

### **ME 542 Numerical Analysis (2-0-2-6)**

Round-off errors and computer arithmetic; Interpolation: Lagrange, Divided differences, Hermite and spline interpolation; Numerical differentiation, Numerical quadrature: Newton-Cotes, Simpson's rule, Gauss quadrature; Solutions of linear equations: Gauss elimination, Matrix factorizations; Iterative methods: Gauss-Seidel, Jacobi, Relaxation methods; Computation of eigen values and eigen vectors; Numerical solution of nonlinear equations; Introduction to ODEs, initial and boundary value problems. Laboratory component: The lab is intended to be a platform for students to get used to scientific computing. Strong emphasis is laid on computer programming and the student is expected to write his own programs/codes for prototypical mathematical problems which will have real-life applications in the area of computational mechanics.

#### *Texts/References:*

- [1] S. D. Conte and C. de Boor, Elementary Numerical Analysis, Third Edition, Tata McGraw-Hill Education, 2005.
- [2] F.B. Hildebrand, Introduction to Numerical Analysis, Second (Revised) Edition, Courier Dover Publications, 1987.
- [3] E. Kreyszig, Advanced Engineering Mathematics, Tenth Ed., John Wiley and Sons, 2010.
- [4] R. Burden and J. Faires, Numerical Analysis, 8th Edition, Brooks/Cole, 2001.
- [5] L.N. Trefethen, David Bau III, Numerical Linear Algebra, SIAM, 1997.
- [6] A.Quarteroni, R. Sacco, and F. Saleri. Numerical Mathematics, Springer-Verlag, New York, 2000.