iii. Introduction to Solids, Leonid V. Azaroff, 2004, Tata Mc-Graw Hill.
iv. Solid State Physics, N.W. Ashcroft and N.D. Mermin, 1976, Cengage Learning.
v. Solid-state Physics, H. Ibach and H. Luth, 2009, Springer.
vi. Solid State Physics, Rita John, 2014, McGraw Hill.
vii. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India.
viii. Solid State Physics, M.A. Wahab, 2011, Narosa Publications.
ix. Solid state Physics, S.O. Pillai, New age publisher.

PHYDSC354P

LAB: SOLID STATE PHYSICS AND DIGITAL ELECTRONICS

Contact Hours: 60

Full Marks = 100

Course objective: *In this course, the students will learn to use various instruments, estimate various physical parameters for every experiment performed and report the result of experiments related to solid state physics and digital electronics.*

Two Experiments are to be performed – one from each part

Part-A: Solid State Physics

1. To measurement the susceptibility of paramagnetic solution by (Quinck`s Tube Method)/suitable method.
2. To measure the Magnetic susceptibility of Solids.
3. To measure the Dielectric Constant of a dielectric Material by suitable method.
4. To study the P-E Hysteresis loop of a Ferroelectric Crystal.
5. To draw the B-H curve of Fe using Solenoid/transformer & determine energy loss from Hysteresis.
6. To measure the resistivity of a semiconductor (Ge) with temperature by four-probe method (room temperature to 150 ^{o}C) and to determine its band gap.
7. To determine the Hall coefficient of a semiconductor sample.
8. To determine magnetic field as a function of the resonance frequency for studying electron spin resonance
9. To Study the Zeeman effect: with external magnetic field; Hyperfine splitting.
10. To determine Planck’s constant using LEDs of at least 4 different colours.
11. To determine Boltzmann’s constant using V-I characteristics of PN junction diode.

Part-B: Digital Electronics

1. To verify the truth tables of AND, OR, NOT, NOR and NAND gates.
2. To study and verify NAND and NOR gates as a universal gate.
3. To design a combinational logic system for a specified Truth Table using breadboard.
4. To convert a Boolean expression (SOP/POS) into logic circuit and design it using logic gate ICs.
5. To design and verify the De Morgan's theorem.
6. To design and verify Half Adder and Full Adder.
7. To design and verify the truth tables of S-R flip-flop using NOR/NAND gates.
8. To design and verify the truth tables of D flip-flop using NOR/NAND gates.
9. To verify the truth tables of the multiplexer 74150 and demultiplexer 74154.

Expected learning outcomes: *For demonstrating comprehensive knowledge and understanding, at the end of the above course, the students will have the hands-on experience of using various instruments to carry out experiments based on the theory that they have learned to measure the magnetic susceptibility, dielectric constant, to trace hysteresis loop, hall coefficient, Planck's constant. The students are also expected to verify the fundamental and universal logic gates, construct both combinational circuits and sequential circuits by employing logic gates and demonstrate adders, multiplexers and flip flops.*

References:

1. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
2. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal.
3. Elements of Solid State Physics, J.P. Srivastava, 2nd Ed., 2006, Prentice-Hall of India.
4. Advanced Practical Physics Vol II – B. Ghosh (Shreedhar Publishers).
5. Experiments in Digital Electronics, Dr. V. S. Bist, Neel Kamal Prakashan.
6. Practical Digital Electronics: Lab Manual, Nigel P. Cook.