Course: M.Sc (Physics)

Semester	2
Paper Number	8 (MPHC4252)
Paper Title	Core Lab-II (Non-Electronics) and Computational Physics
No. of Credits	6
Course description/objective	**Group A:** The objective of this course is to have an understanding of how different objects such as a wire or a liquid can cause interference pattern of light under certain circumstances, how path difference of coherent light causes interference patterns, and how monochromatic light can be generated and can be transmitted without much loss through a suitable medium. **GroupB:** The objective of this course is to enable students to learn different numerical techniques for solving differential equations and applying these techniques to look at different scientific problems, in particular oscillators.
Course Outcome	**Group A** **Group B** CO1: Learn to solve differential equations using direction fields and phase plane analysis CO2: Numerical techniques for handling linear and non-linear differential equations CO3: Solving different scientific problems, in particular linear and non-linear oscillators
Syllabus	**Group A: Core Lab-II (Non-Electronics)** 1. Determination of Numerical aperture of optical fibers and related experiments 2. To study Iodine absorption spectrum 3. To study Acousto-optical effect using piezo-electric crystal and determination of the velocity of ultrasonic wave in liquids. 4. Interferometry with Michelson's/Jamin's interferometer. 5. Spectrophotometry: Absorption of biomolecules/study of melting. 6. Experiments with Laser: Characteristics of a Diode Laser 7. Experiments with Laser: Thickness of a wire 8. To Study Ferromagnetic to Paramagnetic Phase Transition. 9. Energy band gap of semiconductor by studying the luminescence spectra. 10. Determination of Curie temperature using ferroelectric material [36 lectures] **Group B: (Lab) (Computational Physics)** Numerical Computing using Matlab/Scilab/Octave: Solution of Nonlinear ODEs and System of ODES: tools and algorithms (Euler, Modified Euler, RK, Stiff Integrators). Solution of PDES using FD / FEM scheme: Elementary examples. Modelling of Physical Systems: (a) Nonlinear Oscillations, (b) Stochastic Computation. [36 lectures]
References	**Group A:** Foundation of Soliod State Electronic Devices by Streetman and Banerjee 2. Optics by Ajay Ghatak 3.Principles of Optics: Electromagnetic Theory of Propagation, Interference and Diffraction of Light by Max Born , Emil Wolf **4.** Introduction To Fiber Optics 2017 Edition by Ajoy ghatak, k. Thyagarajan

	Group B: 1. John W. Eaton, David Bateman, Søren Hauberg, Rik Wehbring, GNU Octave: Free your numbers 2. Jason Lachniet, Introduction to GNU Octave
Evaluation	Total: 100 Group A: CIA: 30 (10 (LNB) + 20 (Lab performance)) Group B: CIA: 30 (10 (LNB) + 20 (CIA Exam)) End Semester Examination: 20 (Group A) + 20 (Group B)