Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Differential Calculus (MATH101TH)**

Month	**Weeks**	**Books/Unit/Topics**	**Teaching Methods/ Resources**	**Students activities**
July	**1 - 4**	**Unit-I:** Limit and Continuity (epsilon & delta definition). Types of discontinuities, Differentiability of functions.	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** H.Anton, I. Birens& S. Davis, Calculus, John Wiley & Sons, Inc., 2002. **2.** G.B. Thomas & R.L. Finney, Calculus, Pearson Education, 2017. **3.** T.M. Apostol, Calculus, Vol.-1, John Wiley &Sons, 2002.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1**	Successive differentiation, Leibnitz's Theorem		
	2 - 4	**Unit-II:** Indeterminate forms, Rolle's Theorem, Lagrange's and Cauchy's Mean Value Theorems		
September	**1 - 3**	Taylor's theorem with Lagrange's and Cauchy's form of remainder, Taylor's series, Maclaurin's series		
	4	**Unit -III:** Concavity, Convexity and Points of inflexion.		
October	**1 - 4**	Curvature, Radius of Curvature, Centre of Curvature, Asymptotes, Singular points, Double points, Polar coordinates, Relation between Cartesian and Polar Coordinates.		
November	**1 - 4**	**Unit -IV:** Functions of several variables, Partial differentiation, Euler's Theorem on homogeneous functions		
December	**1 - 4**	Maxima and Minima of functions of several variables.		
February	**1 - 2**	Maxima and Minima with Lagrange multiplies method, Jacobians		
	2 -4	Revision,		

Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Differential Equations (MATH102TH)**

Month	Weeks	Books/Unit/Topics	Teaching Methods/ Resources	Students activities
July	**1 - 4**	**Unit-I:** Basic theory of linear differential equations, Wronskian. First order exact differential equations. Integrating factors and rule to find integrating factor.	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** Sheply L., Ross Differential Equations, 3rd Ed., John Wiley & Sons, 1984. **2.**I. Sneddon, Elements of Partial Differential Equations, MacGraw Hill International Edition, 1967.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1**	First order higher differential equations solvable for x, y, p, Clairut's form		
	2 - 4	**Unit-II:** Methods of solving higher-order differential equations. Solving a differential equation by reducing its order.		
September	**1 - 2**	Linear homogenous equations with constant coefficients, Linear non-homogenous equations.		
	3-4	**Unit -III:** The method of variation of parameters with constant coefficients.		
October	**1 - 4**	The Cauchy-Euler equation and Legendre equation. Simultaneous differential equations, Total differential equations. .		
November	**1 - 2**	**Unit- IV:** Order and degree of partial differential equations, Formation of first order partial differential equations.		
	2 - 4	Linear partial differential equations of first order,		
December	**1 - 4**	Lagrange's method and Classification of second order partial differential equations and Revision		
February	**1 - 4**	Revision,		

Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Transportation & Game Theory (MATH317TH)**

Month	**Weeks**	**Books/Unit/Topics**	**Teaching Methods/ Resources**	**Students activities**
July	**1 - 4**	**Unit-I:** Transportation Problem and its mathematical formulation, northwest corner method, least cost method	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** Mokhtar S. Bazaraa, John J. Javis and Hanif D. Sherali, Linear Programming and NetworkFlows, 2nd Ed., John Wiley & Sons, India, 2004. **2.**Hamdy A. Taha, Operational Research, An Introduction, 8th Ed., Prentice – Hall India, 2006. **3.**F.S. Hillier and G.J. Lieberman, Introduction to Operational Research, 9th Ed., Tata McGraw Hill, Singapore, 2009.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1 - 4**	**Unit-II:** Vogel approximation method for determination of starting basic solution,		
September	**1**	Algorithm for solving transportation problem		
	2 - 4	**Unit -III:** Assignment problem and its mathematical formulation.		
October	**1 - 2**	Hungarian method for solving assignment problem.		
	3 - 4	**Unit -IV:**Game theory, Formulation of two-person zero sum game.		
November	**1 - 4**	Solving two-person zero sum games with mixed strategies,		
December	**1 - 4**	Graphical solution procedure. Revision		
February	**1 - 4**	Revision,		

Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Real Analysis (MATH201TH)**

Month	**Weeks**	**Books/Unit/Topics**	**Teaching Methods/ Resources**	**Students activities**
July	**1 - 4**	**Unit-I:** Limit and Continuity (epsilon & delta definition). Types of discontinuities, Differentiability of functions.	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** E. Fischer, Intermediate Real analysis, Springer, 1983. **2.** R.G. Bartle and D.R. Sherbert, Introduction to Real Analysis, John Wiley and Sons (Asia) P. Ltd., 2000 **3.**K.A. Ross, Elementary Analysis – The Theory of Calculus Series – Undergraduate Texts in Mathematics, Springer Verlag, 2003 **4.**T.M. Apostol, Calculus, Vol.-1, John Wiley &Sons, 2002.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1**	Successive differentiation, Leibnitz's Theorem		
	2 - 4	**Unit-II:** Indeterminate forms, Rolle's Theorem, Lagrange's and Cauchy's Mean Value Theorems		
September	**1 - 3**	Taylor's theorem with Lagrange's and Cauchy's form of remainder, Taylor's series, Maclaurin's series		
	4	**Unit -III:** Concavity, Convexity and Points of inflexion.		
October	**1 - 4**	Curvature, Radius of Curvature, Centre of Curvature, Asymptotes, Singular points, Double points, Polar coordinates, Relation between Cartesian and Polar Coordinates.		
November	**1 - 4**	**Unit -IV:** Functions of several variables, Partial differentiation, Euler's Theorem on homogeneous functions		
December	**1 - 4**	Maxima and Minima of functions of several variables.		
February	**1 - 2**	Maxima and Minima with Lagrange multiplies method, Jacobians		
	2 -4	Revision,		

Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Matrices (MATH301TH)**

Month	Weeks	Books/Unit/Topics	Teaching Methods/ Resources	Students activities
July	**1 - 4**	**Unit-I:** Types of matrices, Rank of matrix, Invariance of rank under elementary transformations, Reduction to normal form,	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** A.I. Kostrikin, Introduction to Algebra, Springer Verlag, 1984. **2.**S.H. Friedberg, A.L.Isel and L.E.Spence, Linear Algerbra, Prentice Hall of India Pvt., Ltd., New Delhi, 2004. **3.** Richard Bronson, Theory and Problems of Matrix Operators, Tata McGraw Hill,1989.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1**	Solution of linear homogeneous and non-homogeneous equations.		
	2 - 4	**Unit-II:** Matrices in diagonal form, Reduction to diagonal form, Computation of matrix inverses using elementary row operations.		
September	**1 - 2**	Rank of matrix. Solution of a system of linear equations using matrices. Illustrative examples of above concepts from geometry, physics, chemistry etc.		
	3 - 4	**Unit -III:** Definition of Vector space, R,R2, R3, as vector spaces over R,		
October	**1 - 4**	Concept of Linear dependence/Independence, Standard basis for R,R2, R3, Examples of different bases, Subspaces of R2, R3.		
November	**1 - 4**	**Unit -IV:** Translation, Dilation, Rotation, Reflection in a point, line and plane, Matrix of basic geometric transformations.		
December	**1 - 4**	Interpretation of eigenvalues and eigenvectors for such transformations and eigenspaces as invariant subspaces.		
February	**1 - 2**	Questions on eigenvalues and eigenvectors, Revision,		

Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Probability & Statistics (MATH313TH)**

Month	Weeks	Books/Unit/Topics	Teaching Methods/ Resources	Students activities
July	**1 - 4**	**Unit-I:** Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function.	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** Robert V. Hogg, Joseph W. McKean and Aen T. Craig, Introduction to Mathematical Statistics, Pearson Education, Asia, 2007. **2.**Irwin Miller and Marylees Miler, John E. Freund, Mathematical Statistics with Application, 7th Edition Pearson Education, Asia, 2006. **3.** Sheldon Ross, Introduction to probability Model 9th Ed. Academic Pres Indian Reprint, 2007.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1-2**	Probability mass/density functions		
	3 - 4	**Unit-II:** Mathematical expectations, moments, moment generating functions.		
September	**1 - 3**	Questions on moment generating functions, Characteristic function, discrete distribution: Uniform.		
	4	**Unit -III:** Binomial distribution,		
October	**1 - 4**	Poisson distribution, continuous distributions: uniform, normal distribution		
November	**1**	Exponential distribution.		
	3 -4	**Unit -IV:**Joint cumulative distributionfunction and its properties. Joint probability density functions		
December	**1 - 4**	Marginal and conditional distributions, expectation of functions of two random variables.		
February	**1 - 2**	Conditional expectations, independent and random variables.		
	2 - 4	Revision		

Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Integral Calculus (MATH309TH)**

Month	**Weeks**	**Books/Unit/Topics**	**Teaching Methods/ Resources**	**Students activities**
July	**1 - 4**	**Unit-I:** Integration by Partial fractions Integration of rational and irrational functions.	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** G.B. Thomas & R.L. Finney, Calculus, Pearson Education, 2017. **2.**H. Anton, I. Bivens and S. Davis. Calculus, john Wiely and Sons (Asia) P. Ltd., 2002.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1-2**	Properties of definite integrals		
	3 - 4	**Unit-II:** Reduction formulae.		
September	**1 - 3**	Reduction formulae cont., Reduction by connecting two integrals Smaller index =1 method.		
	4	**Unit -III:**Curves in plane,		
October	**1 - 4**	Area and length of curves in the plane volume and surfaces of solids of revolution		
November	**1**	Cartesian and parametric form.		
	3 -4	**Unit -IV:**Double Integrals		
December	**1 - 4**	Triple integrals.		
February	**1 - 2**	Some questions on Double and triple integrals.		
	2 - 4	Revision		

Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Vector Calculus (MATH310TH)**

Month	**Weeks**	**Books/Unit/Topics**	**Teaching Methods/ Resources**	**Students activities**
July	**1 - 4**	**Unit-I:** Scalar and vector product of three vectors, Product of four vectors, Reciprocal vectors. Scalar valued point functions	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** G.B. Thomas & R.L. Finney, Calculus, Pearson Education, 2017. **2.**H. Anton, I. Bivens and S. Davis. Calculus, john Wiely and Sons (Asia) P. Ltd., 2002. **3.** P.C. Matthew's, Vector Calculus, Springer Verlag London Limited, 1998.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1-3**	Vector valued point functions. Derivative along a curve, directional derivatives.		
	3 - 4	**Unit-II:** Gradient of scalar point function.		
September	**1 - 4**	Divergence and curl of a vector point function, Divergence and curl of sums and products. Laplacian operator.		
October	**1 - 4**	**Unit -III:**Orthogonal Curvilinear Coordinates, Condition for orthogonality. Fundamental triads of mutually orthogonal unit vectors.		
November	**1 - 2**	Gradient, Divergence, curl and Laplacian operators in terms of orthogonal curvilinear coordinates.		
	3 -4	**Unit -IV:**Vector Integration		
December	**1 - 4**	Line, surface and volume integrals. Theorems of Gauss, Green and Stokes		
February	**1 - 3**	Problems based on Gauss, Green and Stokes Theorems.		
	4	Revision		

Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Numerical Methods (MATH304TH)**

Month	Weeks	Books/Unit/Topics	Teaching Methods/ Resources	Students activities
July	**1 - 4**	**Unit-I:** Algorithms, Convergence, Bisection method, False position method, Fixed point method.	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** B. Bradie, A Friendly Introduction to Numerical Analysis. Pearson Education, India, 2007. **2.**M. K. Jain, S. R. K. Iyenger and R. K. Jain, Numerical Methods for Scientific and Engineering Computation, 5th Ed., New age International Publisher, India, 2007.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1-3**	Newton's method, Secant method, LU decomposition.		
	4	**Unit-II:** Gauss-Jacobi method		
September	**1 - 4**	Gauss-Seidel and SOR iterative methods, Problems based on these methods.		
October	**1 - 2**	Lagrange and Newton interpolation: linear and higher order.		
	3 - 4	**Unit -III:**Finite difference operators, Numerical differentiation.		
November	**1 - 2**	Newton's forward difference and backward difference methods.		
	3 -4	Sterling's Central difference method, Problems based on above methods.		
December	**1 - 4**	**Unit -IV:**NumericalIntegration: Trapezoidal rule, Simpson's rule, questions on numerical integration.		
February	**1 - 2**	Euler's method.		
	3 - 4	Revision		

Yearly Teaching Plan

Name of the Department: **Mathematics** Session: **2023-2024**

Course: **Algebra (MATH202TH)**

Month	Weeks	Books/Unit/Topics	Teaching Methods/ Resources	Students activities
July	**1 - 4**	**Unit-I:** Definition and examples of groups, examples of abelian and non-abelian groups, the group Zn of integers under addition modulo n.	**Teaching Methods:** Lecture Methods/PPT **Resources:** **1.** John B. Fraleigh, A FIrst Course in Abstract Algebra, 7th Ed., Pearson, 2002. **2.**M. Artin, Abstract Algebra, 2nd Ed., Pearson, 2011. **3.** Joseph A Gallian, Contemporary Abstract Algebra, 4th Ed., Narosa, 1999.	**1.** Students Presentations **2.** Class tests **3.** Seminars **4.** Quiz **5.** Group Discussions
August	**1-3**	The group U(n) of units under multiplication modulo n. Cyclic groups from number systems, complex roots of unity.		
	4	**Unit-II:** Subgroups		
September	**1 - 4**	Cycle subgroups, the concept of a subgroup generated by a subset and the commutator subgroup of a group, examples of subgroups.		
October	**1 - 2**	Center of a group, Cosets, Index of subgroups, Lagrange's theorem, order of an element.		
	3 - 4	**Unit -III:**Normal subgroups: their definition, examples and characterization,		
November	**1 - 4**	Quotient groups. Kernel, Basic theorem of Homomorphism. First theorem of Homomorphism.		
December	**1 - 4**	**Unit -IV:**Definition and examples of Rings, examples of commutative and non-commutative rings: rings from number systems, Zn the ring of integers modulo n. Rings of matrices.		
February	**1 - 3**	Polynomial rings, subrings and ideals, definition of Integral domain and fields.		
	3 - 4	Revision		