

PROGRAM SUBJECT OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : HCT 3.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Functional Analysis		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>1)Banach spaces Normed linear spaces,Banach spaces, Quotient norm spaces, continuous linear transformations, equivalent norms,the Hahn-Banach theorem and its consequences. Conjugate space and separability, second conjugate space. The open mapping Theorem, The closed graph theorem, The conjugate of an operator, The uniform boundedness principle.</p> <p>2)Hilbert spaces Definition and examples and simple properties, orthogonal complements, The projection theorem, orthogonal sets, The Bessels inequality, Fourier expansion and Perseval's equation, separable Hilbert spaces, The conjugate space, Riesz's theorem, The adjoint of on operators, self adjoint operators, Normal and unitary operators, projections.</p> <p>3)Contraction mapping and Banach fixed point theorem.</p>	<p>1)To introduce students about Normed linear spaces,Banach spaces, Quotient norm spaces, The uniform boundedness principle</p> <p>2)To introduce students about Definition and examples and simple properties, orthogonal complements, The projection theorem, orthogonal sets, unitary operators, projections.</p> <p>3)To students start learning about Contraction mapping and Banach fixed point theorem.</p>	<p>1)Students will learn Normed linear spaces,Banach spaces, Quotient norm spaces, The uniform boundedness principle</p> <p>2)Students will learn Definition and examples and simple properties, orthogonal complements, The projection theorem, orthogonal sets, unitary operators, projections</p> <p>3)Students will learn Contraction mapping and Banach fixed point theorem.</p>

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B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : HCT 3.2		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Advanced Discrete Mathematics		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>1)Lattices Definition and examples of posets and lattices, sublattices and direct products, Modular and distributive lattices, Homomorphisms, Boolean algebras and applications.</p> <p>2)Graph Theory Definition of a graph, vertex degrees, simple, regular complete and bipartite graphs, paths and cycles in a graph, connected graphs, The matrix representation of a graph, Fusion.</p> <p>3)Trees Definition and simple properties of a tree, bridges, spanning trees, cut vertices.</p> <p>4)Combinatorics Basic counting methods: Inclusion exclusion principle Pigeonhole principle, recurrence relations and generating functions.</p>	<p>1)To introduce students about posets and lattices, sublattices , Boolean algebras and applications</p> <p>2)To introduce students about Definition of a graph, vertex degrees, simple, regular complete and bipartite graphs, Fusion</p> <p>3)To students start learning about Trees ,Definition and simple properties of a tree</p> <p>4)To introduce students about Combinatorics ,Basic counting methods</p>	<p>1)Students will learn posets and lattices, sublattices , Boolean algebras and applications</p> <p>2)Students will learn Definition of a graph, vertex degrees, simple, regular complete and bipartite graphs, Fusion</p> <p>3)Students will learn Trees ,Definition and simple properties of a tree</p> <p>4)Students will learn Combinatorics ,Basic counting methods</p>

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B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : HCT 3.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Linear Algebra		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit – 1: Linear Transformations Linear functional, The double dual, The transpose of a linear transformation, characteristic values, Annihilator polynomials, invariant subspaces.</p> <p>Unit – 2: Elementary canonical forms: Triangulability, diagonalizability, Direct sum decompositions, Invariant direct sums, The primary decomposition theorem</p> <p>Unit – 3 Jordan and Rational Forms: The Jordan form, computation of Invariant factors, Companion matrix, the rational form</p> <p>Unit- 4 : Inner Product Spaces: Linear functional and adjoints, unitary operators, Normal operators, Operators on Inner Product Spaces, Forms on Inner product spaces, positive forms, more on forms, spectral theory .</p>	<p>1)To introduce special linear transformations,annihilator of a subspace,double dual.</p> <p>2)To make students realize importance of triangulability and diagonalizability of linear transformations and solving problems based on the concepts.</p> <p>3)To introduce students about JC and rational forms ,companion matrix especially when matrix is not diagonalizable.</p> <p>4)To introduce Inner Product spaces,Projection maps,Normal,Unitary and Adjoint operators,positive forms.</p>	<p>1)Students start solving examples based on annihilator ,functionals and bases of dual and double dual</p> <p>2)Students start learning diagonalizing and triangularizing matrices</p> <p>3)Students start solving examples examples on Rational and JC forms and simplifying the matrices.</p> <p>4)Student start categorising given matrix into positive and negative forms,semi-definite forms.</p>

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B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : SCT 3.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Differential Geometry		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit 1 1.1 Tangent vectors and tangent vector fields, frame fields. 1.2 Reparametrization of curves, standard curves. 1.3 Directional derivative 1.4 Differential forms 1.5 Speed of curve</p> <p>Unit 2 2.1 Frenet formulas for unit speed and for arbitrary speed curves 2.2 Isometries in 2.3 Translation, Rotation, Orthogonal Transformation 2.4 Frenet approximation of curves 2.5 Covariant derivatives</p> <p>Unit 3 3.1 Calculus on Surface 3.2 Co-ordinate patches 3.3 Surface, Surface of revolution 3.4 Patch Computation 3.5 Parametrization of a region $X(D)$ in M 3.6 Differentiable functions and Tangent vectors</p> <p>Unit 4 4.1 Shape Operator 4.2 Normal curvature 4.3 Guassian and mean curvature</p>	<p>1)To introduce basic concepts of vector fields,directional derivatives and reparametrization of curves</p> <p>2)To make students know frenet apparatus of curves,isometries and their properties</p> <p>3)To introduce basic concepts of patch computation and its applications in geographical patch</p> <p>4)To make students know shape operator,normal operator and curvatures</p>	<p>1)Students will realize geometrical meaning of directional derivatives and reparametrization of curves.</p> <p>2)Students will start finding Frenet apparatus of given curves thereby interpreting properties of the curves.</p> <p>3)Students will learn process of finding patch computation,definition of surface</p> <p>4)Students will realize imprtance of curvatures in determining shapes of surfaces.</p>

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NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : OET 3.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Numerical Analysis		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Errors in numerical calculations and solution of algebraic and transcendental equations. 1.1 Numbers and their accuracy 1.2 Mathematical preliminaries. 1.3 Errors & their computation: Absolute, relative & percentage errors. 1.4 A general error formula 1.5 Error in series approximation 1.6 The iteration method & it's rate of convergence. 1.7 The method of false position & its rate of convergence 1.8 Secant method & its rate of convergence. 1.9 Newton Raphson method and its rate of convergence Interppolation and Numerical Differentiation. 2.1 Errors in polynomial interpolation. 2.2 Finite Differences: Forward, Backward & Central Differences, Symbolic relations & separation of symbols. 2.3 Newton's Formula for interpolation. 2.4 Lagrange's interpolation formula and error in Lagrange's interpolation formul. 2.5 Divided differences & their properties. 2.6 Newton's general interpolation formula.</p>	<p>1)To make students to know Errors in numerical calculations and solution of algebraic and transcendental equations 2)To make students to know Interppolation and Numerical Differentiation</p>	<p>1)Students will learn Errors in numerical calculations and solution of algebraic and transcendental equations 2)Students will learn Interppolation and Numerical Differentiation</p>

<p>Numerical solutions of system of linear equations & Eigen Values.</p> <p>3.1 Gaussian elimination method.</p> <p>3.2 Method of factorization (LU decomposition)</p> <p>3.3 Iterative Method: Gauss Seidal Method.</p> <p>3.4 Eigen value problem: Householder's method.</p> <p>3.5 Eigen value of symmetric tridiagonal matrix.</p> <p>3.6 Power method for largest Eigen value.</p> <p>Numerical Intergration and Solutions of ordinary differential equations</p> <p>4.1 Numerical Integration: Trpezoidal rule Simpson's 1/3rd rule and Simpson's 3/8th rule.</p> <p>4.2 Errors in the above methods.</p> <p>4.3 Solution of differential equation by Taylor's series: Euler's method and Euler's modified method.</p>	<p>1)To make students to know Numerical solutions of system of linear equations & Eigen Values.</p> <p>2)To make students to know Numerical Intergration and Solutions of ordinary differential equations</p>	<p>1)Students will learn Numerical solutions of system of linear equations & Eigen Values.</p> <p>2)Students will learn Numerical Intergration and Solutions of ordinary differential equations</p>
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PROGRAM SUBJECT OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : HCT 4.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Measure and Integration		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit - 1 Measure and Integration : Measure space, Measurable function, Integration Fatous lemma (statement only), Generalization of monotone and Lebesque convergence theorem</p> <p>Unit - 2 Signed Measure : Hahn Decomposition, Jordan Decomposition, Radon-Nikodym theorem Lebesque Decomposition</p> <p>Unit - 3 Measure and Outer Measure : Outer Measure and measurability, the Extension theorem, Product measures, Fubini's and Tonelli's theorem</p> <p>Unit - 4 Inner measure and its properties, Baire Borel sets and positive linear functional and Borel measures</p>	<p>1)To make students to know Measure space, Measurable function, Integration , Lebesque convergence theorem.</p> <p>2)To make students to know Hahn Decomposition, Jordan Decomposition , Lebesque Decomposition.</p> <p>3)To make students to know Outer Measure and measurability, the Extension theorem.</p> <p>4)To make students to know Inner measure and its properties , Borel measures</p>	<p>1)Students will learn Measure space, Measurable function, Integration , Lebesque convergence theorem.</p> <p>2)Students will learn Hahn Decomposition, Jordan Decomposition, Lebesque Decomposition.</p> <p>3)Students will learn Outer Measure and measurability, the Extension theorem/</p> <p>4)Students will learn Inner measure and its properties , Borel measures</p>

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Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : HCT 4.2		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Partial Differential Equations		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit - 1 First order Partial Differential Equations : Curves and surfaces, classification of integrals , linear equations of first order, Pfaffians, compatible systems, Charpits method , Jacobi method</p> <p>Unit -2 Integral surfaces through a given curve, quasi linear equations, nonlinear first order partial differential equations</p> <p>Unit - 3 Second order Partial Differential Equations : Genesis of Second order Partial Differential Equations, Classification, one dimensional wave equations, vibrations, of a string, families of equipotential surface</p> <p>Unit -4 Maximum and minimum principles, Dirichlets and Neumann problems. Dirichlet problem for circle, Harnacks theorem. Greens theorem (Statement only) , Classification in case of n variables</p>	<p>1)To make students to study Curves and surfaces, classification of integrals, Pfaffians, compatible systems, Charpits method , Jacobi method.</p> <p>2)To make students to study Integral surfaces through a given curve, nonlinear first order partial differential equations.</p> <p>3)To make students to study Genesis of Second order Partial Differential Equations, equipotential surface.</p> <p>4)To make students to study Maximum and minimum principles, Dirichlets and Neumann problems, Classification in case of n variables</p>	<p>1)Students will learn Curves and surfaces, classification of integrals, Pfaffians, compatible systems, Charpits method , Jacobi method.</p> <p>2)Students will learn Integral surfaces through a given curve, nonlinear first order partial differential equations.</p> <p>3)Students will learn Genesis of Second order Partial Differential Equations, equipotential surface.</p> <p>4)Students will learn Maximum and minimum principles, Dirichlets and Neumann problems, Classification in case of n variables.</p>

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NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : HCT 4.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Integral Equations		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit - 1 Preliminary concepts : Introduction, Some problems which give rise to integral equations, Classification of linear integral equations, Integro -differential equations, conversions of initial value problems to Volterra type integral equations and boundary value problems Fredholm type integral equations, Conversion of Sturm Liouville problems to integral equations, Solution of Sturm Liouville problems.</p> <p>Unit - 2 Fredholm Equations : Integral equations with separable (Degenerate), Hermitian and symmetric Kernel, The operator method in the theory of integral equations, Hilbert-Schmidt theorem. Construction of Green function and its use in solving Boundary Value Problems</p> <p>Unit - 3 Volterra Equations : Types of Volterra equations, Resolvent kernel of Volterra equations, Methods of successive approximations, Convolution type kernels. Application of Fourier and Laplace transforms to the solution of Volterra integral equations.</p> <p>Unit - 4 Determination of Iterated Kernels and Resolvent Kernels Solution of fredholms integral equations by successive approximations</p>	<p>1)To introduce basic concepts of integral equation,relation between differential and integral equation and their interconversion 2)To introduce Fredholm integral equation,methods to find solution ,kernel and Green's function 3)To introduce Volterra integral equation,methods to find solution ,kernel and method to find approximate solution 4)To make students acquainted with kernels and resolvent kernels and their importance in finding solutions to integral equations</p>	<p>1)Students will learn methods of interconversion of differential equation into integral equation and vice versa 2)Students will start solving Fredholm equations with different specified methods,will effectively start solving examples involving Green's functions 3)Students will start solving Volterra equations with different specified methods,will effectively start solving examples involving Green's functions 4)Students will use resolvent kernel to find solutions to integral equations</p>

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B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : HCT 4.4		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Operation Research		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit-1. Convex Sets and Functions: Convex sets, supporting and separating hyperplanes, convex polyhedra and polytope, extreme points, convex functions. Linear Programming Problem (LPP): Introduction to linear programming problems, Graphical solution to LPP, Standard LPP (SLPP), basic solution and basic feasible solution to SLPP. Methods for solving LPP: Simplex Algorithm, Two-phase simplex method, Big M method</p> <p>Unit-2. Duality in LPP: Concept of duality, Theorems related to duality, complementary slackness property and development of dual simplex algorithm. Integer Linear Programming Problem The concept of cutting plane, Gomory's method of cutting plane for all ILPP and mixed ILPP, Branch and Bound method</p> <p>Unit-3 Quadratic Programming Problem (QPP): Definition of QPP, Kuhn-Tucker conditions, Algorithms for solving QPP: Wolfe's and Beale's</p>	<p>1)To make students to study Convex Sets and Functions, Linear Programming Problem (LPP) , Two-phase simplex method, Big M method</p> <p>2)To make students to study Concept of duality, Theorems related to duality, complementary slackness property, Gomory's method of cutting plane for all ILPP and mixed ILPP, Branch and Bound method</p> <p>3)To make students to study Quadratic Programming Problem, Wolfe's and Beale's algorithm</p>	<p>1)Students will learn Convex Sets and Functions, Linear Programming Problem (LPP) , Two-phase simplex method, Big M method</p> <p>2)Students will learn Concept of duality, Theorems related to duality, complementary slackness property, Gomory's method of cutting plane for all ILPP and mixed ILPP, Branch and Bound method</p> <p>3)Students will learn Quadratic Programming Problem, Wolfe's and Beale's algorithm</p>

<p>algorithm</p> <p>Unit-4. Theory of Games: Two person zero sum games, Minimax and Maxmin principles, Saddle point, Mixed strategies; Rules of dominance, Solution of 2 x 2 game by Algebraic method, Graphical method, Reduction of game problem as LPP, Minimax and Maxmin theorem</p>	<p>4)To make students to study Theory of Games, Solution of 2 x 2 game by Algebraic method ,Minimax and Maxmin theorem</p>	<p>4)Students will learn Theory of Games, Solution of 2 x 2 game by Algebraic method, Minimax and Maxmin theorem</p>
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D.B.F.Dayanand College of Arts and Science,Solapur

PROGRAM SUBJECT OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : SCT 4.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Probability Theory		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit-1: Classes of sets, Sequence of sets, limsup and liminf and limit of sequence of sets, field, σ-field, σ-field generated by a class, Borel σ-field, Probability measure, Probability space, properties of probability measure-continuity, mixture of probability measure. Lebesgue and Lebesgue-Stieltjes measures on \mathbb{R}. Independence of events.</p> <p>Unit 2: Measurable function, random variable, distribution of a random variable, simple random variable, elementary random variable, liminf, limsup and limit of sequence of random variables. Method of obtaining a random variable as a limit of sequence of simple random variables. Integration of a measurable function with respect to a measure, expectation of a random variable, monotone convergence theorem, Fatous Lemma, Dominated Convergence theorem and their application.</p> <p>Unit-3: Convergence of sequence of random variables, almost sure convergence, a characterizing property, convergence in probability, uniqueness of limit, a characterizing property. Yule Slutsky results and preservation under continuous transform (statement only). convergence in rth mean, interrelationships.</p> <p>Unit-4: Independence: Borel-Cantelli Lemma, Characteristics function, simple properties. Inversion theorem and uniqueness property (statements only). Convergence in distribution, continuity theorem (statement only), Weak and Strong laws of large numbers, Kolmogorov's three series theorem for almost sure convergence (statement only), Liapoune's Lindeberg-Feller Theorems on CLT (statement only). Application of the above result.</p>	<p>1)To make students acquainted with Classes of sets, Sequence of sets, limsup and liminf and limit of sequence of sets.</p> <p>2)To make students acquainted with Measurable function, random variable, distribution of a random variable, simple random variable, elementary random variable.</p> <p>3)To make students acquainted with Convergence of sequence of random variables, almost sure convergence, a characterizing property, convergence in probability.</p> <p>4)To make students acquainted with Borel-Cantelli Lemma, Characteristics function, simple properties</p>	<p>1)Students will learn Classes of sets, Sequence of sets, limsup and liminf and limit of sequence of sets.</p> <p>2)Students will learn Measurable function, random variable, distribution of a random variable, simple random variable, elementary random variable.</p> <p>3)Students will learn Convergence of sequence of random variables, almost sure convergence, a characterizing property, convergence in probability.</p> <p>4)Students will learn Borel-Cantelli Lemma, Characteristics function, simple properties</p>

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Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : HCT1.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Algebra-I		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>UNIT I: Groups Commutator subgroups, P-Subgroups, Conjugate classes , Zassenhaus lemma, G- sets, class equation, Sylow theorems</p> <p>UNIT II:Normal and subnormal series, Composition series, Jordan -Holder Theorem, Solvable groups, Nilpotent groups.</p> <p>UNIT III:UFD, PID, Euclidean domain, arithmetic in Euclidean domains</p> <p>UNIT IV: Polynomial rings, Polynomial ring over the rational field, The Eisenstien criteria, Division algorithm, irreducible polynomials, ideal structure in $F[X]$, Uniqueness of factorization in $F[x]$, UFD in Polynomial rings, Modules, Submodules.</p>	<p>1)To make students know concepts of Commutator subgroup,class equation and Sylow's theorem that help them to study finite groups</p> <p>2)To make students know different series of subgroups,refinements of seires.</p> <p>3)To introduce different types of rings,properties of irreducible and prime elements.</p> <p>4)To intoduce students about ring structure of polynomials over fields,the very feature of condition of irreducibility of polynomials over set of rational numbers.</p>	<p>1)Students will learn methods to find complete structure of finite groups just by knowing at order of groups.</p> <p>2)Students will learn process of refinements of series of subgroups for a group.</p> <p>3)Students will learn ED,PID,UFD structures,their properties and interrelations.</p> <p>4)Students will learn different methods of checking irredu ibility of polynomials over different fields,factorisation of polynomials over polynomial rings over field.</p>

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Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : HCT1.2		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Real Analysis –I		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>UNIT I :Riemann Integration Definition and existence of the integral, Refinement of partitions, Darboux’s theorem, Conditions of integrability, Integrability of the Sum and difference of integrable functions, The integral as a limit of sums, Some integrable functions, Integration and differentiation, the fundamental theorem of Calculus, Mean Value theorem of integral Calculus, Second Mean Value theorem.</p> <p>UNIT II Riemann – Stieltjes integral Definition and existence of the integral, A condition of integrability</p> <p>UNIT III Multivariable differential calculus Introduction, the directional derivative, Directional derivatives and continuity, total derivative, the total derivative expressed in terms of partial derivatives, the Jacobian matrix , the chain rule, the mean value theorem, for differentiable functions, Taylors formula for functions from R_n to R_1</p> <p>UNIT IV Implicit functions and Extremum problems Functions with nonzero Jacobian determinant, The inverse function theorem, The Implicit function theorem, Extrema of real valued functions of one variable</p>	<p>1)To make students know concepts of Riemann integration & darboux’x theorem & fundamental theorem on calculus that help them to study integration.</p> <p>2)To make students know concepts of Riemann integration Stieltjes integral.</p> <p>3)To make students know concepts of Multivariable differential calculus, To study the directional derivative & its extension to total derivative.</p> <p>3)To make students know concepts of Implicit functions theorem and Extremum problems.</p>	<p>1)Students will learn methods to study complete structure of real line & integration.</p> <p>2)Students will learn methods to study Riemann integration Stieltjes integral.</p> <p>3)Students will learn methods to study Multivariable differential calculus , To study the directional derivative & its extension to total derivative.</p> <p>4)Students will learn methods to study Implicit functions theorem and Extremum problems.</p>

PROGRAM SUBJECT OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : HCT1.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Differential Equations		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit I:Linear Equations with constant coefficients: The second order homogeneous equation, initial value problems for second order equations, Linear dependence and independence. A formula for the Wronskian, the non-homogeneous equations of order two, the homogeneous equations of order n, initial value problems for the nth order equations, Equations with real constants, The non- homogeneous equation of order n</p> <p>Unit II: Linear Equations with variable coefficients:Initial value problems for the homogeneous equations, solutions of the homogeneous equations, The Wronskian and linear independence, reduction of the order of a homogeneous equation, Homogeneous equations with analytic coefficients.</p> <p>Unit III: Linear Equations with regular singular points:The Euler equations, second order equations with regular singular points, The Bessels equation</p> <p>Unit IV: Existence and uniqueness of solutions:The method of successive approximations, The Lipschitz condition.</p>	<p>1)To make students know about linear dependence,independence of solutions,IVP of order 2 and n,Concepts of Wronskian</p> <p>2)To intrdouce students the concepts of Wronskian,solution using Wronskian and study of differential equations with analytic coefficients</p> <p>3)To introduce students about Euler's equation,categorisations of singular points and Bessel's equation</p> <p>4)To make students know method of successive approximation,Lipschitz condition for existence of solution</p>	<p>1)Students will learn effective methods of finding solutions to different examples using Wronskian</p> <p>2)Students will learn different concepts of Wronskian and its use in solving problems with analytic coefficients.</p> <p>3)Students get acquainted with solution by Euler's method,singular points and Bessel's equation</p> <p>4)Students will start using method of successive approximations and Lipschitz condition effectively and</p>

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B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : HCT1.4		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Classical Mechanics		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit-I : Mechanics of a particle, Mechanics of a system of particles, constraints, Generalised coordinates, D'Alembert's principle, Lagrange's equations of motion, the forms of Lagrange's equation for velocity dependent potential, and dissipative forces, applications of Lagrangian formulation, cyclic co-ordinates and generalised momentum,.</p> <p>Unit –II Functionals, basic lemma in calculus of variations, Euler-Lagrange's equations, the case of several dependent variables, the minimum surface of revolutions, the problem of Brachistochrone, Isoperimetric problems, Problem of the maximum enclosed area, shape of a hanging rope</p> <p>Unit –III Hamilton's principle, Lagrange's equations from Hamilton's principle, Hamilton's equations of motion from a variational principle. The principle of least action cyclic co ordinates and Routh's procedure, conservation theorems and physical significance of Hamiltonian</p> <p>Unit –IV The kinematics of rigid body motion: The independent co-ordinates of a rigid body, orthogonal transformations, properties of transformation matrix, infinitesimal rotations, the Eulerian angles, the Cayley-Klein parameters, Euler's theorem on motion of rigid body. Angular momentum and kinetic energy of motion of a rigid body about a point, The inertia tensor and moment of inertia, Euler's equations of motion</p>	<p>1)To make students know method Mechanics of a particle, Mechanics of a system of particles, constraints, Generalised coordinates, D'Alembert's principle generalised momentum</p> <p>2)To make students know method Functionals, basic lemma in calculus of variations, Euler-Lagrange's equations, the case of several dependent variables Isoperimetric problems</p> <p>3)To make students know method Hamilton's principle, Lagrange's equations from Hamilton's principle significance of Hamiltonian</p> <p>4)To make students know method The kinematics of rigid body motion: The independent co-ordinates of a rigid body, orthogonal transformations, properties of transformation matrix Euler's equations of motion</p>	<p>1)Students will learn different concepts of Mechanics of a particle, Mechanics of a system of particles, constraints, Generalised coordinates, D'Alembert's principle generalised momentum</p> <p>2)Students will learn different concepts of Functionals, basic lemma in calculus of variations, Euler- Lagrange's equations, the case of several dependent variables Isoperimetric problems</p> <p>3)Students will learn different concepts of Hamilton's principle, Lagrange's equations from Hamilton's principle significance of Hamiltonian</p> <p>4)Students will learn different concepts of The kinematics of rigid body motion: The independent co-ordinates of a rigid body, orthogonal transformations, properties of transformation matrix Euler's equations of motion</p>

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B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : SCT1.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Number Theory		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit- I Review of divisibility, The division algorithm, Greatest common divisor , Euclidean algorithm Diophantine equation $ax + by = C$. Primes and their distribution , Fundamental Theorem of Arithmetic, The Goldback Conjecture.</p> <p>Unit- II Congruences, Properties of Congruences, Linear congruences, Special divisibility tests. Fermats theorem, Fermats factorization method, Little theorem, Wilsons theorem.</p> <p>Unit-III Number theoretic functions, The functions σ and τ, The Mobius Inversion formula, The greatest integer function, Eulers Generalization of Fermats theorem Euler's phi function, Euler's theorem, properties of phi function.</p> <p>Unit-IV Primitive roots, The order of an integer modulo n, primitive roots for primes, composite numbers having primitive roots, The theory of Indices.</p>	<p>1)To introduce students about Diophantine equations and their solution,distribution of primes</p> <p>2)To make students know about congruence relation,its solution,Fermat's theorem and its application. To introduce students a Chinese Remainder theorem in solving simultaenous linear congruences</p> <p>3)To make students learn importance of Number-theoretic functions and to encourage work with new number-theoretic functions in solving problems.</p> <p>4)To introduce students about primitive roots,their imortance in solving non-linear congruences</p>	<p>1)Students get hand at solving Diophantine equation,start solving them effectively and various aspects of primes.</p> <p>2)Students will start solving linear congruence and their system and get hands at solving problems with the help of Fermat's theorem</p> <p>3)Students start solving examples involving different number theoretic functions.</p> <p>4)Students start solving many problems involving non-linear congruences in effective way.</p>

PROGRAM SUBJECT OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : HCT2.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Algebra-II		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit –I Field extensions, Finite field extension, Field adjunctions, Simple extension, algebraic element, Transcendental element, Algebraic extensions, Roots of polynomial, Multiple roots, splitting field of polynomial, Separable element, separable extension of a field, perfect field</p> <p>Unit –II The elements of Galois theory. Fixed field, The group $G(K,F)$ of automorphisms of K relative of F, Normal extension, Galois group, Fundamental theorem to Galois theory</p> <p>Unit –III Constructible real number, Solvability by radicals, Totally in separable extensions cyclotomic extensions</p> <p>Unit –IV : Finite fields and applications</p>	<p>1)To introduce students Field extensions, Finite field extension, Field adjunctions, Simple extension, algebraic element, Transcendental element , perfect field</p> <p>2)To make students know about Galois theory. Fixed field , Fundamental theorem to Galois theory</p> <p>3)To make students learn importance Constructible real number, Solvability by radicals , cyclotomic extensions</p> <p>4)To introduce students about Finite fields and applications</p>	<p>1)Students will learn Field extensions, Finite field extension, Field adjunctions, Simple extension, algebraic element, Transcendental element , perfect field</p> <p>2)Students will learn Galois theory. Fixed field , Fundamental theorem to Galois theory</p> <p>3)Students will learn Constructible real number, Solvability by radicals , cyclotomic extensions</p> <p>4)Students will learn Finite fields and applications</p>

D.B.F. Dayanand College of Arts and Science, Solapur

PROGRAM SUBJECT OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : HCT2.2		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Real Analysis-II		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>1) Lebesgue Measure: Outer measure, Measurable sets, Lebesgue measure, non-measurable sets</p> <p>2) Measurable functions: Measurable functions and their properties, Egoroff's theorem</p> <p>3) Lebesgue Integral: Lebesgue integral of a bounded function over a set of finite measure, the Lebesgue integral of a non-negative measurable function, Fatou's Lemma, the general Lebesgue integral, convergence in measure</p> <p>4) Differentiation and Integration: Differentiation of monotone functions, function of bounded variation, Differentiation of an integral, Absolute continuity, Convex functions.</p>	<p>1) To introduce students Lebesgue Measure , Measurable sets , non-measurable sets</p> <p>2) To make students know Measurable functions</p> <p>3) To make students learn importance Lebesgue integral of a bounded function over a set of finite measure, convergence in measure</p> <p>4) To introduce students about Differentiation and Integration</p>	<p>1) Students will learn Lebesgue Measure , Measurable sets , non-measurable sets</p> <p>2) Students will learn Measurable functions</p> <p>3) Students will learn Lebesgue integral of a bounded function over a set of finite measure, convergence in measure</p> <p>4) Students will learn Differentiation and Integration</p>

D.B.F.Dayanand College of Arts and Science,Solapur

PROGRAM SUBJECT OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : HCT2.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : General Topology		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit –I Definition and examples of topological spaces, closed sets, closure, dense sets, Neighborhood, Interior, Exterior, Boundary, accumulation points, and derived sets. Bases, subbases, Relative topology. Continuous functions and homeomorphism.</p> <p>Unit –II Compact sets and connected sets</p> <p>Unit –III First and Second countable spaces, lindeloff spaces, separable spaces, second countability and seperablility</p> <p>Separation Arioms : To, T1, T2, T3, T 3½, T4 - Their characterizations and basic properties.</p>	<p>1)To make students know about concepts of interior,exterior,limit points and dense sets in topological spaces,continuous functions</p> <p>2)To intrduce students about compact and connected sets with their properties</p> <p>3)To intrdouce students with separation axioms,countability of topological spaces</p> <p>4)To provide properties in detail about separation axioms and resultant topological spaces</p>	<p>1)Students will learn to find interior,exterior ,limit points and dense sets in examples.</p> <p>2)Students will start identifying compact and connected sets</p> <p>3)Students will start stablishing relation between lindelof ,separable and countable spaces.</p> <p>4)Students start finding exact difference in different separation axioms,get acquainted with properties thoroughly.</p>

D.B.F.Dayanand College of Arts and Science,Solapur

PROGRAM SUBJECT OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : SCT2.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Complex Analysis		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>UNIT –I Cross Ratio, Mobius transformations, Analytic functions, Power series representation of analytic functions</p> <p>UNIT –II Liouville's theorem, Fundamental theorem of algebra, Zeros of analytic function. Index of a closed curve, Cauchy's integral formula, Cauchy's theorem, Morera's theorem, counting zeros of analytic functions, open mapping theorem, Goursat's theorem.</p> <p>UNIT –III Isolated singularities, characterization of isolated singularities, Laurent series expansion, Residues Residue theorem, Evaluation of definite integrals.</p> <p>Unit-IV : Argument principle, Rouche's theorem, Maximum Modulus theorems, Schwarz's lemma. Hurwitz's theorem Montel theorem, Riemann mapping theorem</p>	<p>1)To introduce basic concepts in analyticity of complex valued functions,cross ratio</p> <p>2)To introduce complex integration of analytic function,Cauchy's integral formula in solving examples involving integration of analytic functions having singularities.</p> <p>3)To encourage students in categorising types of singularities in functions,Laurents series and residue theorem</p> <p>4)To make students know about methods that helps to determine number of zeros and poles in given domain,Shwartz lemma</p>	<p>1)Students start learning relation between cross ratio and their role in mapping geometrical structures.</p> <p>2)Student start using Cauchy's integral formula effectively in solving problems involving complex integrations.</p> <p>3)Students will start solving real integrals using residue categorising singularities</p> <p>4)Students will start solving problems based on Rouche's theorem and Argument principle,maximum modulus theorem.</p>

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : OET2.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Mathematical Statistics		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit-1: Probability theory: Sample space, Axioms of probability theory. Conditional probability, independent events. Baye's theorem, Examples. Discrete random variables : Definition of a random variable, Probability mass functions and probability distribution functions, Bernoulli trials and related distributions, Poisson distribution, Discrete Uniform distribution, geometric distribution, Expectation and moments and their evaluation, Examples</p> <p>Unit-2: Continuous random variables: Definition of a continuous random variable, Probability density function. Expectation and moments and their evaluation, uniform, exponential and gamma distributions, normal distribution. Distribution of functions of a continuous random variable, Examples</p> <p>Unit-3: Bivariate random variables: Discrete bivariate distributions, continuous bivariate distributions. Covariance and correlation. Conditional distribution and conditional mean, Bivariate normal distribution, Examples</p> <p>Unit-4: Generating functions: Probability generating function; moment generating function; and characteristic function; their properties. Moment inequalities: Markov, Chebychev, Holder, Minkowski and Jensen inequalities with their applications</p>	<p>1)To make students know about Sample space, Axioms of probability theory. Conditional probability, independent events, Expectation and moments and their evaluation, Examples</p> <p>2)To make students know about Definition of a continuous random variable, Probability density function. Expectation and moments and their evaluation , Examples</p> <p>3)To make students know about Discrete bivariate distributions, continuous bivariate, Bivariate normal distribution, Examples</p> <p>4)To make students know about Probability generating function; moment generating Function, inequalities with their applications</p>	<p>1)Students start learning about Sample space, Axioms of probability theory. Conditional probability, independent events, Expectation and moments and their evaluation, Examples</p> <p>2)Students start learning about Definition of a continuous random variable, Probability density function. Expectation and moments and their evaluation , Examples</p> <p>3)Students start learning Discrete bivariate distributions, continuous bivariate, Bivariate normal distribution, Examples</p> <p>4)Students start learning about Probability generating function; moment generating Function, inequalities with their applications</p>

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : HCT1.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Algebra-I		
COURSE CONTENT	OBJECTIVES	OUTCOME
UNIT I: Groups Commutator subgroups, P-Subgroups, Conjugate classes , Zassenhaus lemma, G- sets, class equation, Sylow theorems	To make students know concepts of Commutator subgroup,class equation and Sylow's theorem that help them to study finite groups	Students will learn methods to find complete structure of finite groups just by knowing at order of groups.
UNIT II: Normal and subnormal series, Composition series, Jordan -Holder Theorem, Solvable groups, Nilpotent groups.	To make students know different series of subgroups,refinements of seires.	Students will learn process of refinements of series of subgroups for a group.
UNIT III: UFD, PID, Euclidean domain, arithmetic in Euclidean domains	To introduce different types of rings,properties of irreducible and prime elements.	Students will learn ED,PID,UFD structures,their properties and interrelations.
UNIT IV: Polynomial rings, Polynomial ring over the rational field, The Eisenstien criteria, Division algorithm, irreducible polynomials, ideal structure in $F[X]$, Uniqueness of factorization in $F[x]$, UFD in Polynomial rings, Modules, Submodules.	To intoude students about ring structure of polynomials over fields,the very feature of condition of irreducibility of polynomials over set of rational numbers.	Students will learn different methods of checking irredu ability of polynomials over different fields,factorisation of polynomials over polynomial rings over field.

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : HCT1.2		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Real Analysis –I		
COURSE CONTENT	OBJECTIVES	OUTCOME
UNIT I :Riemann Integration Definition and existence of the integral, Refinement of partitions, Darboux’s theorem, Conditions of integrability, Integrability of the Sum and difference of integrable functions, The integral as a limit of sums, Some integrable functions, Integration and differentiation, the fundamental theorem of Calculus, Mean Value theorem of integral Calculus, Second Mean Value theorem.	To make students know concepts of Riemann integration & Darboux’s theorem & fundamental theorem on calculus that help them to study integration.	Students will learn methods to study complete structure of real line & integration.
UNIT II Riemann – Stieltjes integral Definition and existence of the integral, A condition of integrability	To make students know concepts of Riemann integration Stieltjes integral.	Students will learn methods to study Riemann integration Stieltjes integral.
UNIT III Multivariable differential calculus Introduction, the directional derivative, Directional derivatives and continuity, total derivative, the total derivative expressed in terms of partial derivatives, the Jacobian matrix , the chain rule, the mean value theorem, for differentiable functions, Taylors formula for functions from R^n to R^1	To make students know concepts of Multivariable differential calculus, To study the directional derivative & its extension to total derivative.	Students will learn methods to study Multivariable differential calculus , To study the directional derivative & its extension to total derivative.
UNIT IV Implicit functions and Extremum problems Functions with nonzero Jacobian determinant, The inverse function theorem, The Implicit function theorem, Extrema of real valued functions of one variable	To make students know concepts of Implicit functions theorem and Extremum problems.	Students will learn methods to study Implicit functions theorem and Extremum problems.

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : HCT1.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Differential Equations		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit I:Linear Equations with constant coefficients: The second order homogeneous equation, initial value problems for second order equations, Linear dependence and independence. A formula for the Wronskian, the non-homogeneous equations of order two, the homogeneous equations of order n, initial value problems for the nth order equations, Equations with real constants, The non- homogeneous equation of order n	To make students know about linear dependence,independence of solutions,IVP of order 2 and n,Concepts of Wronskian	Students will learn effective methods of finding solutions to different examples using Wronksian
Unit II: Linear Equations with variable coefficients: Initial value problems for the homogeneous equations, solutions of the homogeneous equations, The Wronskian and linear independence, reduction of the order of a homogeneous equation, Homogeneous equations with analytic coefficients.	To intrdouce students the concepts of Wronskian,solution using Wronskian and study of differential equations with analytic coefficients	Students will learn different concepts of Wronskian and its use in solving problems with analytic coefficients.
Unit III: Linear Equations with regular singular points: The Euler equations, second order equations with regular singular points, The Bessels equation	To introduce students about Euler's equation,categorisations of singular points and Bessel's equation	Students get acquainted with solution by Euler's method,singular points and Bessel's equation
Unit IV: Existence and uniqueness of solutions: The method of successive approximations, The Lipschitz condition.	To make students know method of successive approximation,Lipschitz condition for existence of solution	Students will start using method of successive approximations and Lipschitz condition effectively and

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : HCT1.4		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Classical Mechanics		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-I : Mechanics of a particle, Mechanics of a system of particles, constraints, Generalised coordinates, D'Alembert's principle, Lagrange's equations of motion, the forms of Lagrange's equation for velocity dependent potential, and dissipative forces, applications of Lagrangian formulation, cyclic co-ordinates and generalised momentum,.	To make students know method Mechanics of a particle, Mechanics of a system of particles, constraints, Generalised coordinates, D'Alembert's principle generalised momentum	Students will learn different concepts of Mechanics of a particle, Mechanics of a system of particles, constraints, Generalised coordinates, D'Alembert's principle generalised momentum
Unit –II Functionals, basic lemma in calculus of variations, Euler-Lagrange's equations, the case of several dependent variables, the minimum surface of revolutions, the problem of Brachistochrone, Isoperimetric problems, Problem of the maximum enclosed area, shape of a hanging rope	To make students know method Functionals, basic lemma in calculus of variations, Euler- Lagrange's equations, the case of several dependent variables Isoperimetric problems	Students will learn different concepts of Functionals, basic lemma in calculus of variations, Euler- Lagrange's equations, the case of several dependent variables Isoperimetric problems
Unit –III Hamilton's principle, Lagrange's equations from Hamilton's principle, Hamilton's equations of motion from a variational principle. The principle of least action cyclic co ordinates and Routh's procedure, conservation theorems and physical	To make students know method Hamilton's principle, Lagrange's equations from Hamilton's principle significance of Hamiltonian	Students will learn different concepts of Hamilton's principle, Lagrange's equations from Hamilton's principle significance of Hamiltonian

significance of Hamiltonian		
<p>Unit –IV</p> <p>The kinematics of rigid body motion: The independent co-ordinates of a rigid body, orthogonal transformations, properties of transformation matrix, infinitesimal rotations, the Eulerian angles, the Cayley-Klein parameters, Euler's theorem on motion of rigid body. Angular momentum and kinetic energy of motion of a rigid body about a point, The inertia tensor and moment of inertia, Euler's equations of motion</p>	<p>To make students know method The kinematics of rigid body motion: The independent co-ordinates of a rigid body, orthogonal transformations, properties of transformation matrix Euler's equations of motion</p>	<p>Students will learn different concepts of The kinematics of rigid body motion: The independent co-ordinates of a rigid body, orthogonal transformations, properties of transformation matrix Euler's equations of motion</p>

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : I		
COURSE NUMBER (PAPER NUMBER) : SCT1.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Number Theory		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit- I Review of divisibility, The division algorithm, Greatest common divisor , Euclidean algorithm Diophantine equation $ax + by = C$. Primes and their distribution , Fundamental Theorem of Arithmetic, The Goldback Conjecture.	To introduce students about Diophantine equations and their solution,distribution of primes	Students get hand at solving Diophantine equation,start solving them effectively and various aspects of primes.
Unit- II Congruences, Properties of Congruences, Linear congruences, Special divisibility tests. Fermats theorem, Fermats factorization method, Little theorem, Wilsons theorem.	To make students know about congruence relation,its solution,Fermat's theorem and its application. To introduce students a Chinese Remainder theorem in solving simultaenous linear congruences	Students will start solving linear congruence and their system and get hands at solving problems with the help of Fermat's theorem
Unit-III Number theoretic functions, The functions σ and τ , The Mobius Inversion formula, The greatest integer function, Eulers Generalization of Fermats theorem Euler's phi function, Euler's theorem, properties of phi function.	To make students learn importance of Number-theoretic functions and to encourage work with new number-theoretic functions in solving problems.	Students start solving examples involving different number theoretic functions.
Unit-IV Primitive roots, The order of an integer modulo n, primitive roots for primes, composite numbers having primitive roots, The theory of Indices.	To introduce students about primitive roots,their imortance in solving non-linear congruences	Students start solving many problems involving non-linear congruences in effective way.

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : HCT2.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Algebra-II		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit –I Field extensions, Finite field extension, Field adjunctions, Simple extension, algebraic element, Transcendental element, Algebraic extensions, Roots of polynomial, Multiple roots, splitting field of polynomial, Separable element, separable extension of a field, perfect field	To introduce students Field extensions, Finite field extension, Field adjunctions, Simple extension, algebraic element, Transcendental element , perfect field	Students will learn Field extensions, Finite field extension, Field adjunctions, Simple extension, algebraic element, Transcendental element , perfect field
Unit –II The elements of Galois theory. Fixed field, The group $G(K,F)$ of automorphisms of K relative of F , Normal extension, Galois group, Fundamental theorem to Galois theory	To make students know about Galois theory. Fixed field , Fundamental theorem to Galois theory	Students will learn Galois theory. Fixed field , Fundamental theorem to Galois theory
Unit –III Constructible real number, Solvability by radicals, Totally in separable extensions cyclotomic extensions	To make students learn importance Constructible real number, Solvability by radicals , cyclotomic extensions	Students will learn Constructible real number, Solvability by radicals , cyclotomic extensions
Unit –IV : Finite fields and applications	To introduce students about Finite fields and applications	Students will learn Finite fields and applications

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : HCT2.2		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Real Analysis-II		
COURSE CONTENT	OBJECTIVES	OUTCOME
Lebesgue Measure: Outer measure, Measurable sets, Lebesgue measure, non-measurable sets	To introduce students Lebesgue Measure , Measurable sets , non-measurable sets	Students will learn Lebesgue Measure , Measurable sets , non-measurable sets
Measurable functions: Measurable functions and their properties, Egoroff's theorem	To make students know Measurable functions	Students will learn Measurable functions
Lebesgue Integral: Lebesgue integral of a bounded function over a set of finite measure, the Lebesgue integral of a non-negative measurable function, Fatou's Lemma, the general Lebesgue integral,convergence in measure	To make students learn importance Lebesgue integral of a bounded function over a set of finite measure, convergence in measure	Students will learn Lebesgue integral of a bounded function over a set of finite measure, convergence in measure
Differentiation and Integration: Differentiation of monotone functions, function of bounded variation, Differentiation of an integral, Absolute continuity, Convex functions.	To introduce students about Differentiation and Integration	Students will learn Differentiation and Integration

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : HCT2.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : General Topology		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit –I Definition and examples of topological spaces, closed sets, closure, dense sets, Neighborhood, Interior, Exterior, Boundary, accumulation points, and derived sets. Bases, subbases, Relative topology. Continuous functions and homeomorphism.	To make students know about concepts of interior,exterior,limit points and dense sets in topological spaces,continuous functions	Students will learn to find interior,exterior ,limit points and dense sets in examples.
Unit –II Compact sets and connected sets	To intrduce students about compact and connected sets with their properties	Students will start identifying compact and connected sets
Unit –III First and Second countable spaces, lindeloff spaces, separable spaces, second countability and seperability	To intrdouce students with separation axioms,countability of topological spaces	Students will start stablishing relation between lindelof ,separable and countable spaces.
Separation Arioms : To, T1, T2, T3, T 3½, T4 - Their characterizations and basic properties.	To provide properties in detail about separation axioms and resultant topological spaces	Students start finding exact difference in different separation axioms,get acquainted with properties thoroughly.

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : SCT2.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Complex Analysis		
COURSE CONTENT	OBJECTIVES	OUTCOME
UNIT –I Cross Ratio, Mobius transformations, Analytic functions, Power series representation of analytic functions	To introduce basic concepts in analyticity of complex valued functions,cross ratio	Students start learning relation between cross ratio and their role in mapping geometrical structures.
UNIT –II Liouville's theorem, Fundamental theorem of algebra, Zeros of analytic function. Index of a closed curve, Cauchy's integral formula, Cauchy's theorem, Morera's theorem, counting zeros of analytic functions, open mapping theorem, Goursat's theorem.	To introduce complex integration of analytic function,Cauchy's integral formula in solving examples involving integration of analytic functions having singularities.	Student start using Cauchy's integral formula effectively in solving problems involving complex integrations.
UNIT –III Isolated singularities, characterization of isolated singularities, Laurent series expansion, Residues Residue theorem, Evaluation of definite integrals.	To encourage students in categorising types of singularities in functions,Laurents series and residue theorem	Students will start solving real integrals using residue categorising singularities
Unit-IV : Argument principle, Rouché's theorem, Maximum Modulus theorems, Schwarz's lemma. Hurwitz's theorem Montel theorem, Riemann mapping theorem	To make students know about methods that helps to determine number of zeros and poles in given domain,Shwartz lemma	Students will start solving problems based on Rouché's theorem and Argument principle,maximum modulus theorem.

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. I		
NAME OF THE SUBJECT : Mathematics		
SEM : II		
COURSE NUMBER (PAPER NUMBER) : OET2.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Mathematical Statistics		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1: Probability theory: Sample space, Axioms of probability theory. Conditional probability, independent events. Baye's theorem, Examples. Discrete random variables : Definition of a random variable, Probability mass functions and probability distribution functions, Bernoulli trials and related distributions, Poisson distribution, Discrete Uniform distribution, geometric distribution, Expectation and moments and their evaluation, Examples	To make students know about Sample space, Axioms of probability theory. Conditional probability, independent events, Expectation and moments and their evaluation, Examples	Students start learning about Sample space, Axioms of probability theory. Conditional probability, independent events, Expectation and moments and their evaluation, Examples
Unit-2: Continuous random variables: Definition of a continuous random variable, Probability density function. Expectation and moments and their evaluation, uniform, exponential and gamma distributions, normal distribution. Distribution of functions of a continuous random variable, Examples	To make students know about Definition of a continuous random variable, Probability density function. Expectation and moments and their evaluation , Examples	Students start learning about Definition of a continuous random variable, Probability density function. Expectation and moments and their evaluation , Examples
Unit-3: Bivariate random variables: Discrete bivariate distributions, continuous bivariate distributions. Covariance and correlation. Conditional distribution and conditional mean, Bivariate normal distribution, Examples	To make students know about Discrete bivariate distributions, continuous bivariate, Bivariate normal distribution, Examples	Students start learning Discrete bivariate distributions, continuous bivariate, Bivariate normal distribution, Examples
Unit-4: Generating functions: Probability generating function; moment generating function; and characteristic function; their properties. Moment inequalities: Markov, Chebychev, Holder, Minkowski and Jensen inequalities with their applications	To make students know about Probability generating function; moment generating Function, inequalities with their applications	Students start learning about Probability generating function; moment generating Function, inequalities with their applications

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : HCT 3.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Functional Analysis		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Banach spaces Normed linear spaces,Banach spaces, Quotient norm spaces, continuous linear transformations, equivalent norms,the Hahn-Banach theorem and its consequences. Conjugate space and separability, second conjugate space. The open mapping Theorem, The closed graph theorem, The conjugate of an operator, The uniform boundedness principle.</p>	<p>To introduce students about Normed linear spaces,Banach spaces, Quotient norm spaces, The uniform boundedness principle</p>	<p>Students will learn Normed linear spaces,Banach spaces, Quotient norm spaces, The uniform boundedness principle</p>
<p>Hilbert spaces Definition and examples and simple properties, orthogonal complements, The projection theorem, orthogonal sets, The Bessels inequality, Fourier expansion and Parseval's equation, separable Hilbert spaces, The conjugate space, Riesz's theorem, The adjoint of an operator, self adjoint operators, Normal and unitary operators, projections.</p>	<p>To introduce students about Definition and examples and simple properties, orthogonal complements, The projection theorem, orthogonal sets, unitary operators, projections.</p>	<p>Students will learn Definition and examples and simple properties, orthogonal complements, The projection theorem, orthogonal sets, unitary operators, projections</p>
<p>Contraction mapping and Banach fixed point theorem.</p>	<p>To students start learning about Contraction mapping and Banach fixed point theorem.</p>	<p>Students will learn Contraction mapping and Banach fixed point theorem.</p>

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : HCT 3.2		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Advanced Discrete Mathematics		
COURSE CONTENT	OBJECTIVES	OUTCOME
Lattices Definition and examples of posets and lattices, sublattices and direct products, Modular and distributive lattices, Homomorphisms, Boolean algebras and applications.	To introduce students about posets and lattices, sublattices , Boolean algebras and applications	Students will learn posets and lattices, sublattices , Boolean algebras and applications
Graph Theory Definition of a graph, vertex degrees, simple, regular complete and bipartite graphs, paths and cycles in a graph, connected graphs, The matrix representation of a graph, Fusion.	To introduce students about Definition of a graph, vertex degrees, simple, regular complete and bipartite graphs, Fusion	Students will learn Definition of a graph, vertex degrees, simple, regular complete and bipartite graphs, Fusion
Trees Definition and simple properties of a tree, bridges, spanning trees, cut vertices.	To students start learning about Trees ,Definition and simple properties of a tree	Students will learn Trees ,Definition and simple properties of a tree
Combinatorics Basic counting methods: Inclusion exclusion principle Pigeonhole principle, recurrence relations and generating functions.	To introduce students about Combinatorics ,Basic counting methods	Students will learn Combinatorics ,Basic counting methods

D.B.F.Dayanand College of Arts and Science,Solapur

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Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : HCT 3.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Linear Algebra		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit – 1: Linear Transformations Linear functional, The double dual, The transpose of a linear transformation, characteristic values, Annihilator polynomials, invariant subspaces.	To introduce special linear transformations, annihilator of a subspace, double dual	Students start solving examples based on annihilator ,functionals and bases of dual and double dual
Unit – 2: Elementary canonical forms: Triangulability, diagonalizability, Direct sum decompositions, Invariant direct sums, The primary decomposition theorem	To make students realize importance of triangulability and diagonalizability of linear transformations and solving problems based on the concepts.	Students start learning diagonalizing and triangularizing matrices
Unit – 3 Jordan and Rational Forms: The Jordan form, computation of Invariant factors, Companion matrix, the rational form	To introduce students about JC and rational forms ,companion matrix especially when matrix is not diagonalizable.	Students start solving examples examples on Rational and JC forms and simplifying the matrices.
Unit- 4 : Inner Product Spaces: Linear functional and adjoints, unitary operators, Normal operators, Operators on Inner Product Spaces, Forms on Inner product spaces, positive forms, more on forms, spectral theory .	To introduce Inner Product spaces, Projection maps, Normal, Unitary and Adjoint operators, positive forms	Student start categorising given matrix into positive and negative forms, semi-definite forms.

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Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : SCT 3.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Differential Geometry		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit 1 1.1 Tangent vectors and tangent vector fields, frame fields. 1.2 Reparametrization of curves, standard curves. 1.3 Directional derivative 1.4 Differential forms 1.5 Speed of curve	To introduce basic concepts of vector fields,directional derivatives and reparametrization of curves	Students will realize geometrical meaning of directional derivatives and reparametrization of curves.
Unit 2 2.1 Frenet formulas for unit speed and for arbitrary speed curves 2.2 Isometries in 2.3 Translation, Rotation, Orthogonal Transformation 2.4 Frenet approximation of curves 2.5 Covariant derivatives	To make students know frenet apparatus of curves,isometries and their properties	Students will start finding Frenet apparatus of given curves thereby interpreting properties of the curves.
Unit 3 3.1 Calculus on Surface 3.2 Co-ordinate patches 3.3 Surface, Surface of revolution 3.4 Patch Computation 3.5 Parametrization of a region $X(D)$ in M 3.6 Differentiable functions and Tangent vectors	To introduce basic concepts of patch computation and its applications in geographical patch	Students will learn process of finding patch computation,definition of surface
Unit 4 4.1 Shape Operator 4.2 Normal curvature 4.3 Guassian and mean curvature	To make students know shape operator,normal operator and curvatures	Students will realize imprtance of curvatures in determining shapes of surfaces.

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : OET 3.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Numerical Analysis		
COURSE CONTENT	OBJECTIVES	OUTCOME
Errors in numerical calculations and solution of algebraic and transcendental equations. 1.1 Numbers and their accuracy 1.2 Mathematical preliminaries. 1.3 Errors & their computation: Absolute, relative & percentage errors. 1.4 A general error formula 1.5 Error in series approximation 1.6 The iteration method & it's rate of convergence. 1.7 The method of false position & its rate of convergence 1.8 Secant method & its rate of convergence. 1.9 Newton Raphson method and its rate of convergence	To make students to know Errors in numerical calculations and solution of algebraic and transcendental equations	Students will learn Errors in numerical calculations and solution of algebraic and transcendental equations
Interppolation and Numerical Differentiation. 2.1 Errors in polynomial interpolation. 2.2 Finite Differences: Forward, Backward & Central Differences, Symbolic relations & separation of symbols.	To make students to know Interppolation and Numerical Differentiation	Students will learn Interppolation and Numerical Differentiation

<p>2.3 Newton's Formula for interpolation.</p> <p>2.4 Lagrange's interpolation formula and error in Lagrange's interpolation formul.</p> <p>2.5 Divided differences & their properties.</p> <p>2.6 Newton's general interpolation formula.</p>		
<p>Numerical solutions of system of linear equations & Eigen Values.</p> <p>3.1 Gaussian elimination method.</p> <p>3.2 Method of factorization (LU decomposition)</p> <p>3.3 Iterative Method: Gauss Seidal Method.</p> <p>3.4 Eigen value problem: Householder's method.</p> <p>3.5 Eigen value of symmetric tridiagonal matrix.</p> <p>3.6 Power method for largest Eigen value.</p>	<p>To make students to know Numerical solutions of system of linear equations & Eigen Values</p>	<p>Students will learn Numerical solutions of system of linear equations & Eigen Values</p>
<p>Numerical Intergration and Solutions of ordinary differential equations</p> <p>4.1 Numerical Integration: Trpezoidal rule Simpson's 1/3rd rule and Simpson's 3/8th rule.</p> <p>4.2 Errors in the above methods.</p> <p>4.3 Solution of differential equation by Taylor's series: Euler's method and Euler's modified method.</p>	<p>To make students to know Numerical Intergration and Solutions of ordinary differential equations</p>	<p>Students will learn Numerical Intergration and Solutions of ordinary differential equations</p>

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : HCT 4.1		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Measure and Integration		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit - 1 Measure and Integration : Measure space, Measurable function, Integration Fatous lemma (statement only), Generalization of monotone and Lebesque convergence theorem	To make students to know Measure space, Measurable function, Integration , Lebesque convergence theorem	Students will learn Measure space, Measurable function, Integration , Lebesque convergence theorem
Unit - 2 Signed Measure : Hahn Decomposition, Jordan Decomposition, Radon-Nikodym theorem Lebesque Decomposition	To make students to know Hahn Decomposition, Jordan Decomposition , Lebesque Decomposition	Students will learn Hahn Decomposition, Jordan Decomposition, Lebesque Decomposition
Unit - 3 Measure and Outer Measure : Outer Measure and measurability, the Extension theorem, Product measures, Fubini's and Tonelli's theorem	To make students to know Outer Measure and measurability, the Extension theorem	Students will learn Outer Measure and measurability, the Extension theorem
Unit - 4 Inner measure and its properties, Baire Borel sets and positive linear functional and Borel measures	To make students to know Inner measure and its properties , Borel measures	Students will learn Inner measure and its properties , Borel measures

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : HCT 4.2		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Partial Differential Equations		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit - 1 First order Partial Differential Equations : Curves and surfaces, classification of integrals , linear equations of first order, Pfaffians, compatible systems, Charpits method , Jacobi method	To make students to study Curves and surfaces, classification of integrals, Pfaffians, compatible systems, Charpits method , Jacobi method	Students will learn Curves and surfaces, classification of integrals, Pfaffians, compatible systems, Charpits method , Jacobi method
Unit -2 Integral surfaces through a given curve, quasi linear equations, nonlinear first order partial differential equations	To make students to study Integral surfaces through a given curve, nonlinear first order partial differential equations	Students will learn Integral surfaces through a given curve, nonlinear first order partial differential equations
Unit - 3 Second order Partial Differential Equations : Genesis of Second order Partial Differential Equations, Classification, one dimensional wave equations, vibrations, of a string, families of equipotential surface	To make students to study Genesis of Second order Partial Differential Equations, equipotential surface	Students will learn Genesis of Second order Partial Differential Equations, equipotential surface
Unit -4 Maximum and minimum principles, Dirichlets and Neumann problems. Dirichlet problem for circle, Harnacks theorem. Greens theorem (Statement only) , Classification in case of n variables	To make students to study Maximum and minimum principles, Dirichlets and Neumann problems, Classification in case of n variables	Students will learn Maximum and minimum principles, Dirichlets and Neumann problems, Classification in case of n variables

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : HCT 4.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Integral Equations		
COURSE CONTENT	OBJECTIVES	OUTCOME
<p>Unit - 1 Preliminary concepts : Introduction, Some problems which give rise to integral equations, Classification of linear integral equations, Integro -differential equations, conversions of initial value problems to Volterra type integral equations and boundary value problems Fredholm type integral equations, Conversion of Sturm Liouville problems to integral equations, Solution of Sturm Liouville problems.</p>	<p>To introduce basic concepts of integral equation,relation between differential and integral equation and their interconversion</p>	<p>Students will learn methods of interconversion of differential equation into integral equation and vice versa</p>
<p>Unit - 2 Fredholm Equations : Integral equations with separable (Degenerate), Hermitian and symmetric Kernel, The operator method in the theory of integral equations, Hilbert-Schmidt theorem. Construction of Green function and its use in solving Boundary Value Problems</p>	<p>To introduce Fredholm integral equation,methods to find solution ,kernel and Green's function</p>	<p>Students will start solving Fredholm equations with different specified methods,will effectively start solving examples involving Green's functions</p>
<p>Unit - 3 Volterra Equations : Types of Volterra equations, Resolvent kernel of Volterra equations, Methods of successive approximations, Convolution type kernels. Application of Fourier and Laplace transforms to the solution of Volterra integral equations.</p>	<p>To introduce Volterra integral equation,methods to find solution ,kernel and method to find approximate solution</p>	<p>Students will start solving Volterra equations with different specified methods,will effectively start solving examples involving Green's functions</p>
<p>Unit - 4 Determination of Iterated Kernels and Resolvent Kernels Solution of fredholms integral equations by successive approximations</p>	<p>To make students acquainted with kernels and resolvent kernels and their importance in finding solutions to integral equations</p>	<p>Students will use resolvent kernel to find solutions to integral equations</p>

COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : HCT 4.4		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Operation Research		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1. Convex Sets and Functions: Convex sets, supporting and separating hyperplanes, convex polyhedra and polytope, extreme points, convex functions. Linear Programming Problem (LPP): Introduction to linear programming problems, Graphical solution to LPP, Standard LPP (SLPP), basic solution and basic feasible solution to SLPP. Methods for solving LPP: Simplex Algorithm, Two-phase simplex method, Big M method	To make students to study Convex Sets and Functions, Linear Programming Problem (LPP) , Two-phase simplex method, Big M method	Students will learn Convex Sets and Functions, Linear Programming Problem (LPP) , Two-phase simplex method, Big M method
Unit-2. Duality in LPP: Concept of duality, Theorems related to duality, complementary slackness property and development of dual simplex algorithm. Integer Linear Programming Problem The concept of cutting plane, Gomory's method of cutting plane for all ILPP and mixed ILPP, Branch and Bound method	To make students to study Concept of duality, Theorems related to duality, complementary slackness property, Gomory's method of cutting plane for all ILPP and mixed ILPP, Branch and Bound method	Students will learn Concept of duality, Theorems related to duality, complementary slackness property, Gomory's method of cutting plane for all ILPP and mixed ILPP, Branch and Bound method
Unit-3 Quadratic Programming Problem (QPP): Definition of QPP, Kuhn-Tucker conditions, Algorithms for solving QPP: Wolfe's and Beale's algorithm	To make students to study Quadratic Programming Problem, Wolfe's and Beale's algorithm	Students will learn Quadratic Programming Problem, Wolfe's and Beale's algorithm

<p>Unit-4. Theory of Games: Two person zero sum games, Minimax and Maxmin principles, Saddle point, Mixed strategies; Rules of dominance, Solution of 2 x 2 game by Algebraic method, Graphical method, Reduction of game problem as LPP, Minimax and Maxmin theorem</p>	<p>To make students to study Theory of Games, Solution of 2 x 2 game by Algebraic method ,Minimax and Maxmin theorem</p>	<p>Students will learn Theory of Games, Solution of 2 x 2 game by Algebraic method, Minimax and Maxmin theorem</p>
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COURSE OUTCOME

Name of the Department : Mathematics

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Mathematics		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : SCT 4.3		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Probability Theory		
COURSE CONTENT	OBJECTIVES	OUTCOME
Unit-1: Classes of sets, Sequence of sets, limsup and liminf and limit of sequence of sets, field, σ -field, σ -field generated by a class, Borel σ -field, Probability measure, Probability space, properties of probability measure-continuity, mixture of probability measure. Lebesgue and Lebesgue-Stieltjes measures on \mathbb{R} . Independence of events.	To make students acquainted with Classes of sets, Sequence of sets, limsup and liminf and limit of sequence of sets	Students will learn Classes of sets, Sequence of sets, limsup and liminf and limit of sequence of sets
Unit 2: Measurable function, random variable, distribution of a random variable, simple random variable, elementary random variable, liminf, limsup and limit of sequence of random variables. Method of obtaining a random variable as a limit of sequence of simple random variables. Integration of a measurable function with respect to a measure, expectation of a random variable, monotone convergence theorem, Fatous Lemma, Dominated Convergence theorem and their application.	To make students acquainted with Measurable function, random variable, distribution of a random variable, simple random variable, elementary random variable	Students will learn Measurable function, random variable, distribution of a random variable, simple random variable, elementary random variable
Unit-3: Convergence of sequence of random variables, almost sure convergence, a characterizing property, convergence in probability, uniqueness of limit, a characterizing property. Yule Slutsky results and preservation under continuous transform (statement only). convergence in rth mean, interrelationships.	To make students acquainted with Convergence of sequence of random variables, almost sure convergence, a characterizing property, convergence in probability	Students will learn Convergence of sequence of random variables, almost sure convergence, a characterizing property, convergence in probability
Unit-4: Independence: Borel-Cantelli Lemma, Characteristics function, simple properties. Inversion theorem and uniqueness property (statements only). Convergence in distribution, continuity theorem (statement only), Weak and Strong laws of large numbers, Kolmogorov's three series theorem for almost sure convergence (statement only), Liapoune's Lindeberg-Feller Theorems on CLT (statement only). Application of the above result.	To make students acquainted with Borel-Cantelli Lemma, Characteristics function, simple properties	Students will learn Borel-Cantelli Lemma, Characteristics function, simple properties