

## MATHEMATICS- II (Advanced Calculus)

**B.Tech. I Year I Sem.**

Course Code: MA102BS/MA202BS

**L T/P/D C**  
**4 1/0/0 4**

**Prerequisites:** Foundation course (No prerequisites).

### **Course Objectives:**

To learn

- concepts & properties of Laplace Transforms
- solving differential equations using Laplace transform techniques
- evaluation of integrals using Beta and Gamma Functions
- evaluation of multiple integrals and applying them to compute the volume and areas of regions
- the physical quantities involved in engineering field related to the vector valued functions.
- the basic properties of vector valued functions and their applications to line, surface and volume integrals.

### **Course Outcomes:**

After learning the contents of this course the student must be able to

- use Laplace transform techniques for solving DE's
- evaluate integrals using Beta and Gamma functions
- evaluate the multiple integrals and can apply these concepts to find areas, volumes, moment of inertia etc of regions on a plane or in space
- evaluate the line, surface and volume integrals and converting them from one to another

### **UNIT-I**

**Laplace Transforms:** Laplace transforms of standard functions, Shifting theorems, derivatives and integrals, properties- Unit step function, Dirac's delta function, Periodic function, Inverse Laplace transforms, Convolution theorem (without proof).

Applications: Solving ordinary differential equations (initial value problems) using Laplace transforms.

### **UNIT-II**

**Beta and Gamma Functions:** Beta and Gamma functions, properties, relation between Beta and Gamma functions, evaluation of integrals using Beta and Gamma functions.

Applications: Evaluation of integrals.

### **UNIT-III**

**Multiple Integrals:** Double and triple integrals, Change of variables, Change of order of integration.

Applications: Finding areas, volumes & Center of gravity (evaluation using Beta and Gamma functions).

#### **UNIT–IV**

**Vector Differentiation:** Scalar and vector point functions, Gradient, Divergence, Curl and their physical and geometrical interpretation, Laplacian operator, Vector identities.

#### **UNIT–V**

**Vector Integration:** Line Integral, Work done, Potential function, area, surface and volume integrals, Vector integral theorems: Greens, Stokes and Gauss divergence theorems (without proof) and related problems.

#### **Text Books:**

1. Advanced Engineering Mathematics by R K Jain & S R K Iyengar, Narosa Publishers
2. Engineering Mathematics by Srimanthapal and Subodh C. Bhunia, Oxford Publishers

#### **References:**

1. Advanced Engineering Mathematics by Peter V. O. Neil, Cengage Learning Publishers.
2. Advanced Engineering Mathematics by Lawrence Turyn, CRC Press