

# General Physics Laboratory – Electromagnetism and Optics

Fall 2014

August 18<sup>th</sup> – December 8<sup>th</sup>

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**Course:** PHYS 1040L, Section 000 (CRN# 40776)**Title:** General Physics Laboratory – Electromagnetism and Optics**Class Schedule:** GROTE HALL 217; Thursdays 12:10-2:00 P.M.**Course:** PHYS 1040L, Section 001 (CRN# 45234)**Title:** General Physics Laboratory – Electromagnetism and Optics**Class Schedule:** GROE HALL 217; Thursdays 3:05-4:55 P.M**Credit:** 1 hour**FACULTY:** Mr. Harold A. Climer. Office: Grote 223, tel. 425-4523, **Office Hours: Tuesday 8:30 to 9:30 A.M. W 8:30 to 9:30 A.M., Thursday 8:30- 9:30 A.M.****E-mail: Harold-Climer@utc.edu.** *Email is the best way to contact me. Inquiries will be replied to as soon as possible, usually within 24 hours (M-F).*

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**ADA Statement and Other Help:** If you are a student with a disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) and think that you might need special assistance or a special accommodation in this class or any other class, call the Disability Resource Center (DRC) at 425-4006 or come by the office, 102 Frist Hall.If you find that personal problems, career indecision, study and time management difficulties, etc. are adversely affecting your successful progress at UTC, please contact the Counseling and Career Planning Center at 425-4438 or <http://www.utc.edu/Administration/CounselingAndCareerPlanning/>.

If you need a tutor, please call the Advisement and Student Success Center at (423) 425-4573, or visit the office in the University Center, Room 108.

To enhance student services, the University will use your UTC email address (firstname-lastname@mocs.utc.edu) for all communications. (See <http://www.utc.edu> to log in.) Please check your UTC email on a regular basis. If you have problems with accessing your email account or UTC Online, contact the Help Desk at 423-425-4000.

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**Prerequisites and Co-requisites:** *Co-requisite:* Physics 1040 or permission of the head of the department.**Catalog Description:** Laboratory to accompany Physics 1040. Experiments investigate various aspects of electromagnetism, electrical currents, instrumentation, optics, and radioactivity.**General Education Statement:** This course fulfills a general education requirement of the university in the Natural Science Laboratory (SL) category *only* when taken in combination with Physics 1040.**Course Objectives:** This laboratory is aimed to enhance the understanding and demonstration of scientific principles covered in the co-requisite lecture course. We will study the laws and methods of analysis that physicists have used in order to understand the world around us. In effecting this goal, students will integrate conceptual ideas into practical quantitative activities in lab, gaining hands-on experience and practicing detailed observation and recording of data. Many of the lab exercises are computer-assisted, meaning that current-day methods and technology will be employed to take and

analyze experimental data. The advantages and limitations of specific approaches will be addressed in analysis and discussion of the result uncertainties in experiments. Logical analysis of data in problem-solving and presentation of data by graphs are addressed. Finally, students will enhance their skills in effective communication of scientific results and practice the scientific method through writing lab reports.

### Required Materials:

**A. Laboratory Manual:** A description of all experiments as well as the report cover and data pages are available for printing from the class website from the URL links.

<http://www.utc.edu/Faculty/Harold-Climer/> or <http://web2.utc.edu/~pbs273/>

. You must print the manual for each experiment and bring it to class with you. Please make sure that you print the cover pages and data pages one-sided, one page per sheet of paper. **Please look at the schedule to determine which experiment you will need for any given week.**

**B. Scientific Calculator:** STAND ALONE ONLY CALCULATORS.

You will be allowed to use one, so own one and bring it to class with you. **(WE WILL NOT LEND YOU CALCULATORS)**. It need not be a graphing calculator, but should be able to perform calculations like the logarithm of a number, natural exponents, trigonometric functions, and work in scientific notation. You should familiarize yourself with how to use scientific notation and trigonometric functions on it. **Your instructor will not teach you how to use it.**

**Calculators on cell phones, laptops, tablets and other personal electronic devices are not permitted. Use of these prohibited devices will result in a zero for that day's lab or on the Final Exam**

**Participation and Attendance Policy:** **Attendance at all laboratory sessions is required.** If you miss a session, you will get a zero for this lab. Your instructor may make exceptions and give you a makeup session if he/she is convinced that you were ill, had a death in the family, or were involved in a similar emergency. Verification documents must be provided. The instructor's signature is required to get a make-up session with Mr. Pitkin. **If you are late to a lab session** for more than 5 minutes, **you are not allowed to perform the experiment** and you will get zero for this lab, unless other arrangements have been made.

**Composition of your Final Grade\*:** The purposes of the final grade are (1) to define and communicate the student's level of educational achievement and (2) to motivate students to greater effort.

The tentative grading scale is as following:

	Percentage
Lab Reports/Assignments (drop 1)	75%
Final Exam	25%
Total	100%

The components needed for individual lab reports will be listed at the end of the description for that lab. In general, the points will be divided as follows:

Pre-lab (goals, background, methods)	20%
Experimental data	25%
Calculations/Graphs	30%
Results	10%
Conclusions/Discussion	10%
Style	5%

The first lab missed will count as the dropped grade. If all assignments are completed, the lowest grade will be dropped. The **final exam** will be a written exam that is comprehensive of all labs performed in the course.

In accord with the University's general education guidelines, >20% of the course grade is derived from written expression (using English sentences or symbolic language).

**Grading Scale\*:** A $\geq$ 90.0%; B=80.0-89.9%; C=70.0-79.9%; D=60.0-69.9%; F<60.0%

*From UTC's Handbook:* "A" represents superior performance in the course. "B" represents commendable performance in the essentials of the course. "C" represents acceptable performance in the essentials of the course. "D" represents marginal performance below the acceptable standards of university work. "F" indicates unqualified failure and the necessity for repeating the course to obtain credit.

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## LAB REPORT FORMAT

Your lab report is the original documented record of all the work you have performed regarding each lab experiment. YOUR LAB REPORT SHOULD CONTAIN:

1. Title of experiment
2. Date performed
3. Your name, Partner(s) (if any).
4. The goals of the experiment
5. Theoretical background.
6. Sketch of the experimental set-up.
7. Experimental procedure.
8. Experimental data.
9. Sample Calculations and/or graphs.
10. Results
11. Conclusions: Comparison of obtained results with known parameters, and discussion of types of errors and sources of errors specific for the particular experiment. As well as any discussion questions from your instructor.

**FOR MORE DETAILED INFORMATION, SEE LABORATORY REQUIREMENTS**

## LABORATORY REQUIREMENTS

### HOW TO PREPARE FOR THE LABORATORY SESSION

You should study the description of the experiment and start to write your lab report **BEFORE** the lab session. The experiments are listed on my web page. **Please consult the schedule for your section and choose the appropriate experiment to prepare.**

Download and print the report cover page and fill it out in long hand. Read the manual and write down the goals of the experiment, sketch of the experimental set-up, and the experimental procedure.

**Parts 1 through 7 of your lab report (see above) should be hand-written before the lab session and turned in before the lab session begins. Any pre lab turned in after the lab session begins will be considered as late.** It will be graded together with the rest of your lab report. It is worth 20% of your grade for each experiment. Please make a copy for yourself; you will need it during your lab session.

### LABORATORY SESSION

**Please, respect the LAB RULES (posted in the lab). No food or drinks are allowed in lab.**

During the laboratory session in class you should record all work you have performed on the data page, which is a part of your experimental manual. All activities, experimental data, results, etc., should be recorded as they occur, **in ink**. No erasures should be made. A single line through the "wrong material" is sufficient, with any corrections or change noted above or beside it. This will allow for the recovery of information which, later, may be proving to be valuable. Attach the handwritten data page to your lab report.

### HOW TO FINISH YOUR LAB REPORT

After the experiment you need to perform the analysis of your experimental data. **This part of your lab report must be typed. Sections 8, 9, 10, and 11 of the report must be stapled together in the correct order according to "Lab report format". Presentation is important to receive full credit.** Make necessary calculations. **Write down an example of each of your calculations.** Draw graphs, obtain results, round them properly, and estimate experimental errors. The most important part of your lab report is the **CONCLUSIONS SECTION** where you need to evaluate the obtained results, compare them with known parameters, discuss the errors and sources of errors. **The conclusion does not have to be long, but it should make physical sense. Do not repeat the procedure (or steps of the experiment) in the results or conclusion.**

**Make sure that you understand the difference between experimental errors and mistakes.** The experimental errors are unavoidable and can be estimated from the measurement uncertainties. Mistakes should be avoided; they will reduce the amount of credit given for the lab.

Each **GRAPH**, attached to appropriate place in your report must have the following: Title; stating which variables are being plotted along with their units; properly labeled coordinate axes **WITH UNITS**; Clearly marked data points with error bars; Analysis/equation that best fits your data.

**Honor Code:** The University's honor code, as outlined in the Student Handbook, shall be followed strictly in all classes. A violation of the honor code could result in appearing in honor court and receiving a course grade of F.

**Cheating and Plagiarism policy:** Although you may work with a lab partner during the experiment, lab reports should be written individually as it is important your assignment be completed with your thoughts alone. It is important that if you need help or assistance, you seek it out from fellow students or the instructor in order to get the most understanding of the concept or assignment. However, if you receive help from anyone else, you must acknowledge their help by placing their name under yours on the front page of the report. **If we find that two students copied their lab reports from each other, the lab reports will be returned ungraded and neither student will receive credit for the lab report.** Do not directly “copy and paste” discussions or figures from the laboratory manual – the report should be in your own words and with your own interpretation.

Please read and heed the following information regarding academic dishonesty in cheating and plagiarism. The instructor cannot and will not tolerate academic dishonesty. Cheating includes, but is not limited to: 1. supplying or using work or answers that are not your own; 2. providing or accepting assistance with completing examinations, or 3. faking data or results. Plagiarism can be defined as, but is not limited to: 1. copying a paper from a source text without proper acknowledgment, 2. buying a paper from a research service or term paper mill, 3. turning in another student’s work (past or present) with or without that student’s knowledge, or 4. Paraphrasing materials from a source text without appropriate documentation. For more information, refer to the UTC Student Handbook.

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**Lab Report Due Dates\*:** The hand-written pre-lab portion of each lab report (including objective, relevant background, and methods) is due before the beginning of the session in which the experiment will be performed. **WHEN YOU FIRST COME INTO CLASS.**

Printed copies of the last parts of all reports are due on the Tuesday following the laboratory session, by 8:00 AM, in the black basket on the outside of my office door. This includes your data, calculations/graphs, results, conclusions, and any additional questions; do not write the pre-lab again.

**Electronic (emailed) lab reports are not accepted. Late pre-labs are not accepted. Late lab reports are not accepted** unless other arrangements have been made with your instructor. No lab reports will be accepted after the due date of the last lab report. The two parts of your report (pre-lab and lab report) will be put together by your instructor and will be returned after grading. Keep up with these to study for your final exam.

### **LATE MEANS:**

- 1. Pre-LABS TURNED IN AFTER I HAVE BEGUN THE DISCUSSION FOR THAT DAYS LAB.**
- 2. LAB REPORTS TURNED IN AFTER THE TIME FOR REPORTS TO BE TURNED IN. 8:00 AM TUESDAY.**

## TENTATIVE LAB SCHEDULE\* – Fall 2014

Week	Date	Experiment
1	21 Aug 2014	Introduction to Lab. No lab report for this week
2	28-Aug 2014	Inverse Square Law
3	4-Sept 2014	Ohm's Law
4	11-Sept 2014	Wheatstone Bridge
5	18-Sept 2014	RC Time Constant
6	25-Sept2014	Magnetic field in a Slinky
7	2-Oct 2014	Oscilloscope
8	9-Oct 2014	Diode Power Supply
9	16-Oct 2014	Lenses / Images
10	23-Oct 2014	Fall break
11	30-Oct 2014	Interference and Diffraction
12	6-Nov 2014	Spectroscopy
12	13-Nov 2014	Half-life time
13	20-Nov 2014	Final Exam

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\* This schedule, the grading scale, class policies, and everything on this syllabus, are subject to changes at the discretion of the instructor. It is the responsibility of the student to keep up with changes announced in class or on my web page.