COURSE CONTENT

ADVANCED ENGINEERING PHYSICS LAB

I Semester: CE / CSD / CSM / ECE / EEE / ME

II Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
25X0071	Basic Science	0	0	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 30				Total Classes: 30		
Prerequisites: Intermediate Physics								

Course Overview:

Advanced Engineering Physics Lab course is to provide hands on experience for experiments in different areas of physics. This laboratory includes experiments involving, electrical, electromagnetism and optoelectronics. This course enhances student knowledge to apply the various physical concepts in current technology.

Course Objectives:

1. Capable of handling instruments related to the Hall effect Experiment and their measurements.
2. Understand the characteristics of various devices such as solar cell, lasers and optical fiber.
3. Apply the analytical techniques & graphical analysis for Stewart Gees, B-H curve.
4. Synthesize and study the physical properties of materials like semiconductors ferromagnetic and ferroelectric substances.
5. Develop intellectual communication skills through discussion on basic principles of scientific concepts in a group.

Course Outcomes: After Completion of the Course, Students should be able to

1. Demonstrate the Planck's constant using Photo electric effect and Apply the Hall effect and band gap measurement techniques to examine semiconductor properties
2. Determine key electrical, magnetic and optical properties of semiconductors and other functional materials.
3. Describe the steps involved in the Synthesis of magnetic nanomaterials using chemical methods.
4. Compare the variation of magnetic and electric field and the behaviours of hysteresis curve. Interpret data analysis.
5. Demonstrate working of laser systems, optical fiber and solar cell parameters through experimental study.

List of Experiments: (Any 8 experiments are to be performed)

1. Determination of work function and Planck's constant using photo electric effect
2. Determination of Hall coefficient and carrier concentration of a given semiconductor
3. Determination of energy gap of a semiconductor
4. Synthesis of magnetic (Fe_3O_4) nanoparticles using sol-gel method.
5. Study of B-H curve of a ferromagnetic material
6. Determination of magnetic field induction along the axis of a current carrying coil.
7. Determination of dielectric constant of a given material.
8. Study of V-I and P-I characteristics of solar cell.
9. Determination of wavelength of a laser using diffraction grating and to study of V-I & 55L-I characteristics of a given laser diode

10. Determination of numerical aperture of a given optical fibre and to determination of bending losses of a given optical fibre.

List of Experiments: (Any 8 experiments are to be performed)

1. To calculate the concentration of charge carriers in the sample using Hall effect -NITK, Surathkal Virtual Lab.
2. To draw hysteresis (B-H curve) of a specimen in the form of a transformer and to determine its hysteresis loss - IIT Kanpur Virtual Lab.
3. To calculate the beam divergence and spot size of the given laser beam - Amritha Viswa Vidya Peetham Virtual Lab
4. To study various crystals structures - Amritha Viswa Vidya Peetham Virtual Lab

ELECTRONIC RESOURCES

1. Kittel, Charles, and Paul McEuen. Introduction to solid state physics. John Wiley & Sons, 2018. https://ph1-nitk.vlabs.ac.in/exp/hall-effect/references.html.
2. Kasap S O., Principles of Electronic Materials and Devices, 3rd Ed, Mcgraw Hill, 2006). https://bop2-iitk.vlabs.ac.in/exp/hysteresis-loss/references.html.
3. Koechner, Walter. Solid-State Laser Engineering. Berlin: Springer, 2006. https://lo-amrt.vlabs.ac.in/exp/laser-beam-divergence/references.html.
4. Pillai, SO. Solid State Physics, City: New Age Publications (Academic), India, 2005. https://ssp-amrt.vlabs.ac.in/exp/crystal-structure/references.html
5. https://youtu.be/Ujx68vgBk9w?si=c4k9V0aZvn9D46Dc
6. https://youtu.be/rOhTZ5D_nGI?si=mN_eVtpLP7d4HNyA

MATERIALS ONLINE:

1. Course template
2. AEP Lab Manual
3. Open-ended experiments
4. e-Learning Readiness Videos (ELRV)