

Program: Bachelor's Degree with Honours/Hons. with Research Class: UG		Year: Fourth	Semester: VII
Subject: Mathematics			
Course Code: MJ-16		Course Title: Fluid Mechanics & Special Function	
Course Learning Outcomes: This course will enable the students to: <ol style="list-style-type: none"> understand the nature of fluid, its pressure and centre of pressure. explain the fluid motion using equation of continuity and Bernoulli's theorem. find series solution of differential equations about ordinary and singular points. understand the properties of Legendre polynomials and properties of Hypergeometric functions. 			
Credit: 4 (Theory)		Compulsory	
Full Marks: 75		Time: 3 Hours	
Unit	Content	Hours	
I	Nature and Properties of Fluid pressure, pressure of heavy liquids. Equilibrium of fluids under given system of forces. Centre of pressure.	15 h	
II	Thrust on plane and curved surfaces. Lagrangian and Eulerian methods, Equation of continuity. Euler's equation of motion for perfect fluid, Bernoulli's Theorem.	15 h	
III	Series solution: Ordinary point, singular point (regular), General Methods and forms of series solution (Indicial equation-frobenius method). [N.B. result of analysis regarding validity of series. Solution are to be taken for granted] Bessel's equation: Solution Recurrence formula for $J_n(x)$; generating function for $J_n(x)$, equations reducible to Bessel equation, Orthogonality of Bessel's functions.	15 h	
IV	Legendre equation: Solution, Rodrigue's formula, Legendre polynomials, generating function for $P_n(x)$, Orthogonality of Legendre polynomials. Hypergeometric functions, special cases, Integral representation. Summation theorem.	15 h	
Sessional Internal Assessment (SIA) Full Marks 25 Marks			
A Internal written Examination - 20 Marks (1 Hr.) B Over All Performance including Regularity 05 Marks			
Books Recommended: <ol style="list-style-type: none"> Hydrostatics: J.P. Sinha Hydrodynamics: Ramsey / M.D. Raisingania Advance differential equation: M. D. Raisingania 			

Program: Bachelor's Degree with Honours/Hons. with Research Class: UG		Year: Fourth	Semester: VII
Subject: Mathematics			
Course Code: MJ-17		Course Title: Metric space & Discrete Mathematics	
Course Learning Outcomes: This course will enable the students to: a) Develop the concept of metric space and related properties. b) Learn the idea of completeness of a space with its properties. c) Learn the idea of continuous and uniform continuous functions. d) Learn the concept of cardinality & mathematical induction. e) understand the concept of graph and lattices.			
Credit: 4 (Theory)		Compulsory	
Full Marks: 75		Time: 3 Hours	
Unit	Content		Hours
I	Definition and example of metric spaces, Open sets, Interior closed Sets closure.		15 h
II	Convergence, completeness, Bair's theorem, Cantor's Intersection theorem. Continuous maps. Uniform Continuity, and related extensions.		15 h
III	Sets and Propositions-Cardinality. Mathematical Induction. Principle of Inclusion and exclusion. Relations and Functions – Binary Relations. Equivalence Relations and partitions. Partial. Order Relations and Lattices, chains and Antichains. Pigeon Hole Principle.		15 h
IV	Graphs and Planar Graph, basic terminology. Multigraphs. Weighted Graphs. Paths and Circuits. Shortest paths. Eulerian Paths and Circuits. Travelling Salesman Problem. Planer Graphs. Boolean Algebras – Lattices and algebraic structures. Duality. Distributive and complemented Lattices. Boolean lattices and Algebras. Boolean Functions and Expression.		15 h
Sessional Internal Assessment (SIA) Full Marks - 25 Marks A Internal written Examination - 20 Marks (1 Hr.) B Over All Performance including Regularity - 05 Marks			
Books Recommended: 1. Discrete Mathematics: C.L. Lieu, Elements of Discrete Mathematics: McGraw Hill International Ed. 2. Topology: K.K. Jha / J.N. Sharma 3. Mathematical Analysis: Shanti Narayan / Mallick Arora 4. Metric Space by Lalji Prasad			

Program: Bachelor's Degree with Honours/Hons. with Research Class: UG		Year: Fourth	Semester: VII
Subject: Mathematics			
Course Code: MJ-18		Course Title: Integral Transform	
Course Learning Outcomes: This course will enable the students to: a) learn concept of Laplace and inverse Laplace transform. b) solve the differential equation using Laplace transform. c) learn the concept and properties of Fourier transform. d) learn application of Fourier sine & cosine transform.			
Credit: 4 (Theory)		Compulsory	
Full Marks: 75		Time: 3 Hours	
Unit	Content		Hours
I	Laplace transform: Def, transformation of elementary functions, properties, inverse transform, transform derivatives and integrals, multiplication by t^n division by t .		15 h
II	Inverse Laplace Transform, Convolution theorem and application to differential equation.		15 h
III	Infinite Fourier Transform: Infinite Fourier sine transform, Infinite Fourier cosine transform, Relation between Fourier & Laplace transform.		15 h
IV	The Finite Fourier Transform & Integral: Finite Fourier sine transform, Finite Fourier cosine transform, Fourier Integral.		15 h
Sessional Internal Assessment (SIA) Full Marks . 25 Marks A Internal written Examination . 20 Marks (1 Hr.) B Over All Performance including Regularity . 05 Marks			
Books Recommended: 1. Laplace's & Fourier Transforms J.K. Goyal, K.P. Gupta, G.S. Gupta 2. Integral Transform & Fourier Series: A. N. Srivastava			

Program: Bachelor's Degree with Honours/Hons. with Research Class: UG		Year: Fourth	Semester: VII
Subject: Mathematics			
Course Code: MJ-19		Course Title: Partial Differentiation	
Course Learning Outcomes: This course will enable the students to: a) apply a range of techniques to solve first & second order partial differential equations. b) apply Monge's method to solve non-linear equation of second order. c) model physical phenomena using partial differential equations such as the heat and wave equations.			
Credit: 4 (Theory)		Compulsory	
Full Marks: 75		Time: 3 Hours	
Unit	Content	Hours	
I	Partial differential equation, formation, linear p.d.e. of order 1-Lagrange's method.	15 h	
II	Non-linear equation of order 1, four forms Charpits method, Jacobi Method. Homogeneous linear equation with constant co-efficient Rules of C.F. and P.I.	15 h	
III	Non-linear equations of second order, Monge's method.	15 h	
IV	Boundary Value Problem: Derivation and solution of one-dimensional wave equation and one-dimensional heat equation.	15 h	
Sessional Internal Assessment (SIA) Full Marks . 25 Marks A Internal written Examination . 20 Marks (1 Hr.) B Over All Performance including Regularity . 05 Marks			
Books Recommended: 1. Advanced Differential Equation: M.D. Raisingania 2. Differential equation: J.N. Sharma			