

Under-Graduate Programme with MATHEMATICS; 6th Semester

MATHEMATICS

MMT626J3: Advanced Calculus

Credits: 4 (THE)+ 2 (TUT)

Theory: 4 Credits (60 Hours)

Tutorial: 2 Credits (30 Hours)

Course Objectives: To enable students to understand functions of several variables. To make students able to understand the techniques for solving double and triple integrals.

Course Outcome: After the completion of this course, students shall be able to solve double and triple integrals. To evaluate problems using Green's theorem, surface integrals for solution of integrals.

Theory: 4 Credits

Unit- I

Functions of several variables. Limit and continuity of a function of two variables. Algebra of limits. Partial derivative of function of two variables. Mean value theorem. Sufficient condition for continuity. Differentiability of functions of two variables, Sufficient condition for differentiability of functions of two variables. Algebra of differentiable functions. Explicit and implicit functions.

Unit – II

Concept of partial derivatives of higher order. Change in the order of partial derivatives. Sufficient condition for equality of f_{xy} and f_{yx} . Young's theorem and Schwarz's theorem. Functions of functions. Derivative of composite functions (the chain rule), total differentiability. Jacobians: Some properties and applications in two and three variables. Change of variables

Unit – III

Taylor's theorem. Extreme values: Maxima and minima of functions of two variables, sufficient conditions for $f(x, y)$ to have an extreme value. Lagrange's method of undetermined multipliers and its applications.

Double Integral: Geometrical Significance, Condition of integrability. Evaluation of double integral over rectangular region, over any bounded region, Evaluation by changing order of integration and change of variables.

Unit – IV

Review of vector fields. Gradient, Directional derivative, Divergence, Curl, scalar potential and harmonic function. Line and surface integral. Green's Theorem.

Triple integral: Evaluation of triple integral (simple cases), application of triple integral to find volume.

Tutorials: 2 Credits

Unit – V

Applications of Mean value theorem, Young's theorem, Schwarz's theorem for functions of two variables.

Unit – VI

Applications of change of variables, Green's theorem, Surface integrals.

References

1. Mathematical Analysis, S. C. Malik and Savita Arora, 6th Edition, New Age.
2. Advanced Calculus, David V. Widder, 2nd Edition, Printice Hall.
3. Sudhir R. Ghorpade, B.V. Limaye: A Course in Multivariable Calculus and Analysis, Springer International Edition, 2010.
4. Advanced Calculus, Kochar Chopra.
5. S. Dineen, Functions of two variable, Chapman and Hall, 1995.
6. David Widder, Advanced Calculus, Prentice Hall of India.
7. T.M Apostol, Mathematical Analysis, Narosa Publication house.