

**Srinivas University,
College of engineering and technology,
PhD Coursework Courses (Basic Science Board)
Mukka, Mangaluru**

1. Advanced Fluid Mechanics and Magneto hydrodynamics (20SPHDMA01)	
Exam Hours: 2 hours	Exam Marks(Maximum):50
Module-1	
Real fluids and ideal fluids, velocity of fluid at a point, streamlines, pathlines, streamlines, velocity potential, vorticity vector, local and particle rate of change, equation of continuity, irrotational and rotational motion, acceleration of fluid, conditions at rigid boundary. Euler's equation of motion, Bernoulli's equation, axially symmetric flows, impulsive motion.	
Module-2	
Kelvin's Theorem of circulation, equation of vorticity. Three dimensional flows, sources, sinks and doublets, images in rigid planes, images in solid sphere. Stoke's stream function.	
Module-3	
Viscous Flows: Stress components, Stress and strain tensor, Coefficient of viscosity and Laminar flow, Plane Poiseuille flows and Couette flow. Flow through tubes of uniform cross section in the form of circle, Ellipse, equilateral triangle, annulus, under constant pressure gradient, steady flow past a fixed sphere. Dimensional analysis, Reynolds numbers, Prandtl's boundary layer, Boundary layer	
Module-4	
Non-Newtonian fluids, rheological classification, time dependent, thixotropic, viscoelastic fluids, constitution of blood, viscosity of blood, steady non-Newtonian fluid flows in circular tubes, Fahraeus- Lindqvist effect, Pulsative flow in circular rigid tube, flow through artery with stenosis, Peristaltic flow in a tube, long wave length approximation.	
Module-5	
Basic equations of MHD including Faraday's laws and constitutive laws. Magnetic induction equation – Lorentz force – MHD approximations. Non-dimensional numbers – velocity, temperature and magnetic field boundary conditions. Hartmann flow – isothermal boundary conditions – temperature distribution in Hartmann flow – Hartmann couette flow. Classical MHD and Alfven's wave, Alfven's theorem, Frozen – n – phenomenon and equipartition of energy by Alfven's waves.	
Textbook/Reference Books	

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1	An Introduction to Fluid Mechanics	Batchelor, G. K.	Cambridge UniversityPres	Kindle Ed.,
2	Ideal and Incompressible Fluid Dynamics	<u>M.E. O'Neill</u> and F. Chorlton	Ellis Horwood	Digital Ed., 2007
3	Mathematical Models in Biology and Medicine	J.N.Kapur	Affiliated East-West	1 st Ed., 1985
4	An Introduction to Magnetohydrodynamics	P.A.Davidson	Cambridge UniversityPres	2 nd Ed.,
5	A Text Book of Fluid Mechanics	R.K.Bansal	Laxmi Publications	1 st Ed., 2008

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2. Advanced Graph Theory (20SPHDMA02)				
Exam Hours: 2 hours			Exam Marks(Maximum):50	
Module-1				
Varieties of graphs, walks and connectedness, degrees, intersection graphs, operations on graphs. Cut points, bridges and blocks, block graphs and cutpoint graphs. Trees - characterization of trees, centers and centroids, block cutpoint trees, independent cycles and cocycles, Matroids.				
Module-2				
Connectivity and line connectivity, Graphical variations of Menger's theorem, Partitions Eulerian and Hamiltonian graphs, Line graphs, properties and characterizations of line graphs, line graphs and transversability, Total graphs.				
Module-3				
Coverings and independence, critical points and lines, Planes and planar graphs, outerplanar graphs, Kurtowski's theorem.				
Module-4				
Colorability, the chromatic number, Five color theorem, Four color conjecture, The Heawood map coloring theorem, Uniquely colorable graphs, critical graphs. The adjacency matrix, incidence matrix, cycle matrix.				
Module-5				
Digraphs – digraphs and connectedness, directional duality and acyclic digraphs, digraphs and matrices.				
Textbook/Reference Books				
1	GraphTheory	Reinhard Deistel	Springer	5 th Ed., 2017
2	GraphTheorywithApplicationstoEngineeringandComputerScience	N.Deo	PHI	1 st Ed., th
3	GraphTheory	F.Harary	AdditionWesleyReadingMA	1 st Ed., 1969
4	GraphTheory	J.A.Bondy & U.S.R.Murthy	North-Holland	1st Ed.,(5th Print), 1982
5	GraphTheory and Applications	G.Appasami	Sarumathi Publications	1st Ed., 2016

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Advanced numerical methods (20SPHDM03)				
3.				
Exam Hours: 2 hours			Exam Marks(Maximum):50	
Module-1				
High Speed Computation				
Introduction, Computer arithmetic, Errors and computation in numerical techniques, General error formula and error in series approximations. Machine computation and computer software.				
Transcendental and Polynomial Equations				
Introduction, Newton-Raphson method, Secant and Regula falsi method , rate of convergence, Newton-McAuleymethodformultiplerooms.Birge–Vietamethod,Bairstowmethod,Graffe’srootsquaringmethod.				
Module-2				
System of Linear Algebraic Equations and Eigen valueProblems				
Introduction. Consistency, Rank of a matrix, Gaussian elimination, LU decomposition, Gauss-Seidel and Successive Over Relaxation methods, Tri-diagonal system of equations				
Module-3				
Interpolation and Approximation				
Introduction, Lagrange and Newton Interpolations, Interpolating polynomials - piecewise polynomial interpolation, Spline’s interpolation formula, Hermite Interpolation, Bivariate Interpolation, least square approximations. Numerical integration: Newton’s cotes formula, Simpson’s rules, Weddle’s rule, Gaussian				
Module-4				
Ordinary Differential Equations: Boundary Value Problems				
Initial Value and boundary value problems, Runge – Kutta’s Method of order IV for 1 st and 2 nd order ordinary differential equations. System of equations predictor – corrector formulae, Shooting method and				
Module-5				
Partial Differential Equations				
Finitedifferenceapproximationtoderivatives.Laplaceequation–Jacobi,Gauss-SeidelandSORmethods,ADI				
Textbook/Reference Books				
1	NumericalMethodsforScientificandEng g.Computation	M.K.Jain,S.R.K.Iy engarand R.K. Jain	New Age International	6 th Ed.,2012
2	Numerical Methods for Engineers	S. C. Chapra and	McGraw-Hill	7 th Ed., 2015
3	Introductory Methods of Numerical Analysis	S. S. Sastry	PHI	4 th Ed.,2011
4	Elements of Numerical Analysis	R.S.Gupta	Oxford Univ. Press	2 nd Ed.,2015
5	Introduction to Numerical Analysis	F.B.Hilderbrand	Dover Publications	2 nd Ed.,1987