

Experimental Physics III

Module Code: Phys-M2021;	EtCTS of Course: 3 ;	Course Status:	Compulsory
Course Title :		Experimental Physics III	
Course Code:	Phys2023;	Credits Hours:	2
Mode of delivery:	Full Semester;	Weeks required:	16
Prerequisite(s):		Co-requisite(s):	
Academic Year:	20____/____ ;	Year/Semester:	II/ I
Students' College/Faculty:	_____;	Department:	Physics
Program:	Undergraduate	Enrollment:	_____
Instructor's Name (Coordinator) _____			
Address:	Email: _____	Block No. _____;	Rm. No. _____
Class Hours: _____			

Course Rationale

Experimental observations form the basis for new hypotheses, and also test scientific theories. It is therefore essential that all Physicists understand the experimental method and develop the ability to make reliable measurements. This course provides a broad foundation in experimental Physics.

Learning Outcomes

Upon completion of this course students should be able to:

- plan and execute experimental investigations;
- apply and describe a variety of experimental techniques;
- identify, estimate, combine and quote experimental errors;
- keep accurate and thorough records;
- discuss and analyze critically results of investigations, including the use of computers for data analysis;
- minimize experimental errors;
- demonstrate awareness of the importance of safety within the laboratory context;
- identify the hazards associated with specific experimental apparatus, and comply with the safety precautions required;
- delivery of written and oral presentations (experiment write-ups, formal report, group talk);
- work in team;
- manage time;
- use computers (for data analysis and collection), if possible;

Course Description

Selected experiments from topics of Electronics and Atomic Physics.

Recommended List of Experiments: EtCTS(4)

No	Topic	Tutor (hrs)	Lab (hrs)	Home (hrs)	T.Load (hrs)
1)	Electromagnetism	2	6	6	14
2)	Atomic Physics	3	9	8	20
3)	Optics	7	21	19	47
	Total	12	36	33	81

Method of Teaching

Laboratory classes should be conducted in groups, with background material presented in the form of hand-outs (manuals) and with necessary support from the instructor. Tutor sessions should be supplemented with (on-line) notes, error analysis and graph plotting elaborations. Private study and preparing formal experimental reports. Group work in preparing and delivering oral presentation.

Simulation experiments from the Internet can be used to supplement laboratory activities whenever possible.

Tentative Time Breakdown of Lecture Topics

Date	Topics	Pedagogical Approaches	Teachers' Tasks/Activities	Students' Tasks/Activities
Week 9	Electromagnetism • Introduction on report writing and safety precautions	Lecture	Deliver lecture	Proactive in questioning and answering
	• Determination of the speed of sound in air (Electronic Method)	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning, answering and solving problems Hands-on practical works. Data collection and report writing
Week 10	• Measurement of the equivalence between electrical energy and thermal energy.	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
	• Determination of the conversion factor between joules and calories.	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
Week 11	Atomic Physics • Determination of e/m of an electron	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
	• Diffraction of electrons	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
Week 12	• Study of Spectrum of halogen lamp	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
	Optics • Michelson Interferometer	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing

Date	Topics	Pedagogical Approaches	Teachers' Tasks/Activities	Students' Tasks/Activities
Week 13	• Determination of wavelength of Light using Newtons Rings	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
	• Jamin Interferometer	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
Week 14	• Study of Polarization of Light	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
	• Study of Optically Active Substances	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
Week 15	• Magnification with Convex Lenses and the Compound Microscope	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
	• Solar Energy (measure solar irradiance)	Lecture Learning by doing	Deliver lecture Lead supervised practical exercises	Proactive in questioning and answering Hands-on practical works Data collection and report writing
Week 16	Practical Final Exam			
	Written Final Exam			

Assessment

All laboratory works will be supervised by the instructor. Lectures will be delivered prior to practical works. Technical assistants will be available every time a lab is in progress (for arrangement of lab. equipments and lab. check off and any other help).

Students are encouraged to team up in groups and discuss among them selves in conducting experiment. Students will be given laboratory manual from the department. Students should master the entire experiment and submit individually prepared summarized report (which includes the purpose, theory, description of the apparatus and procedures used data analysis, quantitative result with uncertainties, discussion of the results and conclusion). Material and ideas drawn from the work of others must be properly cited and a list of references must be attached to the summary.

No	Type of Assessment	Weight
1	Pre-Lab Questions:	10%
2	In-Lab questions (answering questions during lab sessions and preparedness):	15%
3	Lab-Reports:	30%
4	practical	25%
6	written examination	20%
	Total	100%

It is recommended that the number of students per laboratory session to be between 25 and 30.

Recommended References

- 1.1) David C. Baird, *Experimentation: An Introduction to Measurement, Theory and Experimental Design*, Benjamin Cummings, 3rd ed., 1994.
- 2.2) Andrian C. Melisinos and Jim Napolitano, *Experiments in Modern Physics* Academic Press, 2nd ed., 2003.