

MATHEMATICS FOR ARCHITECTURE I

SH 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

There shall be related tutorials exercised in class and given as regular homework exercise. Tutorial can be as following for each specified chapters

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,(7th ed.), John Willey & Sons.
2. Thomas, T. & Finny, R.(1984), Calculus and Analytic Geometry (6th ed.), Addison-Wesley.
3. Stewart, J. (2015), Calculus: Early Transcendental, (8th ed.), Cengage Learning
4. Singh, M.B. & Bajracharya, B.C.(1995), Differential Calculus, (1st ed.) Sukunda Pustak Bhandar, Nepal
5. Sthapit, Y.R., & Bajracharya, B.C. (2008), A Textbook of Three Dimensional Geometry,(1st ed.), Sukunda Pustak, Bhandar, Nepal
6. Panta, G.D. & Shrestha, G.S.(1994), Integral Calculus and Differential Calculus,(1st ed.), Sunila Prakashan , Nepal