

## **Objective of Phys 495**

- To familiarize students the modern measuring instruments and different experimental technique in measuring the basic properties, like crystal structure, electrical, magnetic dielectric and thermal properties of the materials needed to take the graduate studies in experimental condensed matter physics or in material science or in nano science.
- Physics is an experimental science. This laboratory course offers an ideal opportunity to learn and strengthen the concept of solid state physics what they studied in theory course Phy 471.
- To develop the understanding of the basic theories, such as band theory, difference between metals, semiconductors and insulators by doing the experiment.
- To develop the students' understanding of the various physical properties such as electrical, magnetic, dielectric, thermo electrical, and structural properties of materials and how these properties are effected as a function of external parameter such as temperature, humidity, electric field and magnetic field.
- To familiarize the students the properties of materials which are used in various sensor development such as the resistance of metal platinum and that of semiconductors Si or Ge are used in developing the temperature sensors in measuring the temperature.
- To develop the understanding of thermoelectric phenomena, the Seebeck, Peltier and Thomson effect and to utilize these properties of materials in Peltier cooling and development of thermocouple temperature sensors for measuring the temperature.
- To familiarize the Hall Effect phenomenon in metals and semiconductors and to find the carrier concentration 'n' and nature of electrical carriers in different materials.
- To develop the understanding of paramagnetic and diamagnetic materials and their behaviour in external magnetic field by measuring the susceptibility.
- To familiarize the X-ray diffraction technique and electron diffraction in finding the crystal structure of material with a typical example of finding the crystal structure of sodium chloride using XRD and structure of graphite using electron diffraction.
- To develop the understanding of the function of solar cell
- To develop the understanding of the electron paramagnetic resonance phenomenon
- To develop in the students' an awareness of the relevance of various types of materials in technological revolution.

## Schedule of Assessment Tasks for Students During the Semester

Assessment	Assessment task (eg. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	Class activity how are performing the experiments)	weekly	10%
2	Quizzes	weekly	5%
3	Laboratory reports	weekly	20%
4	Research project	14	15%
5	Final theory exam	16	10%
6	Final laboratory exam	16	40%

### Text Books

- Introduction to Solid state Physics by Charles Kittel 7<sup>th</sup> Edition 2007 John Wiley & Sons