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

- Course Name: Real Analysis
- Course coordinator: Dr. 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*
Feb	**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.	PD	7	Theoretical-06 Tutorial-01
Mar	**Unit 1:** Completeness Property of $\mathbb{R}$ and its equivalent properties. 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	21	Theoretical-18 Tutorial-03
Apr	**Unit 2:** Sequences, Bounded sequence, Convergent sequence, Limit of a sequence, liminf, lim sup. Limit Theorems. Monotone Sequences, Monotone Convergence Theorem.	PD	19	Theoretical-17 Tutorial-02
	1st Internal Assessment			
May	**Unit 2:** Subsequences, Divergence Criteria. Monotone Subsequence Theorem (statement only), Bolzano Weierstrass Theorem for Sequences. Cauchy sequence, Cauchy's Convergence Criterion.	PD	19	Theoretical-16 Tutorial-03
Jun	**Unit 3:** Infinite series, convergence and divergence of infinite series, Cauchy Criterion, Tests for convergence: Comparison test, Limit Comparison test, Ratio Test, Cauchy's nth root test, Integral test. Alternating series, Leibniz test. Absolute and Conditional convergence.	PD	21	Theoretical-18 Tutorial-03
	2nd Internal Assessment			
	Revision	PD	03	Theoretical-00 Tutorial-03
	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-I **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*
Feb	**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, Wronskian: its properties and applications.	BS	7	Theoretical-06 Tutorial-01
Mar	**Unit 1:** Linear homogeneous and non-homogeneous equations of higher order with constant coefficients, Euler's equation, Method of undetermined coefficients, method of variation of parameters.	BS	15	Theoretical-13 Tutorial-02
	Unit 4: Triple product.	SM	4	Theoretical-04 Tutorial-00
Apr	**Unit 2:** System of linear differential equations, types of linear systems, differential operators, an operator method for linear systems with constant coefficients.	BS	17	Theoretical-15 Tutorial-02
	Unit 4: Introduction to vector functions, operations with vector-valued functions.	SM	4	Theoretical-04 Tutorial-00
	1st Internal Assessment			
May	**Unit 2:** Basic Theory of linear systems in normal form, homogeneous linear systems with constant coefficients: Two Equations in two unknown functions.	BS	15	Theoretical-13 Tutorial-02
	Unit 4: Limits and continuity of vector functions, differentiation of vector functions.	SM	3	Theoretical-03 Tutorial-00
Jun	**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.	BS	16	Theoretical-14 Tutorial-02
	Unit 4: Integration of vector functions.	SM	3	Theoretical-03 Tutorial-00
	2nd Internal Assessment			
	Revision	BS SM	04 02	Theoretical-00 Tutorial-06
	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. Speigel, Schaum's outline of Vector Analysis.

Lesson Plan for Course: B.Sc(H) Sem-IV **Code:** MTMACOR08T **Credit: 6**

- Course Name: Riemann Integration and Series of Functions
- Course coordinator: Dr. Sudip Mondal
- Course Outcomes:
  - CO-1. To find Riemann integrable functions and to apply the fundamental theorems of integration.
  - CO-2. To test integrability of improper integrals, convergence of beta and gamma functions.
  - CO-3. To learn some properties of sequence and series and their convergency test.
  - CO-4. To express function through Fourier series.
  - CO-5. To work with power series, radius of convergence, differentiation and integration including some theorems.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 2:** Improper integrals.	BS	3	Theoretical-02 Tutorial-01
	Unit 1: Riemann integration: inequalities of upper and lower sums.	PD	3	Theoretical-02 Tutorial-01
Mar	**Unit 2:** Improper integrals, Convergence of Beta and Gamma functions.	BS	10	Theoretical-09 Tutorial-01
	Unit 1: Darbaux integration, Darbaux theorem, Riemann conditions of integrability, Riemann sum and definition of Riemann integral through Riemann sums, equivalence of two Definitions.	PD	8	Theoretical-07 Tutorial-01
Apr	**Unit 4:** Fourier series: Definition of Fourier coefficients and series, Dirichlet's condition.	BS	11	Theoretical-10 Tutorial-01
	Unit 1: Riemann integrability of monotone and continuous functions. Properties of the Riemann integral; definition and integrability of piecewise continuous and monotone functions. Intermediate Value theorem for Integrals, Fundamental theorem of Integral Calculus.	PD	09	Theoretical-08 Tutorial-01
	1st Internal Assessment			
May	**Unit 4:** Fourier series: Reimann Lebesgue lemma, Bessel's inequality, Parseval's identity.	BS	09	Theoretical-08 Tutorial-01
	Unit 3: Pointwise and uniform convergence of sequence of functions. Theorems on continuity, derivability and integrability of the limit function of a sequence of functions.	PD	10	Theoretical-09 Tutorial-01
Jun	**Unit 5:** Power series, radius of convergence. Cauchy Hadamard Theorem. Differentiation and integration of power series; Abel's Theorem; Weierstrass Approximation Theorem.	BS	11	Theoretical-10 Tutorial-01
	Unit 3: Series of functions, Theorems on the continuity and derivability of the sum function of a series of functions; Cauchy criterion for uniform convergence and Weierstrass M-Test.	PD	11	Theoretical-10 Tutorial-01
	2nd Internal Assessment			
	Revision	BS PD	02 03	Theoretical-00 Tutorial-05
	End Semester Examination			
	Assessment: Internal Assessment & Assignment		**Total: 90 Hrs**	**Theoretical-75** **Tutorial-15**

Books:

- K.A. Ross, Elementary Analysis, The Theory of Calculus, Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint, 2004.
- R.G. Bartle and D.R. Sherbert, Introduction to Real Analysis, 3rd Ed., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2002.
- Santi Narayan, Integral calculus, S Chand, 2005.
- S. K. Mapa, Real Analysis, Asoke Prakasan, Kolkata- 700007.
- T. Apostol, Calculus I, II, Wiley, 2007.

Lesson Plan for Course: B.Sc(H) Sem-IV **Code:** MTMACOR09T **Credit: 6**

- Course Name: Multivariate Calculus
- Course coordinator: Biswajit Sarkar
- Course Outcomes:
  - CO-1. To understand limit, continuity and differentiability of functions of two or more variables and partial differentiation.
  - CO-2. To verify the total differentiability of a function and existence of directional derivatives, and to apply method of Lagrange multipliers to solve optimization problem.
  - CO-3. To calculate double and triple integration over rectangular region and non-rectangular region.
  - CO-4. Able to work with vector field, divergence, curl and application of line integration.
  - CO-5. Able to apply Green's theorem, Stoke's theorem and Divergence theorem in computing surface integral.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 1:** Functions of several variables, limit and continuity of functions of two or more variables, Partial differentiation, total differentiability and differentiability, sufficient condition for differentiability.	SM	7	Theoretical-06 Tutorial-01
Mar	**Unit 1:** Chain rule for one and two independent parameters, Directional derivatives, the gradient, maximal and normal property of gradient, tangent planes, Extrema of functions of two variables, method of Lagrange multipliers, constrained optimization problems. **Unit 3:** Definition of vector field, divergence and curl.	SM	21	Theoretical-18 Tutorial-03
Apr	**Unit 3:** Line integrals, Applications of line integrals: Mass and Work. Fundamental theorem for line integrals, conservative vector fields, independence of path. **Unit 2:** Double integration over rectangular region, double integration over non-rectangular region, Double integrals in polar co-ordinates.	SM	17	Theoretical-15 Tutorial-02
	1st Internal Assessment			
May	**Unit 2:** Triple integrals Triple integral over a parallelepiped and solid regions. Volume by triple integrals, cylindrical and spherical coordinates. Change of variables in double integrals and triple integrals.	SM	22	Theoretical-19 Tutorial-03
Jun	**Unit 4**: Green's theorem, surface integrals, integrals over parametrically defined surfaces. Stoke's theorem, The Divergence theorem.	SM	20	Theoretical-17 Tutorial-03
	2nd Internal Assessment			
	Revision	SM	03	Theoretical-00 Tutorial-03
	End Semester Examination			
	Assessment: Internal Assessment & Assignment		**Total: 90 Hrs**	**Theoretical-75 Tutorial-15**

Books:

- G.B. Thomas and R.L. Finney, Calculus, 9th Ed., Pearson Education, Delhi, 2005.
- E. Marsden, A.J. Tromba and A. Weinstein, Basic Multivariable Calculus, Springer (SIE), Indian reprint, 2005.
- Tom M. Apostol, Mathematical Analysis, Narosa Publishing House, 2nd Ed.,2002
- Courant and John, Introduction to Calculus and Analysis, Vol II, Springer New York, 2012
- W. Rudin, Principles of Mathematical Analysis, Tata McGraw-Hill, 3rd Ed.,2013
- Maity, K.C. and Ghosh, R.K. Vector Analysis, New Central Book Agency (P) Ltd. Kolkata (India).
- Maity, K.C. and Ghosh, R.K. An Introduction to Differential calculus, New Central Book Agency (P) Ltd. Kolkata (India).
- Maity, K.C. and Ghosh, R.K. An Introduction to Integral calculus, New Central Book Agency (P) Ltd. Kolkata (India).
- Terence Tao, Analysis II, Hindustan Book Agency, 3rd Ed., 2015
- M.R. Speigel, Schaum's outline of Vector Analysis. Tata McGraw-Hill, 2009.

Lesson Plan for Course: B.Sc(H) Sem-IV **Code:** MTMACOR10T **Credit: 6**

- Course Name: Ring Theory and Linear Algebra I
- Course coordinator: Dr. Sudip Mondal
- Course Outcomes:
  - CO-1. To know the fundamental concepts in ring theory such as the concepts of ideals, ideal generated by a subset of a ring, factor rings, operations on ideals.
  - CO-2. To learn about ring homomorphism and field of quotients.
  - CO-3. To understand the concepts of vector spaces, subspaces, bases, dimension and their properties.
  - CO-4. To get concepts on linear transformations and its representation by a matrix.
  - CO-5. To learn about isomorphism.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 1:** Definition and examples of rings, properties of rings, subrings.	PD	8	Theoretical-07 Tutorial-01
Mar	**Unit 1:** Integral domains and fields, characteristic of a ring. Ideal, ideal generated by a subset of a ring, factor rings, operations on ideals, prime and maximal ideals.	PD	23	Theoretical-20 Tutorial-03
Apr	**Unit 1:** Integral domains and fields, characteristic of a ring. Ideal, ideal generated by a subset of a ring, factor rings, operations on ideals, prime and maximal ideals.	PD	19	Theoretical-17 Tutorial-02
	1st Internal Assessment			
May	**Unit 3:** Vector spaces, subspaces, algebra of subspaces, quotient spaces, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspaces.	PD	18	Theoretical-15 Tutorial-03
Jun	**Unit 4:** Introduction to linear transformations, Subspaces, dimension of subspaces, null space, range, rank and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformations. Isomorphisms. Isomorphism theorems, invertibility and isomorphisms, change of coordinate matrix.	PD	19	Theoretical-16 Tutorial-03
	2nd Internal Assessment			
	Revision	PD	03	Theoretical-00 Tutorial-03
	End Semester Examination			
	Assessment: Internal Assessment & Assignment		**Total: 90 Hrs**	**Theoretical-75 Tutorial-15**

Books:

- John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
- M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011.
- S. Kumaresan, Linear Algebra- A Geometric Approach, Prentice Hall of India, 1999
- Kenneth Hoffman, Ray Alden Kunze, Linear Algebra, 2nd Ed., Prentice-Hall of India Pvt. Ltd., 1971.
- D.S. Malik, John M. Mordeson and M.K. Sen, Fundamentals of Abstract Algebra,1997.

Lesson Plan for Course: B.Sc(H) Sem-IV **Code:** MTMSSEC02M **Credit: 6**

- Course Name: Logic and Sets
- Course coordinator: Dr. Pintu Debnath
- Course Outcomes:

CO-1. To learn the syntax of first-order logic and semantics of first-order languages.
CO-2. Able to understand the propositional logic and basic theorems like compactness theorem, meta theorem and post-tautology theorem.
CO-3. To learn about sets and subsets.
CO-4. To learn several operations on sets.
CO-5. To learn relation, partitions, equivalence relations, partial ordering relations, n-ary relations on sets including congruence modulo relation.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 1:** Introduction, Propositions, truth table.	SM	1	Theoretical-01
Mar	**Unit 1:** Negation, conjunction and disjunction, Implications, biconditional propositions, converse, contra positive and inverse propositions and precedence of logical operators, Propositional equivalence: Logical equivalences.	SM	8	Theoretical-08 Tutorial-00
Apr	**Unit 1:** Predicates and quantifiers: Introduction, Quantifiers, Binding variables and Negations. **Unit 2:** Sets, subsets, Set operations.	SM	8	Theoretical-08 Tutorial-00
May	**Unit 2:** Laws of set theory and Venn diagrams. Examples of finite and infinite sets. Finite sets and counting principle, Empty set, properties of empty set. Standard set operations. Classes of sets. Power set of a set.	SM	4	Theoretical-04 Tutorial-00
Jun	**Unit 3:** Difference and Symmetric difference of two sets. Set identities, Generalized union and intersections. Relation: Product set. Composition of relations, Types of relations, Partitions, Equivalence Relations with example of congruence modulo relation. Partial ordering relations, n- ary relations.	SM	8	Theoretical-08 Tutorial-00
	End Semester Examination			
	Assessment: Internal Assessment & Assignment		**Total: 29 Hrs**	**Theoretical-29 Tutorial-00**

Books:

- R.P. Grimaldi, Discrete Mathematics and Combinatorial Mathematics, Pearson Education, 1998.
- P.R. Halmos, Naive Set Theory, Springer, 1974.

Lesson Plan for Course: B.Sc(H) Sem-VI **Code:** MTMACOR13T **Credit: 6**

- Course Name: Metric Spaces and Complex Analysis
- Course coordinator: Biswajit Sarkar
- Course Outcomes:
  - CO-1. To undersand fundamental idea of metric spaces including Cantor's theorem and completeness.
  - CO-2. To learn about continuity, uniform continuity, compactness, homeomorphism of metric space, Banach fixed point theorem and its application to ordinary differential equation.
  - CO-3. To know about limits, continuity, Cauchy-Riemann equation and differentiability of complex valued function.
  - CO-4. To familiar with analytic functions and to evaluate Contour integrals and learn about Cauchy integral formula.
  - CO-5. To aware with fundamental theorem of algebra using Liouville's theorem, Laurent series expansion with its examples, absolute and uniform convergence of power series.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit-1**: Metric spaces: Definition and examples. Open and closed balls, neighbourhood, open set, interior of a set. Limit point of a set, closed set, diameter of a set, subspaces, dense sets, separable spaces. Sequences in Metric Spaces.	PD	07	Theoretical-06 Tutorial-01
Mar	**Unit-1**: Cauchy sequences. Complete Metric Spaces, Cantor's theorem. **Unit 2:** Continuous mappings, sequential criterion and other characterizations of continuity, Uniform continuity, Connectedness, connected subsets of R. Compactness: Sequential compactness, Heine-Borel property, Totally bounded spaces, finite intersection property, and continuous functions on compact sets. Homeomorphism, Contraction mappings,	PD	17	Theoretical-15 Tutorial-02
Apr	**Unit 2:** Banach Fixed point Theorem and its application to ordinary differential equation. **Unit 3:** Limits, Limits involving the point at infinity, continuity. Properties of complex numbers, regions in the complex plane, functions of complex variable, mappings. Derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient conditions for differentiability.	PD	17	Theoretical-14 Tutorial-03
	1st Internal Assessment			
May	**Unit 4:** Analytic functions, examples of analytic functions, exponential function, Logarithmic function, trigonometric function, derivatives of functions, and definite integrals of functions. Contours, Contour integrals and its examples, upper bounds for moduli of contour integrals. Cauchy-Goursat theorem, Cauchy integral formula.	PD	17	Theoretical-15 Tutorial-02

Jun	**Unit 5:** Liouville's theorem and the fundamental theorem of algebra. Convergence of sequences and series, Taylor series and its examples. **Unit 6:** Laurent series and its examples, absolute and uniform convergence of power series.	PD	19	Theoretical-17 Tutorial-02
	2nd Internal Assessment			
	Revision	PD	03	Theoretical-00 Tutorial-03
	End Semester Examination			
	Assessment: Internal Assessment & Assignment		**Total: 80 Hrs**	**Theoretical-67** **Tutorial-13**

Books:

- Satish Shirali and Harikishan L. Vasudeva, Metric Spaces, Springer Verlag, London, 2006.
- G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw-Hill, 2004.
- S. Ponnusamy, Foundations of omplex Analysis, Alpha Science International, 2005.
- Joseph Bak and Donald J. Newman, Complex Analysis, 2nd Ed., Undergraduate Texts in Mathematics, Springer-Verlag New York, Inc., NewYork, 1997.

Lesson Plan for Course: B.Sc(H) Sem-VI **Code:** MTMACOR14T **Credit: 6**

- Course Name: Ring Theory and Linear Algebra II
- Course coordinator: Dr. Sudip Mondal
- Course Outcomes:

CO-1. To familiar with Polynomial rings, division algorithm and consequences.
CO-2. To know about Eisenstein criterion of reducibility test, divisibility in integral domains, unique factorization domains and Euclidean domains.
CO-3. To find dual spaces, dual basis and transpose of a linear transformation.
CO-4. To aware with Eigen spaces of a linear operator, Cayley-Hamilton theorem and canonical forms.
CO-5. To work with inner product spaces, Gram-Schmidt orthogonalisation process, Bessel's inequality, Orthogonal projections and Spectral theorem.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 2:** Dual spaces.	BS	04	Theoretical-03 Tutorial-01
	Unit 1: Polynomial rings over commutative rings, division algorithm and consequences.	PD	04	Theoretical-03 Tutorial-01
Mar	**Unit 2:** Dual basis, double dual.	BS	09	Theoretical-08 Tutorial-01
	Unit 1: Principal ideal domains, Factorization of polynomials, reducibility tests, irreducibility tests, Eisenstein criterion, and unique factorization in Z [x].	PD	08	Theoretical-07 Tutorial-01
Apr	**Unit 2:** Transpose of a linear transformation and its matrix in the dual basis, annihilators.	BS	09	Theoretical-08 Tutorial-01
	Unit 1: Divisibility in integral domains, irreducible, primes, unique factorization domains, Euclidean domains.	PD	08	Theoretical-07 Tutorial-01
	1st Internal Assessment			
May	**Unit 2:** Eigen spaces of a linear operator, diagonalizability, invariant subspaces and Cayley-Hamilton theorem.	BS	08	Theoretical-07 Tutorial-01
	Unit 3 : Inner product spaces and norms, Gram-Schmidt orthogonalisation process, orthogonal complements, Bessel's inequality, the adjoint of a linear operator, Least Squares Approximation,	PD	09	Theoretical-08 Tutorial-01
Jun	**Unit 2:** The minimal polynomial for a linear operator, canonical forms.	BS	10	Theoretical-09 Tutorial-01
	Unit 3 : Minimal solutions to systems of linear equations, Normal and self-adjoint operators, Orthogonal projections and Spectral theorem.	PD	10	Theoretical-09 Tutorial-01
	2nd Internal Assessment			
	Revision	BS PD	02 03	Theoretical-00 Tutorial-05
	End Semester Examination			
	Assessment: Internal Assessment & Assignment		**Total: 84 Hrs**	**Theoretical-69 Tutorial-15**

Books:

- John B. Fraleigh, A First Course in Abstract Algebra, 7th Ed., Pearson, 2002.
- Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Linear Algebra, 4th Ed., Prentice- Hall of India Pvt. Ltd., New Delhi, 2004.

Lesson Plan for Course: B.Sc(H) Sem-VI **Code:** MTMADSE04T **Credit: 6**

- Course Name: Theory of Equations.
- Course coordinator: Dr. Sudip Mondal
- Course Outcomes:
  - CO-1. To familiar with General properties of polynomials including General properties of equations.
  - CO-2. Able to apply Descartes's rule of signs positive and negative rule and to compute relation between the roots and the coefficients of equations.
  - CO-3. To familiar with symmetric functions of the roots and its application including transform the equations.
  - CO-4. Capable to solve reciprocal equations, binomial equations, cubic and biquadratic equations.
  - CO-5. Able to apply Strum's theorem for determining the conditions for reality of the roots of an equation.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 1:** General properties of polynomials, Graphical representation of a polynomial, maximum and minimum values of a polynomials.	BS	05	Theoretical-05 Tutorial-00
Mar	**Unit 1:** General properties of equations, Descarte's rule of signs positive and negative rule, Relation between the roots and the coefficients of equations. **Unit 2:** Symmetric functions. Applications of symmetric function of the roots.	BS	18	Theoretical-16 Tutorial-02
Apr	**Unit 2:** Transformation of equations. Solutions of reciprocal and binomial equations. Algebraic solutions of the cubic (Cardan's method) and biquadratic (Ferrari's method). Properties of the derived functions.	BS	18	Theoretical-16 Tutorial-02
	1st Internal Assessment			
May	**Unit 3:** Symmetric functions of the roots, Newton's theorem on the sums of powers of roots, homogeneous products, limits of the roots of equations.	BS	17	Theoretical-15 Tutorial-02
Jun	**Unit 4:** Separation of the roots of equations, Strums theorem. Applications of Strum's theorem, Conditions for reality of the roots of an equation. Solution of numerical equations.	BS	19	Theoretical-17 Tutorial-02
	2nd Internal Assessment			
	Revision	BS	03	Theoretical-00 Tutorial-03
	End Semester Examination			
	Assessment: Internal Assessment & Assignment		**Total: 80 Hrs**	**Theoretical-69** **Tutorial-11**

Books:

- W.S. Burnside and A.W. Panton, The Theory of Equations, Dublin University Press, 1954.
- C. C. MacDuffee, Theory of Equations, John Wiley & Sons Inc., 1954.
- S.K. Mapa, Classical Algebra, Asoke Prakasan, Kolkata-700007

Lesson Plan for Course: B.Sc(H) Sem-VI **Code:** MTMADSE06T **Credit: 6**

- Course Name: Mechanics
- Course coordinator: Biswajit Sarkar
- Course Outcomes:
  - CO-1. To understand the basic law of forces, coplanar forces, equilibrium, friction and these types of topic used in classical mechanic.
  - CO-2. To evaluate equations of motion referred to a set of rotating axes and Motion of a projectile in a resisting medium.
  - CO-3. Able to find motion of a body/ point mass in different types of path under inverse square law of force.
  - CO-4. To calculate degree of freedom, moments and products of inertia of a system.
  - CO-5. To find motion of Compound pendulum and motion of a rigid body in two dimensions under finite and impulsive forces.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Feb	**Unit 1:** Co-planar forces. Astatic equilibrium. Friction.	SM	06	Theoretical-06 Tutorial-00
Mar	**Unit 1:** Equilibrium of a particle on a rough curve. Virtual work. Forces in three dimensions. General conditions of equilibrium, Centre of gravity for different bodies. Stable and unstable equilibrium.	SM	19	Theoretical-18 Tutorial-01
Apr	**Unit 2:** Equations of motion referred to a set of rotating axes. Motion of a projectile in a resisting medium. Stability of nearly circular orbits. Motion under the inverse square law. Slightly disturbed orbits. Motion of artificial satellites.	SM	16	Theoretical-14 Tutorial-02
	1st Internal Assessment			
May	**Unit 2:** Motion of a particle in three dimensions. Motion on a smooth sphere, cone, and on any surface of revolution. **Unit 3:** Degrees of freedom. Moments and products of inertia. Momental Ellipsoid. Principal axes.	SM	16	Theoretical-14 Tutorial-02
Jun	**Unit 3:** D'Alembert's Principle. Motion about a fixed axis. Compound pendulum. Motion of a rigid body in two dimensions under finite and impulsive forces. Conservation of momentum and energy.	SM	20	Theoretical-18 Tutorial-02
	2nd Internal Assessment			
	Revision	SM	03	Theoretical-00 Tutorial-03
	End Semester Examination			
	Assessment: Internal Assessment & Assignment		**Total: 80 Hrs**	**Theoretical-70 Tutorial-10**

Books:

- Ghosh, M. C, Analytical Statics.
- Matiur Rahman, Md., Statics, New Central Book Agancy (P) Ltd, 2004.
- Loney, S. L., An Elementary Treatise on the Dynamics of particle and of Rigid Bodies, 2017.
- Loney, S. L., Elements of Statics and Dynamics I and II, 2004.