Teaching Plan

Name of the Faculty : Dr. Divya Haridas

Name of the Course : B.Sc. Physics (Erstwhile FYUP)

Semester : VI Sem Sec (if any) :

Title of the Paper : **PHYSICS-VIIA: MATHEMATICAL PHYSICS-IV**

Month	Topics Covered	References
January February	**Vector Spaces:** Vector Spaces over Fields of Real and Complex numbers. Examples. Vector space of functions. Linear independence of vectors. Basis and dimension of a vector space. Change of basis. Subspace. Isomorphisms. Inner product and Norm. Inner product of functions: the weight function. Triangle and Cauchy Schwartz Inequalities. Orthonormal bases. Sine and cosine functions in a Fourier series as an orthonormal basis. Gram Schmidt orthogonalisation. **Linear Transformations:** Introduction. Identity and inverse. Singular and non-singular transformations. Representation of linear transformations by matrices. Similarity transformation. Linear operators. Differential operators as linear operators on vector space of functions. Commutator of operators. Orthogonal & unitary operators and their matrix representations.Adjoint of a linear operator. Hermitian operators and their matrix representation. Hermitian differential operators and boundary conditions. Examples. Eigenvalues & eigenvectors of linear operators. Properties of eigenvalues and eigenvectors of Hermitian and unitary operators. Functions of Hermitian operators/matrices. **Tensors:** Tensors as multilinear transformations (functionals) on vectors. Examples: Moment of Inertia, dielectric susceptibility. Components of a tensor in a basis. Symmetric and antisymmetric tensors. The completely antisymmetric tensor. Non-orthonormal and reciprocal bases. Summation convention. Inner product of vectors and the metric tensor. Coordinate systems & coordinate basis vectors. Reciprocal coordinate basis. Components of metric in a coordinate basis and association with infinitesimal distance. Change of basis:	• Mathematical Tools for Physics, James Nearing, 2010, Dover Publications • Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E.Harris,1970, Elsevier • Introduction to Matrices and Linear Transformations, D.T. Finkbeiner, 1978, Dover Publications • Linear Algebra, W. Cheney, E.W. Cheney and D.R. Kincaid, 2012, Jones and Bartlett Learning • Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole **Additional Books for Reference** • Mathematical Methods for Physicis and Engineers, K.F.Riley, M.P.Hobson, S.J.Bence, 3rd Ed.,2006, Cambridge University Press • Mathematics for Physicists: Philippe Denneryand Andre Krzywicki, 1967, Dover Publications • The Mathematics of Physics and Chemistry, H. Margenau and G. M. Murphy, 1956, Van Nostrand • Advanced Engineering Mathematics,D.J.Zill&W.S.Wright, 4th Ed., 2012,Jones& Bartlett Learning

	relation between coordinate basis vectors.	
March	Change of tensor components under a change of coordinate system. Example: Inertial coordinates and bases in Minkowski space, Lorentz transformations as coordinate transformations, the Elelctromagnetic tensor and change in its components under Lorentz transformations. **Calculus of Variations** Variational Principle: Euler's Equation. Application to Simple Problems(shape of a soap film, Fermat's Principle,etc.).	
April	Several Dependent Variables and Euler's Equations. Example: Hamilton's Principle and the Euler-Lagrange equations of motion. Geodesics: geodesic equation as a set of Euler's equations. Constrained Variations: Variations with constraints. Applications: motion of a simple pendulum, particle constrained to move on a hoop.	

Tentative date of test: 28 March 2016

Tentative date of Presentation: The presentation series will be held in the month of April 2016. A uniform schedule will be informed to the students as per their respective groups.

Schedule of Practicals: Practical's are already been allotted as per the syllabus. Timely record (allotment & completion) of practicals has been maintained in the laboratory.

Teaching Plan

Name of the Faculty : Dr. Kanupriya Goswmi

Name of the Course : FYUP – PHYSICS VI Semester

Semester : VI Sec (if any) : none

Title of the Paper :PHYSICS VI C STATISTICAL MECHANICS

Month	Topics Covered	References
January	Theory of Radiation + Some topics of Classical Statistics	

February March April	Remaining Topics of Classical statistics Bose Einstein Statistics + Some topics of Fermi Dirac Statistics Remaining Topics of Fermi Dirac Statistics	1.Statistical Mechanics, R.K. Pathria, Butterworth Heinemann: 2nd Ed., 1996, Oxford University Press. 2.Statistical Physics, Berkeley Physics Course, F. Reif, 2008, Tata McGraw-Hill 3.Thermodynamics, Kinetic Theory and Statistical Thermodynamics, Francis W. Sears and Gerhard L. Salinger, 1986, Narosa. 4. Modern Thermodynamics with Statistical Mechanics, Carl S. Helrich, 2009, Springer 5.An Introduction to Statistical Mechanics & Thermodynamics, R.H. Swendsen, 2012, Oxford Univ. Press

The date of test : 17th March 2016