

PHY 2822 Physics Laboratory II

Course Description

This lab course is designed to help students develop basic skills used in experimental physics, including data acquisition, graph plotting, data analysis, error analysis and report writing. The experiments also illustrate the principles taught in the physics courses at the 2000-level.

Course Content

	Topics	Highlights of Fundamental Concepts
1.	Lab 1: Resistivity of metal and semiconductor	Physics: conduction mechanisms in metal & semiconductor, and their temperature dependence. Technique: 4-point probe method Equipment: digital multimeters and DC power supplies.
2.	Lab 2: Resistance of tungsten filament in a lamp and black body radiation	Physics: Stefan-Boltzmann law; temperature dependence of tungsten resistivity at high temperature. Equipment: digital multimeters and DC power supplies.
3.	Lab 3: Hall effect	Physics: Hall effect. Equipment: Hall probes, Gaussmeter, electromagnet, digital multimeters and DC power supplies.
4.	Lab 4: Verification of Ampere's Law	Physics: Ampere's law & Helmholtz coils. Equipment: Helmholtz coils, Hall probe, digital multimeters and DC power supplies.
5.	Lab 5: Charge-to-mass ratio of electron	Physics: e/m of electron, Lorentz force & Helmholtz coils. Equipment: Electron beam tube, digital multimeters and DC power supplies.
6.	Lab 6: Verification of Faraday's Law	Physics: Faraday's Law Equipment: Digital oscilloscope, coils & magnet.
7.	Lab 7: half-life	Physics: radioactivity Technique: Radiation protection practice. Equipment: minigenerator, GM counter, Smart Timer.
8.	Short test on use of equipment	
9.	Lab demonstrations:	1. Magnetic levitation (4 demos) 2. Fireworks in microwave oven 3. Cruncher of soft drink can 4. Plasma ball and Tesla coil 5. GM counters for cosmic rays detection

Learning Outcomes

1.	Learn basic skills used in experimental physics.
2.	Learn basic instrumentation in physics lab.
3.	Learn how to collect, analyze, handling (plotting) data by Excel and estimate errors by Excel.
4.	Learn how to write a short report.
5.	Learn how an experiment is designed.
6.	Learn skills in problem solving, team work, computer usage, and planning in lab.
7.	Use experiments to illustrate the principles taught in the physics courses at the 2000-level.

Learning Activities

Lecture	Tutorial		Exercise Class and Assignment		Laboratory		Project / Report		Presentation		Case study		Web teaching		Other 1 (specify)		Other 2 (specify)	
	(hr / week) in class	(hr / week) out class	(hr / week) in class	(hr / week) out class	(hr / week) in class	(hr / week) out class	(hr in total) in class	(hr in total) out class	(hr in total) in class	(hr in total) out class	(hr in total) in class	(hr in total) out class	(hr / week) in class	(hr / week) out class	(hr in total) in class	(hr in total) out class	(hr in total) in class	(hr in total) out class
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M: Mandatory activity in the course O: Optional activity NA: Not applicable

	Learning Activity	Description
1.	Prelab exercises	Prelab exercises are given in lab manual. This homework will help clarify the lab content. Students are not required to hand in their homework. The solutions of Prelab exercises are available for download in the course page.

Assessment Scheme

	Component	Description	Weight
1.	Preparation	Write the first page of lab report before coming to lab	12.5%
2.	Performance	Performance in lab rated by TA	12.5%
3.	Lab report	The lab reports will be graded by the TAs and the graded reports will be returned to you. If you have enquiries concerning the grading, please feel free to contact me or the TAs.	60%
4.	Examination	One equipment test	15%

Learning Resources

	Resource	Web link or ref no. in library
1.	Lab manual	
2.	References are given for each experiment in lab manual	
3.	References for error analysis: Select one of the following books.	(all reserved at UL)
	(1) L. Kirkup, "Data Analysis with Excel"	Q180.55S7K57 2002
	(2) John R. Taylor, "An introduction to error analysis : the study of uncertainties in physical measurements"	QA275.T38 1982
	(3) L. Lyons, "A practical guide to Data analysis for physical science students"	QC33L9 1991
	(4) D.C. Baird, "Experimentation"	QC39B17 1995

Feedback for Evaluation

1.	Send email to teacher (hwong@phy.cuhk.edu.hk), give him a call (2609 6355), or come to his office; especially for issues that require immediate action;
2.	express your views in the term-end course evaluation;
3.	express your views (or ask a student representative to help you convey the messages) in the staff-student consultation meeting held every year;
4.	post a message on the forum of the course website.

Course Schedule

	Topics	Week No.	Activities / Readings / References#
1.	Lab 1: Resistivity of metal and semiconductor	6	Do Experiment 1, write report and submit report next week. Lab demo: Magnetic levitation (1).
2.	Lab 2: Resistance of tungsten filament in a lamp and black body radiation	7	Do Experiment 2, write report and submit report next week. Lab demo: Fireworks in microwave oven.
3.	Lab 3: Hall effect	8	Do Experiment 3, write report and submit report next week. Lab demo: Magnetic levitation (2)
4.	Lab 4: Verification of Ampere's Law	9	Do Experiment 4, write report and submit report next week. Lab demo: Magnetic levitation (3).
5.	Lab 5: Charge-to-mass ratio of electron	10	Do Experiment 5, write report and submit report next week.
6.	Lab 6: Verification of Faraday's Law	11	Do Experiment 6, write report and submit report next week. Lab demo: Magnetic levitation (4) & Cruncher of soft drink can
7.	Lab 7: Measurement of half-life	12	Do Experiment 7, write report and submit report next week. Lab demo: 1. GM counters for cosmic rays detection. 2. Plasma ball and Tesla coil
8.	Short test on use of equipment	13	Test

Readings/references are given for each experiment in lab manual.

Teachers' or TAs' Contact Details

Teacher's Name	Contact	Additional Information
WONG Hong Kuen	Office : SC 208 Tel. no. : 2609 6355 Email : hwong@phy.cuhk.edu.hk Office hr: half an hour before lab session.	
Lab Manager's Name	Contact	Additional Information
LEE Chung Kay	Office : SC 214 Tel. no. : 2609 6356 Email : ckleee@phy.cuhk.edu.hk Office hr: half an hour before lab session.	
Technician's Name	Contact	Additional Information
WU Chin Nam Lab Technician	Office : SC 214 Tel. no. : 2609 6356 Email : cnwu	
TA's Name	Contact	Additional Information
<ul style="list-style-type: none"> • See Course Page 		

Academic Honesty and Plagiarism

Attention is drawn to University policy and regulations on honesty in academic work, and to the disciplinary guidelines and procedures applicable to breaches of such policy and regulations. Details can be found at <http://www.cuhk.edu.hk/policy/academichonesty/>.

1.	After the course registration, you are required to submit "Declaration of Honesty in Academic Work" declaring that you are aware of these policies, regulations and procedures. The form can be found at http://www.phy.cuhk.edu.hk/ .
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Facilities for Posting Announcements and Materials

1.	The course website (http://www.phy.cuhk.edu.hk/hkwong/phy2822/) contains the following useful information and resources: (a) The lab schedule, staff contact information, list of reference books, solutions of prelab exercises. (b) A notice board for announcements of important events (e.g. first meeting day, change of lab schedule). (c) A web forum for you to ask questions, discuss problems with teachers and classmates. You are also welcome to express your comments on the course in the forum. The password for this forum will be given to you in the first lecture.
2.	An additional webpage is used to explain the principle and procedures of each experiment.