Details of Course

Course Title	Course Structure			Pre-Requisite
Mathematical Physics -B.Tech. EP 3rd Sem Lesson Plan	**L**	**T**	**P**	Basic knowledge of Vector analysis, Differentiation, Integration and ordinary differential equations (linear algebra)
	3	**1**	**0**	

Course Objective:
To develop student's facility with certain mathematical techniques and to highlight applications of mathematical methods to physical systems

Course Outcomes (CO)

Students will be able to

1. Demonstrate the basics and applications of vector and tensor analysis to solve suitable engineering problems.
2. Understand the basic concepts in complex algebra and solve the problems by applying the various theorems in Complex Analysis**.**
3. Acquire knowledge to derive solutions for various types of partial differential equations and apply these methods to design some experiments related to engineering sciences and technology.
4. Demonstrate the Fourier series to study the behaviour of periodic functions and their applications in Engineering Physics.
5. Apply gained knowledge and skills to carry out advanced tasks and projects, which are useful to contribute to the innovation and application of basic research.

S. No.	Content	Contact Hours
Unit 1	**Review of Vector Analysis:** Scalar and vector fields, Triple Products, Vector Differentiations, divergence and curl, Vector and Volume Integrations, Applications of Greens, Gauss's and stokes theorem, Equation of continuity and its applications	8
Unit 2	**Tensors:** Definition, Rank of a Tensor, Einstein's summation convention, Dummy and real index, Contravariant, Covariant and Mixed tensors, Addition, subtraction, Contraction, Multiplication of tensors: inner and outer product, Quotient law, symmetric and anti-symmetric tensors-application of tensor theory to strain, thermal expansion, piezo-electricity and converse piezo-electric effect	8
Unit 3	**Complex Variables:** Introduction, Functions of complex variables, limit, continuity, Analytic function, Cauchy-Reimann equations, Harmonic function, Singular points and classification, Cauchy theorem, Cauchy's integral formula, Taylor's and Laurent's series, Residues, Calculations of residues, Residue theorem-evaluation of definite integrals.	10
Unit 4	**Fourier Series and Transforms:** Introduction, Periodic functions: Properties, Even & Odd functions: Dirichlet's condition, Fourier series of periodic functions, Introduction to Fourier Transforms and applications	8

Unit 5	**Partial Differential Equations:** Introduction, Method of separation of variables- Solution of Laplace Equation in two dimensions- D'alemberts solution of the wave equation, Application of Laplace equation to two dimensional steady state of heat flow in a thin rectangular plate - application to the vibration of a rectangular membrane.	8
	Total	**42**

Suggested Books:

S.No.	Name of Books/ Authors	Year of Publication/ Reprint
1.	Vector Analysis by M. R. Spiegel	1959/Schaum's outline series, Tata McGraw Hill
2.	Vector and Tensor analysis by Harry Lass, International Student edition	1950/McGraw-Hill
3.	Tensor Analysis-theory and applications by I.S. Sokolnikof	1951/John Wiley & Sons, Inc.
4.	Physical properties of crystals – their representation by Tensors and Matrices by J.F. Nye	1957/Oxford Science Publications, Oxford University Press
5.	Complex variables by M. J. Ablowitz, A.S. Fokas	2003/2nd Edition/Cambridge University Press
6.	Complex variable and applications by J.W. Brown and R.V. Churchill	2009/6th ed., McGraw-Hill Higher Education
7.	Advanced Engineering Mathematics by Erwin Kreyszig	2011/10th Edition/John Wiley & Sons, INC.
8.	Higher Engineering Mathematics by H.K. Dass, Er. R. Verma	2018/ S. Chand & Company Ltd.