

Semester VII

S.No	Course Code	Course Name	L	T	P	C
1	PH501C	<u>Numerical Methods</u>	2	1	0	6
2	PH417T	<u>Nuclear and Particle Physics</u>	2	1	0	6
3	PH401L	<u>Advanced Physics Laboratory</u>	0	0	3	3
4		Program Elective-II	2	1	0	6
5		Institute Elective-III/PH501P:RnD Project	2	1	0	6
6		Seminar-I	0	0	4	4
		Total Credits				31

1	Title of the course (L-T-P-C)	Numerical Methods 2-0-2-6
2	Pre-requisite courses(s)	
3	Course content	<p>Representation of numbers. Round-off error. Condition and stability. Convergence.</p> <p>System of Linear Equations: Exact methods: Lower-Upper (LU) decomposition, Gauss-elimination methods without and with partial pivoting, Iterative methods: Gauss-Jacobi and Gauss-Seidal methods, Matrix norm Condition number and Ill conditioning, Singular value decomposition, Matrices- Eigenvalues and eigenvectors.</p> <p>Non-linear Equations and Roots of Polynomials: Bisection method, Newton-Raphson's method, Direct Iterative method with convergence criterion.</p> <p>Numerical Interpolation and Curve Fitting: Lagrange, Hermite, cubic spline interpolation methods and discussion on associated errors, Curve fitting by least squares.</p> <p>Numerical Calculus: Integral Calculus:- General quadrature formula, Simpson's rules, Improper integrals, Gaussian quadrature formulae. Differential Calculus:- Numerical differentiation, Richardson Extrapolation, Monte Carlo Methods.</p> <p>Ordinary Differential Equations: Euler methods, Runge-Kutta methods and Numerov methods, second order differential equations, coupled differential equations, finite differences, eigen values via finite differences, Power method and eigenvalue problem.</p> <p>Partial Differential Equations: Numerical solutions, Finite difference representation, Elliptic equations.</p>
4	Texts/References	<ol style="list-style-type: none"> 1. P L DeVries, J E Hasbun "A First Course in Computational Physics", JohnWiley, 2nd Edition, 2010. 2. Tao Pang, An Introduction to Computational Physics, Cambridge Univ. Press, 2nd Edition, 2006. 3. K E Atkinson, "An Introduction to Numerical Analysis", Wiley 2nd Edition, 2008. 4. S S Sastry, "Introductory Methods of Numerical Analysis", Prentice Hall, 5th Edition, 2012. 5. E W Cheney, D R Kincaid, "Numerical Mathematics and Computing", Cengage Learning, 7th Edition, 2012.