

MATHEMATICS FOR ARCHITECTURE I

ENSH 104

Lecture : 3
Tutorial : 2
Practical : 0

Year : I
Part : I

Course Objectives:

To equip students with a sound understanding of calculus and geometry enabling them to effectively apply these principles in their respective fields.

- 1 Two Dimensional Geometry (6 hours)**
 - 1.1 Review of two dimensional loci: Straight lines, circle, tangent and normal, parabola
 - 1.2 Ellipse and hyperbola: Standard forms, tangent and normal
 - 1.3 Polar curves and their sketching

- 2 Derivatives and its Applications (8 hours)**
 - 2.1 Review of differentiation techniques, higher order derivatives
 - 2.2 Indeterminate forms: L' Hospital's rule
 - 2.3 Application: Rate measure, maxima and minima
 - 2.4 Asymptote and curvature for Cartesian curves

- 3 Antiderivatives and its Applications (10 hours)**
 - 3.1 Review of integration techniques
 - 3.2 Indefinite and definite integration
 - 3.3 Improper integrals, beta and gamma function and their applications
 - 3.4 Arc length, area, surface of revolution and volume
 - 3.5 Applications: Hydrostatic force and pressure, moment and center of mass of lamina with constant density

- 4 Three Dimensional Geometry (7 hours)**
 - 4.1 Review of coordinates, distance formula, direction ratios and cosines, planes
 - 4.2 Equation of straight lines in general and symmetrical forms
 - 4.3 Sphere
 - 4.4 Right circular cylinder and right circular cone

5 Partial Differentiations and its Applications (6 hours)

- 5.1 Partial derivatives, homogeneous functions, Euler's theorem and total derivatives
- 5.2 Extreme values of function of two and three variables, Lagrange's multipliers
- 5.3 Applications in optimization of function of two variables in one constraint

6 Multiple Integrals and its Applications (8 hours)

- 6.1 Double integrals in Cartesian and polar form, change of order of integration
- 6.2 Introduction of Cartesian, cylindrical and spherical coordinates
- 6.3 Area and volume by double and triple integrals
- 6.4 Applications: Moments and center of mass of lamina with variable density, moment of inertia

Tutorials (30 hours)

1. Two dimensional geometry
2. Derivatives and its applications
3. Antiderivatives and its applications
4. Three dimensional geometry
5. Partial differentiation and its applications
6. Multiple integrals

Reference

1. Kreyszig, E. (1993), Advance Engineering Mathematics (Latest Edition), John Willey & Sons.
2. Thomas, T. Finny, R. (1984), Calculus and Analytic Geometry (Latest Edition), Addison-Wesley.
3. Stewart, J. (2015), Calculus: Early Transcendental. Cengage Learning
4. Singh, M.B. Bajracharya, B.C. (1995), Differential Calculus (Latest Edition). Sukunda Pustak Bhandar.
5. Sthapit, Y.R., Bajracharya, B.C. (2008), A Textbook of Three Dimensional Geometry. Sukunda Pustak, Bhandar.
6. Panta, G.D. Shrestha, G.S. (1994), Integral Calculus and Differential Calculus (Latest Edition). Sunila Prakashan.