350 MA 72: Vector Analysis And Fourier Analysis *-9 Credits*

Course Objectives: This course covers the topics in vector and tensor calculus which are essentialtools of modern applied mathematics. To develop deep understanding of key concepts followed by problems of applied nature. The portion on Fourier analysis will lead to post-graduate studies and research in pure as well as applied mathematics.

Expected Course Outcomes: By the end of this course students will be able to:

- Apply concept of vectors to in calculus.
- Use concept of the Curl of a Vector in calculus

Course Contents:

Unit 1: Differential Vector Calculus
Differentiation of a Vector, Geometrical Interpretation of the Derivative, Differentiation Formulae, Differentiation of dot and Cross Products, Partial Derivatives of Vectors, Differentials of Vectors.

Unit 2: Gradient, Divergence and Curl
Vector Differential Operator Del, Gradient of a Scalar Function, Directional Derivative, Geometric Interpretation, Gradient of the sum of Functions; of the product of functions and of a function of function, Operations involving Del - Divergence of a Vector and its Physical Interpretation, Curl of a Vector and its Physical Interpretation, Expansion Formulae for Operators involving Del, Solenoidal and Irrotational.

Unit 3: Vector Integration
The Line Integral, Surface Integral and its Physical Meaning, Surface Integral and the Concept of Divergence of a Vector, Equivalence of two Definitions of Divergence, Statements of Gauss Divergence Theorem and Green's Theorem (only) and Problems, Line Integral, The Concept of the Curl of a Vector, Statement of Stoke's Theorem (only) and Problems.

Unit 4: Fourier Series
Euler's Formulae, Conditions for Fourier Expansion, Functions having Discontinuity, Change of Interval, Odd and Even Functions, Expansions of Odd or Even periodic Functions, Half-range Series, Typical Wave Forms, Parseval's Formula.

Unit 5: Fourier Transform
Definition, Fourier Integrals, Fourier Since and Cosine Integral, Complex Form of Fourier Integral, Fourier Transform: Fourier Since and Cosine Transforms, Finite Fourier Sine and Cosine Transforms (without proof), Properties of Fourier Transforms, Convolution Theorem for Fourier Transforms, Parseval's Identity for Fourier Transforms - (without derivation)

Delivery Mode

Lecture	Tutorial/	Assignment	Independent	Practical hrs	Total hrs

hrs	Seminar hrs	hrs	Study hrs		
60	-	15	15	-	90

Assessment: Coursework 40%, Final Examination 60%

Suggested Reading List:

1. B.S.Grewal. Higher Engineering Mathematics , Khanna Publishers, New Delhi, 2002.
.
2. G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry, Addison Wesley, 9th Ed. Mass. (Indian Print), 1998 .
3. M.K.Venkataraman, Engineering Mathematics-Part B. National Publishing Company, Chennai,1992.
4. P.R.Vittal, Vector Calculus, Fourier series and Fourier Transform. Margham Publications, Chennai 2004.