit of a sequence, \liminf , \limsup . Limit Theorems.	BS	04	Theoretical-03 Tutorial-01	
February	Unit-1: The Archimedean Property, Density of Rational (and Irrational) numbers in \mathbb{R} , Intervals. Limit points of a set, Isolated points, Open set, closed set, derived set, Illustrations of Bolzano-Weierstrass theorem for sets, compact sets in \mathbb{R} , Heine-Borel Theorem.	PD	22	Theoretical-18 Tutorial-04	
	Unit-2: Monotone Sequences, Monotone Convergence Theorem. Subsequences, Divergence Criteria. Monotone Subsequence Theorem (statement only), Bolzano Weierstrass Theorem for Sequences.	BS	14	Theoretical-12 Tutorial-02	
1st Internal Assessment					
March	Unit-3: Infinite series, convergence and divergence of infinite series, Cauchy Criterion, Tests for convergence: Comparison test, Limit Comparison test, Ratio Test,	PD	14	Theoretical-12 Tutorial-02	
	Unit-2: Cauchy sequence, Cauchy's Convergence Criterion.	BS	06	Theoretical-05 Tutorial-01	
April	Unit-3: Cauchy's nth root test, Integral test.	PD	04	Theoretical-03 Tutorial-01	
	2nd Internal Assessment				
May	Unit-3: Alternating series, Leibniz test. Absolute and Conditional convergence.	PD	20	Theoretical-17 Tutorial-03	
June	End Semester Examination				
	Assessment: Internal Assessment & Assignment		Total: 90 Hrs	Theoretical-75 Tutorial-15	

Books:

- R.G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 3rd Ed., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
- Tom M. Apostol, Mathematical Analysis, Narosa Publishing House
- W. Rudin, Principles of Mathematical Analysis, Tata McGraw-Hill
- Terence Tao, Analysis I, Hindustan Book Agency, 2006
- S.K. Mapa, Real Analysis, Asoke Prakasan, Kolkata-700007

Lesson Plan for Course: B.Sc(H) Sem-II Code: MTMACOR04T Credit: 6

- Course Name: Ordinary Differential Equations and Vector Calculus
- Course coordinator: Dr. Pintu Debnath
- Course Outcomes:
 - CO-1. To use Picard's theorem to test existence of unique solution of 1st order ODE.
 - CO-2. To learn some more technique to solve ODEs including Euler's equation, Bernoulli's equation.
 - CO-3. To able to solve ODEs through the method of undetermined coefficients and method of variation of parameters.
 - CO-4. To calculate power series solution of a differential equation.
 - CO-5. Able to test continuity, differentiability and integrability of vector functions.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
January	Unit-1: Lipschitz condition and Picard's Theorem (Statement only). General solution of homogeneous equation of second order, principle of super position for homogeneous equation.	SM	07	Theoretical -05 Tutorial - 02
February	Unit-1: Wronskian: its properties and applications, Linear homogeneous and non-homogeneous equations of higher order with constant coefficients. Euler's equation, method of undetermined coefficients, method of variation of parameters.	SM	18	Theoretical - 15 Tutorial - 03
1st Internal Assessment				
March	Unit -2: System of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients. Basic Theory of linear systems in normal form, homogeneous linear systems with constant coefficients. Linear systems of two equations in two unknown functions.	SM	18	Theoretical - 15 Tutorial - 03
	Unit- 4: Triple product, introduction to vector functions, operations with vector-valued functions.	BS	09	Theoretical - 07 Tutorial - 02
April	Unit- 4: Limits and continuity of vector functions. Differentiation of vector functions.	BS	07	Theoretical - 06 Tutorial - 01
2nd Internal Assessment				
May	Unit- 4: Integration of vector functions.	BS	14	Theoretical - 12 Tutorial - 02
	Unit-3: Equilibrium points, Interpretation of the phase plane. Power series solution of a differential equation about an ordinary point, solution about a regular singular point.	SM	17	Theoretical - 15 Tutorial - 02
June	End Semester Examination			
	Assessment: Internal Assessment & Assignment		Total: 90 Hrs	Theoretical - 75 Tutorial - 15

Books:

- Approach using Maple and Matlab, 2nd Ed., Taylor and Francis group, London and New York, 2009.
- S.L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004.
- G.F.Simmons, Differential Equations, Tata McGraw Hill
- Maity, K.C. and Ghosh, R.K., An Introduction to Differential Equation, New Central Book Agency (P) Ltd. Kolkata (India).
- Maity, K.C. and Ghosh, R.K., Vector Analysis, New Central Book Agency (P) Ltd. Kolkata (India).
- M.R. Spiegel, Schaum's outline of Vector Analysis