Birla Institute of Technology & Science, Pilani
Hyderabad Campus

First Semester 2021 - 2022

Course Handout (Part II)

Date: 20/08/2021

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 F244**
Course Title: **MODERN PHYSICS LAB**
Instructor-in-charge: Prof. Kannan Ramaswamy
Instructors: Prof. V. Satya Narayana Murthy, Kum. Priyanka Mitra, Kum. Nilofar Naaz

1. Aim and Objective of the course
   - The aim of the course is to introduce to students some well-known experiments in Modern Physics which includes Quantum Mechanics, Optics and Nuclear Physics.
   - The primary objective of this course is to convey the message that it is equally important to develop experimental skills and awareness about the intricacies involved in designing experiments along with a clear understanding of theoretical principles in Physics.
   - As a secondary objective, we anticipate that an exposure to some of the measurement techniques involved in Physics may enable/motivate students to develop new techniques/methods that may be needed to test certain ideas in other branches of science/engineering.

2. Learning Materials

   Whenever required, a visual presentation of every experiment will be made available to the students. The information regarding every experiment will be posted in the Google Classroom link created for this course.

   Learning Outcomes:

   - Ability to acquire experimental data.

- Ability to look at experimental data critically and derive meaningful conclusions.
- Ability to perform error analysis.
- Ability to make clear and concise written technical reports.

Instructors Role:

- Give introductory lecture about experiments and techniques involved in the experiment.
- Demonstrate how data is collected for every experiment planned for this course.
- Provide formative assessments about student's progress.
- Provide any other assistance as needed by the students.

Student's Role:

- Understand the fundamental physical principles behind the experimental techniques.
- Understand the limitations of the experimental arrangement and identify the sources of errors that can creep into the experimental data.
- Whenever, it is feasible, come up with alternate experimental methods to measure the same physical parameters.
- Communicate your understanding about the experimental techniques through written report and oral presentations. **We take this role of the student very seriously.** Every student MUST write their report in their own English language. Students are encouraged to consult and engage in meaningful discussions with your peers.

What happens on a day to day basis in the laboratory sessions?

- Every lab is for a total of 2 hours per week.
- The instructors will give a presentation for about 30 minutes about each experimental technique that will be a part of this course. The students will be provided with resource materials to understand relevant theory.

- There will be open discussions about the theoretical and technical aspects of the experiment. This will be for about 15 minutes.
- The instructors will facilitate LIVE data collection whenever it is feasible. If not students will be given the experimental data.
- Each student will submit a detailed written report based on the analyzed data. Typically, students are split into groups so that there can be healthy discussions about the performed experiments. However, the laboratory report has to be written by each student in their own language.
- This process will continue for all the experiments.

How does evaluation for this course happen?

- Written report of experiments will carry a weightage of 60%.
- Seminar based on the given topic will carry a weightage of 20%
- Every student is expected to participate in active discussions for each experiment.
- Each experiment will be evaluated for a total of 18 Marks. 15 Marks for the written report and 3 Marks for discussions/debate sessions. There will be a total of 10 experiments as given in the list of experiments.
- There will be a Comprehensive examination to test the understanding of theoretical ideas and experimental methods. This will be for 60 Marks.

Rubrik's for evaluating Written Laboratory report (A detailed table is given below)

- Clarity and originality of the write up
- Analysis of the data including error analysis
- Neatness of the graphical representation

Detailed Evaluation Scheme for each experiment: **Total = 15 Marks for report + 3 Marks for discussion**

No.	Component	Marks
1	**Aim / Objective**	1
2	**Introduction**	1

a) b)	Physics of the phenomenon About the Instrument	
3	**Experimental method**	3
4	**Data Collection**	5
5 a) b) c)	**Analysis & Result** Curve fitting Calculation & Error estimation Plotting, labeling the axes and units	3
6	**Explanation for the agreement or disagreement of the result with theory**	2

List of Experiments

Serial No:	Experiment	Learning Outcome
1	e/m	
2	Millikan oil - drop	
3	Photoelectric effect	
4	Fabry Perot interferometer	
5	Brewster's angle measurement	Capability to design experiments that verify fundamental physics principles.
6	Setting up He-Ne laser	
7	Quincke's tube	
8	ESR/NMR	
9	Frank Hertz experiment	
10	Geiger Muller counter	

4. Summary of Course Plan and Evaluation Scheme

Components	Duration	Weightage (%)	Date and Time
Attendance, day to day performance and record	120 minutes	60 (180 Marks)	
Seminar (date and topics will be announced in the lab)	30 minutes per team	20 (60 Marks)	
Comprehensive Examination (It will be written for online classes and hybrid for offline classes)	90 minutes	20 (60 Marks)	

Rubrik's for evaluating Seminar

- Content of the power point slides: 24/60
- Clarity of the presentation: 12/60
- Ability to answer questions: 12/60
- Ability to present ideas in the given time: 12/60

5. Make-up policy: It is applicable to the following two cases and it is permissible on production of evidential documents. (i) Debilitating illness, and (ii) Out of station with prior permission from the Instructor in Charge.

6. Announcements: All announcements regarding this course will be posted in the Google Classroom Link created for this course.

7.**Academic Honesty and Integrity Policy**: Academic honesty and integrity are to be maintained by all the students throughout the semester and no type of academic dishonesty is acceptable.

Instructors
PHY F244