

Lesson Plan for Course: B.Sc(H) Sem-I Code: MTMACOR01T Credit: 6

- Course Name: Calculus, Geometry and Ordinary, Differential Equation
- Course coordinator: Pintu Debnath
- Course Outcomes:

CO-1. To trace curve in two dimensional Cartesian and polar coordinates.

CO-2. Able to work with higher order derivatives, and concavity, inflection points, envelopes, asymptotes of a curve and to calculate their arc length, area and surface of revolution.

CO-3. To construct Reduction formulae, derivations and illustrations of reduction formulae.

CO-4. To solve several ODEs.

CO-5. To solve the problems related to two and three dimensions.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Jul	Unit -1: Hyperbolic functions, higher order derivatives, Leibnitz rule and its applications to problems of type $e^{ax+b} \sin x$, $e^{ax+b} \cos x$, $(ax+b)^n \sin x$, $(ax+b)^n \cos x$.	SM	04	Theoretical-03 Tutorial-01
Aug	Unit -1: Concavity and inflection points, envelopes, asymptotes, curve tracing in Cartesian coordinates, tracing in polar coordinates of standard curves, L'Hospital's rule, applications in business, economics and life sciences.	SM	18	Theoretical-15 Tutorial-03
1st Internal Assessment				
Sep	Unit -3: Reflection properties of conics, translation and rotation of axes and second degree equations, classification of conics using the discriminant, polar equations of conics.	BS	08	Theoretical-07 Tutorial-01
	Unit-2 : Reduction formulae, derivations and illustrations of reduction formulae for the integration of $\sin^n x$, $\cos^n x$, $\tan^n x$, $\sec^n x$, $(\log x)^n$, $\sin^n x \sin^m x$, parametric equations, parametrizing a curve, arc length, arc length of parametric curves, area of surface of revolution. Techniques of sketching conics.	SM	21	Theoretical-18 Tutorial-03
Oct	Unit -3: Spheres, Cylindrical surfaces. Central conicoids, paraboloids, plane sections of conicoids, Generating lines, classification of quadrics.	BS	18	Theoretical-15 Tutorial-03
	Unit-4: Differential equations and mathematical models, General, particular, explicit, implicit and singular solutions of a diff. eqn. Exact diff. eqns and integrating factors, separable equations and equations reducible to this form, linear and Bernoulli eqns.	SM	14	Theoretical-12 Tutorial-02
2nd Internal Assessment				
Nov	Unit-3: Illustrations of graphing standard quadric surfaces like cone, ellipsoid.	BS	04	Theoretical-03 Tutorial-01
	Unit - 4: Special integrating factors and transformations.	SM	03	Theoretical-02 Tutorial-01

Dec	End Semester Examination			
	Assessment: Internal Assessment & Assignment		Total: 90 Hrs	Theoretical-75 Tutorial-15

Books:

- Walter Rudin, Principles of Mathematical analysis, Third Edition, Mc Grawhill Education
- S. K. MAPA, Introduction to Real Analysis, Sarat Book Distributor, India, 2019.

Lesson Plan for Course: B.Sc(H) Sem-I Code: MTMACOR02T Credit: 6

- Course Name: Algebra
- Course coordinator: Sudip Mondal
- Course Outcomes:
 - CO-1. To aware with polar representation of complex numbers, n-th roots of unity, De Moivre's theorem with its application.
 - CO-2. Able to apply Descarte's rule of signs and to solve cubic and biquadratic equations, $AM \geq GM \geq HM$ in inequality.
 - CO-3. To familiar with equivalence relations, well-ordering property of positive integers, Division algorithm, principles of mathematical induction.
 - CO-4. To find rank of a given matrix, and to solve systems of linear equations
 - CO-5. To find out Eigen values, Eigen Vectors, inverse of a matrix though Cayley-Hamilton theorem.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Jul	Unit-1: Polar representation of complex numbers, n-th roots of unity, De Moivre's theorem for rational indices and its applications.	BS	07	Theoretical-06 Tutorial-01
	Unit-2: Equivalence relations and partitions, Functions, Composition of fns.	PD	04	Theoretical-03 Tutorial-01
Aug	Unit -1 : <ul style="list-style-type: none"> <i>Theory of equations:</i> Relation between roots and coefficients, Transformation of equation, Descartes rule of signs, Cubic (Cardan's method) and biquadratic equations (Ferrari's method). <i>Inequality:</i> The inequality involving $AM \geq GM \geq HM$, Cauchy-Schwartz inequality. 	BS	13	Theoretical-11 Tutorial-02
	Unit-2: Invertible functions, One to one correspondence and cardinality of a set. Well-ordering property of positive integers, Division algorithm, Divisibility and Euclidean algorithm. Congruence relation between integers.	PD	17	Theoretical-14 Tutorial-03
	1st Internal Assessment			
Sep	Unit-3: Systems of linear equations, row reduction and echelon forms, vector equations, the matrix equation $Ax = b$, solution sets of linear systems, applications of linear systems, linear independence.	BS	12	Theoretical-10 Tutorial-02
	Unit-2: Principles of Mathematical Induction, statement of Fundamental Theorem of Arithmetic. Unit 4: Matrix, inverse of a matrix, characterizations of invertible matrices.	PD	20	Theoretical-17 Tutorial-03
Oct	Unit 4: Rank of a matrix, Eigen values, Eigen Vectors and Characteristic Equation of a matrix.	PD	14	Theoretical-12 Tutorial-02
	2nd Internal Assessment			
Nov	Unit 4: Cayley-Hamilton theorem and its use in finding the inverse of a matrix.	PD	03	Theoretical-02 Tutorial-01
Dec	End Semester Examination			
	Assessment: Internal Assessment & Assignment		Total: 90 Hrs	Theoretical-75 Tutorial-15

Books:

- Walter Rudin, Principles of Mathematical analysis, Third Edition, Mc Grawhill Education
- S. K. MAPA, Introduction to Real Analysis, Sarat Book Distributor, India, 2019.

Lesson Plan for Course: B.Sc(H) Sem-III Code: MTMACOR05T Credit: 6

- Course Name: Theory of Real Functions
- Course coordinator: Biswajit Sarkar
- Course Outcomes:
 - CO-1. To understand limits of functions including through their definition, continuous functions and uniform continuity theorem.
 - CO-2. Aware about differentiability of a function.
 - CO-3. To familiar with several mean value theorems and their applications.
 - CO-4. Able to express Taylor's and Maclaurin's series expression of several functions.
 - CO-5. Able to apply Taylor's theorem to convex functions and inequalities.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Jul	Unit -1: Limits of functions (ϵ - δ approach), sequential criterion for limits, divergence criteria. Limit theorems, one sided limits. Infinite limits and limits at infinity.	PD	06	Theoretical-05 Tutorial-01
Aug	Unit -1: Continuous functions, sequential criterion for continuity and discontinuity. Algebra of continuous functions. Continuous functions on an interval, intermediate value theorem, location of roots theorem, preservation of intervals theorem. Uniform continuity, non-uniform continuity criteria, uniform continuity theorem.	PD	28	Theoretical-23 Tutorial-05
1st Internal Assessment				
Sep	Unit -2 : Differentiability of a function at a point and in an interval, Caratheodory's theorem, algebra of differentiable functions. Relative extrema, interior extremum, theorem. Rolle's theorem. Mean value theorem, intermediate value property of derivatives, Darboux's theorem. Applications of mean value theorem to inequalities and approximation of polynomials.	PD	33	Theoretical-28 Tutorial-05
Oct	Unit-3: Cauchy's mean value theorem. Taylor's theorem with Lagrange's form of remainder, Taylor's theorem with Cauchy's form of remainder, application of Taylor's theorem to convex functions, relative extrema. Taylor's series and Maclaurin's series expansions of exponential and trigonometric functions, $\ln(1+x)$, $1/ax+b$ and $(1+x)^n$. Application of Taylor's theorem to inequalities.	PD	23	Theoretical-19 Tutorial-04
2nd Internal Assessment				
Nov	Revision	PD		Theoretical-00 Tutorial-00
Dec	End Semester Examination			
	Assessment: Internal Assessment & Assignment		Total: 90 Hrs	Theoretical-75 Tutorial-15

Books:

- Walter Rudin, Principles of Mathematical analysis, Third Edition, Mc Grawhill Education
- S. K. MAPA, Introduction to Real Analysis, Sarat Book Distributor, India, 2019.

Lesson Plan for Course: B.Sc(H) Sem-III Code: MTMACOR06T Credit: 6

- Course Name: Group Theory-I
- Course coordinator: Sudip Mondal
- Course Outcomes:

CO-1. To understand various types of groups, order of an element of a group, subgroups and their product.

CO-2. To familiar with cyclic group and their classification, permutation on group and cosets.

CO-3. To prove Lagrange's theorem and its application to prove Fermat's little theorem.

CO-4. To understand external direct product of a finite number of groups and other familiar groups.

CO-5. To learn group homomorphisms and their properties.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Jul	Unit-1 : Symmetries of a square, Dihedral groups, definition and examples of groups.	BS	08	Theoretical-06 Tutorial-02
Aug	Unit-1 : definition and examples of groups including permutation groups and quaternion groups (through matrices), elementary properties of groups. Unit-2 : Subgroups and examples of subgroups, centralizer, normalizer, center of a group, product of two subgroups. Unit-3 : Properties of cyclic groups, classification of subgroups of cyclic groups.	BS	33	Theoretical-28 Tutorial-05
1 st Internal Assessment				
Sep	Unit-3 : Cycle notation for permutations, properties of permutations, even and odd permutations, alternating group, properties of cosets, Lagrange's theorem and consequences including Fermat's Little theorem. Unit-4 : External direct product of a finite number of groups, normal subgroups, factor groups, Cauchy's theorem for finite abelian groups. Unit-5 : Group homomorphisms, properties of homomorphisms.	BS	38	Theoretical-33 Tutorial-05
Oct	Unit-5 : Cayley's theorem, properties of isomorphisms, First, Second and Third isomorphism theorems.	BS	11	Theoretical-08 Tutorial-03
2 nd Internal Assessment				
Nov				Theoretical-00 Tutorial-00
Dec	End Semester Examination			
	Assessment: Internal Assessment & Assignment		Total: 90 Hrs	Theoretical-75 Tutorial-15

Books:

- David S. Dummit and Richard M. Foote, Abstract Algebra (<http://library.lol/main/36E6532B72807B9EF6B27E52E8C62CCC>) , Third Edition , Wiley pvt.Ltd.
- S. K. Mapa, Higher Algebra, Sarat Book Distributor, India 2019.

Lesson Plan for Course: B.Sc(H) Sem-III Code: MTMACOR07T Credit: 6

- Course Name: Numerical Methods
- Course coordinator: Pintu Debnath
- Course Outcomes:
 - CO-1. To learn algorithms of various numerical methods including their convergences and error.
 - CO-2. To find root of a algebraic an transcendental equation and matrix inverse by various numerical methods.
 - CO-3. To learn various types of interpolation methods and finite differences, and their application on numerical differentiation.
 - CO-4. To integrate numerically by several rules, and power method for determining eigen values.
 - CO-5. To solve ordinary differential equations by Euler's method and Runge-Kutta methods.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Jul	Unit-1: Algorithms, Convergence, Errors: Relative, Absolute. Round off, Truncation.	SM	05	Theoretical-04 Tutorial-01
Aug	Unit-2: Transcendental and Polynomial equations: Bisection method, Newton's method, Secant method, Regulafalsi method, fixed point iteration, Newton-Raphson method. Rate of convergence of these methods. Unit-3: System of linear algebraic equations: Gaussian Elimination and Gauss Jordan methods.	SM	14	Theoretical-12 Tutorial-02
1 st Internal Assessment				
Sep	Unit-3: System of linear algebraic equations: Gauss Jacobi method, Gauss Seidel method and their convergence analysis, LU Decomposition Unit-4: Interpolation: Lagrange and Newton's methods, Error bounds, Finite difference operators. Gregory forward and backward difference interpolations. Numerical differentiation: Methods based on interpolations, methods based on finite differences.	SM	16	Theoretical-13 Tutorial-03
Oct	Unit-5: Numerical Integration: Newton Cotes formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpsons 3/8 th rule, Weddle's rule, Boole's rule. Midpoint rule, Composite Trapezoidal rule, Composite Simpson's 1/3rd rule, Gauss quadrature formula. The algebraic eigenvalue problem: Power method. Unit-6: Ordinary Differential Equations: The method of successive approximations, Euler's method, the modified Euler method, Runge-Kutta methods of orders two and four.	SM	25	Theoretical-21 Tutorial-04
2 nd Internal Assessment				
Nov				Theoretical-00 Tutorial-00

Dec	End Semester Examination			
	Assessment: Internal Assessment & Assignment		Total: 60 Hrs	Theoretical-50 Tutorial-10

Books:

- Brian Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, India, 2007.
- Mollah S. A. Numerical Analysis and Computational Procedures. Publisher Arunabha Sen Books and Allied (P) Ltd. 2018.
- Gupta R. K. Numerical Methods: Fundamentals and Applications. Cambridge University Press; 2019 May 9.

Lesson Plan for Course: B.Sc(H) Sem-III Code: MTMACOR07P Credit: 6

- Course name: Numerical Methods Lab
- Course coordinator: Pintu debnath
- Course Outcomes:
 - CO-1. To learn algorithms of various programming problems.
 - CO-2. Able to write C-programming of various methods to solve transcendental and algebraic equations.
 - CO-3. Able to write C-programming of various methods to solve system of linear equations and ODEs.
 - CO-4. Able to write C-programming for numerical integration and differentiation.
 - CO-5. Able to write C-programming of various methods to fitting a polynomial functions, Power method to find eigen values.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Jul	1. Calculate the sum $1/1 + 1/2 + 1/3 + 1/4 + \dots + 1/N$. 2. Enter 100 integers into an array and sort them in an ascending order.	SM	03	Theoretical-02 Tutorial-01
Aug	3. Solution of transcendental and algebraic equations by <i>a) Bisection method</i>	SM	04	Theoretical-04 Tutorial-00
Sep	3. Solution of transcendental and algebraic equations by <i>b) Newton Raphson method.</i> <i>c) Secant method.</i> <i>d) Regula Falsi method.</i>	SM	12	Theoretical-09 Tutorial-03
1 st Internal Assessment				
Oct	4. Solution of system of linear equations <i>a) LU decomposition method</i> <i>b) Gaussian elimination method</i> <i>c) Gauss-Jacobi method</i> <i>d) Gauss-Seidel method</i> 5. Interpolation <i>a) Lagrange Interpolation</i> <i>b) Newton Interpolation</i> 6. Numerical Integration <i>a) Trapezoidal Rule</i> <i>b) Simpson's one third rule</i> <i>c) Weddle's Rule</i> <i>d) Gauss Quadrature</i> 7. Method of finding Eigenvalue by <i>Power method</i> 8. Fitting a Polynomial Function	BS	30	Theoretical-26 Tutorial-04
2 nd Internal Assessment				
Nov	9. Solution of ordinary differential equations <i>a) Euler method</i> <i>b) Modified Euler method</i> <i>c) Runge Kutta method</i>	BS	11	Theoretical-09 Tutorial-02
Dec	End Semester Examination			
	Assessment: Internal Assessment & Assignment		Total: 60 Hrs	Theoretical-50 Tutorial-10

Books:

- Yashavant Kanetkar, Let Us C, BPB Publications, 2016.
- Kamthane AN. Programming in C, 2/e. Pearson Education India; 2011.

Lesson Plan for Course: B.Sc(H) Sem-III Code: MTMSSEC01M Credit: 6

- Course Name: C-Programming Language
- Course coordinator: Biswajit Sarkar
- Course Outcomes:
 - CO-1. Learn basic of high-level programming languages.
 - CO-2. To know about some arithmetic operators and logical operators to construct flowchart.
 - CO-3. Able to use for loop, while loop and do-while loop in C-programming.
 - CO-4. Able to use arrays and multi-dimensional arrays in C-programming.
 - CO-5. Capable to write programming by using functions.

Course planner

Month	Course Topic	Teacher	Class-hour	Remarks*
Jul	Unit-1: Basics of Computer Programming: Definition, Requirement of programming language, Machine language, high-level programming languages, machine code of a program: compilation process.	SM	02	Theoretical-02 Tutorial-00
Aug	Unit-1: Problem solving approaches: algorithm and flowchart.	SM	05	Theoretical-04 Tutorial-01
Sep	Unit 2 : Fundamentals of Programming: Built in Data Types: int, float, double, char; Constants and Variables; first program: printf(), scanf(), compilation etc., keywords, Arithmetic operators: precedence and associativity, Assignment Statements: post & pre increment/decrement, logical operators: and, or, not. Unit 3 : Statements: Relational operators, if-else statement, Iterative Statements: for loop, while loop and do-while loop; controlling loop execution: break and continue, nested loop.	SM	07	Theoretical-06 Tutorial-01
Oct	Unit 4 : Arrays: Definition & requirement, declaration & initialization, indexing, one dimensional array: finding maximum, minimum, simple sorting and searching. Unit 6 : Functions: Why?, How to declare, define and invoke a function, Variables' scope, local & global variables and function parameters, Pointers, arrays as function parameters, <i>return</i> statement.	SM	05	Theoretical-04 Tutorial-01
	Unit 5 : Multi-dimensional arrays: Matrix Manipulations (Addition, Multiplication, Transpose)	PD	03	Theoretical-02 Tutorial-01
Nov	Unit 6 : Functions: Header files and their role. Illustrate different examples like swapping values, compute n!, nCr, find max/min from a list of elements, sort a set of numbers, matrix addition/ multiplication etc.	SM	05	Theoretical-04 Tutorial-01
	Unit 5 : Multi-dimensional arrays: Arrays and Pointers, Memory allocation and deallocation: <i>malloc()</i> and <i>free()</i> functions.	PD	03	Theoretical-03 Tutorial-00
Dec	End Semester Examination (By Department)			
	Assessment: Assignment		Total: 30 Hrs	Theoretical-25 Tutorial-05

Books:

- Yashavant Kanetkar, Let Us C , BPB Publications, 2016.
- Kamthane AN. Programming in C, 2/e. Pearson Education India; 2011.
- Satbir Mehla, Vishakha Gupta, M.L. Jain, Amit Sehgal, New College Programming in C and Numerical Methods For B.A./B.Sc., Jeevansons Publications, India, Ninth Revised Edition, 2015