MA8101 MATHEMATICS FOR MARINE ENGINEERING – I

L	T	P	C
4	0	0	4

OBJECTIVES :

The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus and three-dimensional analytical geometry. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of Marine Engineering students to model the engineering problems mathematically and provide solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and three-dimensional analytic geometry and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I THREE DIMENSIONAL ANALYTICAL GEOMETRY 12

Equation of a sphere – Plane section of a sphere – Tangent plane – Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

UNIT II DIFFERENTIAL CALCULUS 12

Differentiation of algebraic, circular, exponential and logarithmic functions, products, quotient functions of a function and simple implicit functions - Successive differentiation : Introduction and notation - n^{th} order derivatives of standard functions - n^{th} order derivatives using (a) Trigonometric identities and standard functions (b) Partial fractions - Leibnitz's theorem - Maclaurin's theorem - Taylor's theorem - Indeterminate forms and L'Hospital's rule - Curve tracing of cartesian and polar curves.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 12

Limits and continuity - Partial derivatives – Definition - Geometrical interpretation and rules of partial differentiation - Higher order partial derivatives - Homogeneous functions - Euler's theorem for homogenous functions – Total derivatives and chain rules - Differentiation of implicit functions and composite functions - Errors and approximations - Maxima and Minima - Method of Lagrangian multipliers.

UNIT IV INTEGRAL CALCULUS 12

Integration of standard forms by substitution and by parts - Definite integral as the limit of a sum - Application of integration to area under curve - Volume of revolution - First moment of area and the position of a centroid of an area - Work done by variable forces - Mean values, Root mean square values of sin nx and cos nx. Rules of Guldinus -Theorems of parallel and perpendicular axes - Second moments of area and moments of inertia of a rectangular and circular laminas

UNIT V MULTIPLE INTEGRALS 12

Double and triple integrals – Cartesian coordinates - Region of integration and change of order of integration - Spherical polar and cylindrical coordinates - Theorems of parallel and perpendicular axes - Second moments of area and moments of inertia of a rectangular and circular laminas - Applications - Area, Volume, Mass of wire, Lamina and solid - Centre of Gravity of wire, lamina and solid - Moment of inertia using multiple integrals.

TOTAL : 60 PERIODS

OUTCOMES :

After completing this course, students should demonstrate competency in the following skills:

- Use rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals using the Fundamental Theorem of Calculus.
- Apply integration to compute arc lengths, volumes of revolution and surface areas of revolution.
- Apply integration to compute multiple integrals, area, moment of inertia, integrals in polar coordinates, in addition to change of order.

- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Apply the concepts of three-dimensional geometry to model engineering problems.

TEXT BOOKS :

1. Bali N. P and Manish Goyal, "A Text Book of Engineering Mathematics", 9th Edition, Laxmi Publications Ltd., 2014.
2. Grewal B.S, "Higher Engineering Mathematics", 43rd Edition, Khanna Publications, Delhi, 2014.

REFERENCES :

1. Embleton, W. and Jackson, L., "Mathematics for Engineers", Vol - I, 7th Edition, Reed Marine Engineering Series, Thomas Reed Publications, 1997.
2. Jain R.K and Iyengar S.R.K," Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House Pvt. Ltd., 2007.
3. James, G., "Advanced Engineering Mathematics", 7th Edition, Pearson Education, 2007.
4. Ramana, B.V, "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New 2016.