



SECOND SEMESTER 2015 – 2016

Course Handout (Part – II)

Date: 05/01/2016

In addition to Part I (general Handout for all courses appended to the Time Table), this portion gives further specific details regarding the course.

Course No.: PHY F417

Course Title: Experimental Methods of Physics

Instructor-in-charge : Srijata Dey

Instructors: Debashis Bandyopadhyay, Srijata Dey

**Course Description:** Vacuum Techniques, growth, properties and characterization of materials, with modern experimental techniques including microscopy and spectroscopy.

**Scope & Objective:** The course will cover modern techniques used in experimental physics research laboratories and in industries working in related fields.

**Text Book:** No single text book exists. Lecture notes will be uploaded in NALANDA.

**Course Plan:**

Lecture No.	Learning Objectives	Topics to be covered	Reference
1-2	Techniques used to produce high vacuum and measurement of low pressure	Rotary & Diffusion Pumps, Vacuum Gauges.	<b>Lecture notes</b>
3-5	Ultra high vacuum techniques and trouble shooting	Turbomolecular pumps, cryopumps, valves, leak detection, mass flow controller, degassing	Do
6-7	Cryogenic fundamentals and liquid cryogenics	Joule Kelvin effect, critical temperature, critical pressure; temperature of inversion, liquid nitrogen and liquid helium	Do
8-11	Thin film deposition	Epitaxy, Molecular beam epitaxy (MBE), Chemical vapour deposition (CVD), Physical Vapor deposition (PVD), etc., Growth modes	Do





12-14	Structural characterization with diffraction techniques	X-ray diffraction, Electron diffraction	Do
15-17	Electron microscopy	Principles of electron microscopy: SEM, TEM.	Do
18-21	Structural characterization with scanning probe techniques	Scanning Probe Microscopy (SPM): Scanning Tunneling Microscopy (STM), Scanning Force Microscopy (SFM); their principles and applications.	Do
22-24	Surfaces analytical techniques	Photoelectron spectroscopy: UPS & XPS, AES etc.	Do
25-32	Spectroscopic Techniques	N.M.R. E.P.R., I.R., FT-I.R., UV-visible Spectroscopy, Fluorimetry and Raman Spectroscopy, P.A.S.	Do
33-40	Nuclear Spectroscopy	Mössbauer effect, Mössbauer spectrometer, Multichannel analyzer, Analysis of Mössbauer spectrum.	Do

#### Evaluation Scheme:

EC No.	Evaluation Scheme	Duration	Weightage (%)	Date, Time & Venue	Nature of Component
1.	Mid Sem.Exam.	90 mins.	30	14/3 2:00 - 3:30 PM	Closed Book
2.	Tutorial tests	15 mins.	25	*****	Closed Book
3.	Comprehensive Examination	3 hrs.	45	9/5 FN	Open + Closed Book

**Chamber Consultation Hour:** To be announced in class.

**Notices:** Notices for the course will be displayed on **FD-III** notice board.

**Make-up Policy:** Make up will be given strictly to **genuine cases only** i.e. (i) Sickness leading to hospitalization, (ii) Out of station with prior intimation & permission.

Instructor-in-charge

PHY F417

