# PHYDSC253P

## LAB: THERMAL PHYSICS AND ANALOG 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 results of experiments related to thermal physics and analog electronics.*

Two Experiments are to be performed – one from each part

### Part-A: Thermal Physics

1. To determine Mechanical Equivalent of Heat, J, by Joule's / Callender and Barne's constant flow method.
2. To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus or any suitable method.
3. To determine the coefficient of linear expansion by optical lever method or any other suitable method.
4. To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method or any suitable method.
5. To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT).
6. To study the variation of resistance with temperature by Carry-Foster bridge and hence determine the temperature coefficient of the material using hotplate.
7. To study the variation of Thermo-emf of a Thermocouple with difference of temperature of its two Junctions
8. To determine the specific heat of a liquid by the method of cooling.

### Part-B: Analog Electronics

1. To study V-I characteristics of PN junction diode and Light emitting diode.
2. To study the V-I characteristics of a Zener diode and its use as voltage regulator.
3. To study the V-I and power curves of solar cells and find the maximum power point and efficiency.
4. To study the characteristics of a Bipolar Junction Transistor in CE configuration.
5. To design a CE transistor amplifier of a given gain (mid-gain) using voltage divider bias.
6. To study the frequency response of a single stage RC-coupled transistor amplifier.
7. To show the tunnelling effect in tunnel diode using I-V characteristics.
8. To design an inverting amplifier using Op-amp (741,351) for dc input voltage and find its closed loop gain.

9. To design non-inverting amplifier using Op-amp (741,351) for dc input voltage and find its closed loop gain.
10. To investigate the use of an op-amp (741,351) as an Integrator and Differentiator.
11. To investigate the use of an op-amp (741,351) as adder and subtractor.

***Expected learning outcomes:*** *For demonstrating comprehensive knowledge and understanding, at the end of the above course the students will have hands-on knowledge and overview of various instruments and perform experiments related to various key aspects of thermal physics and analog electronics.*

**Reference Books:**


1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
2. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal.
3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
4. A Laboratory Manual of Physics for undergraduate classes,D. P. Khandelwal,1985, Vani Pub.
5. Advanced Practical Physics Vol I – B. Ghosh (Shreedhar Publishers).
6. Basic Electronics: A text lab manual, P.B. Zbar, A.P. Malvino, M.A. Miller, 1994, Mc-Graw Hill.
7. OP-Amps and Linear Integrated Circuit, R. A. Gayakwad, 4th edition, 2000, Prentice Hall.
8. Electronic Principle, Albert Malvino, 2008, Tata Mc-Graw Hill.
9. Advanced Practical Physics Vol II – B. Ghosh (Shreedhar Publishers).
10. A Textbook on Electronics by S. Chattopadhay (Publisher: NCBA, 2016).