

Calculus-II (Multivariate Calculus)

Total marks: 100 (Theory: 75, Internal Assessment: 25)

5 Periods (4 lectures +1 students' presentation),

1 Tutorial (per week per student)

Use of Scientific Calculators is allowed.

1st Week:

Functions of several variables, limit and continuity of functions of two variables

[1]: Chapter 11 (Sections 11.1(Pages 541-543), 11.2)

2nd Week:

Partial differentiation, total differentiability and differentiability, sufficient condition for differentiability.

[1]: Chapter 11 (Section 11.3, 11.4)

3rd Week:

Chain rule for one and two independent parameters, directional derivatives, the gradient, maximal and normal property of the gradient, tangent planes

[1]: Chapter 11 (Sections 11.5, 11.6)

4th Week:

Extrema of functions of two variables, method of Lagrange multipliers, constrained optimization problems, Definition of vector field, divergence and curl

[1]: Chapter 11(Sections 11.7 (Pages 598-605), 11.8(Pages 610-614))

Chapter 13 (Pages 684-689)

5th Week:

Double integration over rectangular region, double integration over nonrectangular region

[1]: Chapter 12 (Sections 12.1, 12.2)

6th Week:

Double integrals in polar co-ordinates, Triple integrals, Triple integral over a parallelepiped and solid regions

[1]: Chapter 12 (Sections 12.3, 12.4 (Pages 652-655))

7th Week:

Volume by triple integrals, cylindrical and spherical co-ordinates.

[1]: Chapter 12 (Sections 12.4(Pages 656-660), 12.5)

8th Week:

Change of variables in double integrals and triple integrals.

[1]: Chapter 12 (Section 12.6)

9th Week:

Line integrals, Applications of line integrals: Mass and Work.

[1]: Chapter 13 (Section 13.2)

10th Week:

Fundamental theorem for line integrals, conservative vector fields, independence of path.

[1]: Chapter 13 (Section 13.3)

11th Week:

Green's theorem, surface integrals, integrals over parametrically defined surfaces.

[1]: Chapter 13 (Sections 13.4(Page 712–716), 13.5(Page 723–726, 729-730))

12th Week:

Stokes' theorem, The Divergence theorem.

[1]: Chapter 13 (Section 13.6 (Page 733–737), 13.7 (Page 742–745))

REFERENCES:

1. M. J. Strauss, G. L. Bradley and K. J. Smith, *Calculus* (3rd Edition), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), Delhi, 2007.

SUGGESTED READING:

2. E. Marsden, A. J. Tromba and A. Weinstein, *Basic multivariable calculus*, Springer (SIE), Indian reprint, 2005.