

Module Code: MATH-413  
Module Title: **Theory of Approximation and Splines - I**  
Module Rating: 3 Cr. Hours  
Pre-requisite: Geometry

### **Euclidean Geometry**


- Basic concepts of Euclidean geometry
- Scalar and vector functions
- Barycentric coordinates
- Convex hull, matrices of affine maps: translation, rotation, scaling, reflection and shear

### **Approximation using Polynomials**

- **Curve Fitting:** Least squares line fitting, least squares power fit, data linearization method for exponential functions, nonlinear least-squares method for exponential functions, transformations for data linearization, linear least squares, polynomial fitting
- **Interpolation:** Basic concepts of interpolation, Lagrange's method, error terms and error bounds of Lagrange's method, divided differences method, Newton polynomials, error terms and error bounds of Newton polynomials, central difference interpolation formulae; Gauss's forward interpolation formula, Gauss's backward interpolation formula, Hermite's methods.

### **Recommended Books**

1. David A. Brannan, *Geometry*, (Cambridge University Press, 1999).
2. Gerald Farin, *Curves and Surfaces for Computer Aided Geometric Design: A Practical Guide*, 5<sup>th</sup> edition, (Academic Press. Inc., 2002).
3. Richard H. Bartels, John C. Beatty, and John C. Beatty, *An Introduction to Spline for use in Computer Graphics and Geometric Modeling*, (Morgan Kaufmann Publisher 2006).
4. John H. Mathews, *Numerical Methods for Mathematics, Science and Engineering*, 2<sup>nd</sup> edition (Prentice-Hall International Editions, 1992).
5. Steven C. Chapra and Raymond P. Canale, *Numerical Methods for Engineers* 3<sup>rd</sup> edition, (McGraw Hill International Edition, 1998).

  
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