

**IIT Mandi  
Proposal for a New Course**

**Course Name** : Experimental Research Techniques  
**Course Number** : PH 611P  
**Credits** : (0-0-7-4)  
**Prerequisites** : First year I-Ph.D. courses  
**Intended for** : I-Ph.D.  
**Distribution** : Core  
**Semester** : Odd

**Preamble** : According to Newton's third law, we can just move the earth up and down by just throwing the ball up and down. But why don't we feel it? Its simply because its immeasurable within the uncertainty of the measuring set up. Performing an experiment with out the knowledge of uncertainty has no meaning. The students will be given a flavour of what does it really mean by (a) performing an experiment; (b) developing a mini experiment (c) assembling and engineering tools.

**Course Outline** : The aim of the proposed course is to amalgamate the concepts in Physics through assembling, developing mini experiments and building components.

**Modules :**

**Temperature dependence of Electrical resistivity of materials.**

This experiment involves measuring temperature dependent resistivity of any material using four probe method and Vander Pauw methods. The skills that one will develop are to make fine contacts on the sample, learn the intricacies involved in making this set up.

**Electronic properties of material using photoemission technique.**

Photoemission experiments will be done on any material and its electronic properties will be studied. The skills that one will develop are the intricacies involved in conducting experiments in ultra high vacuum conditions.

**Seebeck coefficient measurement.**

Develop mini Seebeck coefficient experiment to distinguish n-type and p-type semiconductors from a mixture of it.

**Structural properties of materials using powder x-ray diffraction (xrd) technique.**