Lesson Plan

Subject code: **EP-203** Course title: **Mathematical Physics**

Relative Weight: **CWS: 25 MTE: 25 ETE: 50**

Unit No.	Contents
I	Introduction, Scalar and vector fields, Triple Products, Vector Differentiations, divergence and curl, Vector and Volume Integrations,
	Greens, Gauss's and stokes theorem,
	Applications of Greens, Gauss's and stokes theorem, Equation of continuity and its applications
II	Introduction, 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
III	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.
IV	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.
V	Introduction to Numerical analysis, Forward and backward differences
	Relation between the operators, Concept of Interpolation and Extrapolation,
	Newton-Gregory formula for forward and backward interpolation, Solution of ordinary differential equations of first order using Runge-Kutta Method.

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	2012/ S. Chand & Company Ltd.