Core Lab-II (Non-Electronics) and Computational Physics

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1. Define the concept of Numerical Aperture of optical fibers and explain its significance in fiber optics communication systems. (Knowledge)
2. Analyze the Iodine absorption spectrum data and interpret the results to determine the characteristics of the iodine molecule. (Comprehension)
3. Compare the Acousto-optical effect in different liquids using piezoelectric crystals and calculate the velocity of ultrasonic waves in each medium. (Analysis)
4. Design and conduct experiments with Michelson's/Jamin's interferometer to demonstrate interference fringes and explain the principles of interferometry. (Application)
5. Investigate the absorption spectrum of biomolecules using spectrophotometry and analyze the data to determine the concentration and characteristics of the molecules. (Analysis)
6. Demonstrate the characteristics of a Diode Laser through experiments and explain the working principle and applications of diode lasers. (Application)
7. Measure the thickness of a wire using laser techniques and discuss the methodology and limitations of the experiment. (Evaluation)
8. Investigate the transition from ferromagnetic to paramagnetic phase in a material and analyze the results to determine the critical temperature. (Analysis)
9. Calculate the energy band gap of a semiconductor from luminescence spectra data and discuss the significance of the band gap in semiconductor devices. (Evaluation)
10. Conduct experiments to determine the Curie temperature using a ferroelectric material and analyze the data to determine the phase transition temperature. (Evaluation)

Upon completion of the course, the students will be able to:
- Apply numerical methods and computational tools to solve nonlinear ODEs and systems of ODEs using algorithms like Euler, Modified Euler, RK, and Stiff Integrators.
- Utilize Finite Difference and Finite Element Methods to solve partial differential equations for physical systems.
- Model and analyze nonlinear oscillations and stochastic phenomena in physical systems using computational techniques.
- Evaluate and interpret simulation results to understand the behavior of complex physical systems and make predictions based on computational models.