



Winter 2014

Physics &223A – Engineering Physics with Lab III

Credits: 5

Item Number: 7615

M, T, Th, F: 7:30am - 8:50am in SC 120

Instructor: Chitra Solomonson

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Office Hours: 1:30pm to 2:30pm on Monday and Friday

7:30am to 9am on Wednesday

9am to 10am on Thursday or by appointment.

- **Required Textbook: SmartPhysics:** - "Classical Mechanics" and "Electricity and Magnetism" by Tim Stelzer, Gary Gladding and Mats Selen.
 - **Optional Textbook:** If you need a detailed hardback book with problems, you can purchase a used copy of a standard textbook (ask the instructor for some recommendations). There are also textbooks that have been placed on “reserve” at the library.
- **Online access to SmartPhysics:** The publisher of the SmartPhysics book will also be providing you with access to pre-lectures, Checkpoint Questions and Homework. These will form an integral part of your grade. All of you should have a valid access code to access Smart Physics online. If you encounter problems with access, please contact the technical help using information provided on the Smart Physics website: <https://www.smartphysics.com/Account/LogOn?ReturnUrl=%2f>. **Please see the SmartPhysics handout for additional information.**

A Three Ring Binder: This is absolutely essential to organize your materials for this course. You will be completing many weekly homework, quizzes and class worksheets for this course. Make sure all worksheets are filed away in your binder. This valuable resource will help you to consolidate all your study material for the final exam. You need not bring the binder to class everyday. However, I may ask to see the binder at the end of the quarter.

- **A Scientific Calculator:** A TI-83 or equivalent should be more than sufficient for this course and should be part of your ‘classroom kit’.
- **Miscellaneous:** A ruler, a sharp pencil, graph paper and other small items may be specified as the need arises in the course.
- **Student email account:** Each of you has a Green River email account. This is a complimentary service provided by the Associate Students of Green River Community

College (ASGRCC). Please use the link below to set up an email account for yourself if you do not have one. I will be posting course announcements on the website. However, if I need to contact you by email, I will be using this account. You can also get these messages forwarded to another personal email account.

<http://www.greenriver.edu/studentemail/>

Description

Phys &223 is the third of a three course sequence of Physics courses for students in the science and engineering track. We will continue our study of electricity followed by magnetism and electromagnetism. This will be followed by a study of oscillations and the general properties of all waves. We will study different kinds of waves: sound waves and electromagnetic waves. In Smart Physics, this will correspond to units 8, 11 through 17, parts of units 22 and 23 in the Electricity and Magnetism book and units 21 through 24 in the Classical Mechanics book.

In addition, you will be working on a project on optimizing the performance of organic solar cells. This project has been made possible by a grant from the National Science Foundation to promote research-like labs for students at Green River. The project will be form an integral part of the course. It will allow you to apply concepts from Physics, Chemistry, Materials Science and Engineering to a system in the cutting edge field of organic photovoltaics.

Physics is an experimental science. Laboratory is an integral part of the course but some topics will lend themselves better to experiments more so than others. Typically, we will do labs to understand concepts before solving problems.

Finally, this course satisfies the **math/science** or **lab science requirement** for AA and AS degrees.

Prerequisites: Grades of 2.0 or higher in Phys &222 and MATH &152 and at least concurrent enrollment in Math &153.

Instructional Method

Physics is a contact sport – you learn by doing it. In that spirit, this course is intended to be an extremely hands-on and minds-on course. **The instructor will be merely a facilitator of the learning process. You, as the student, are on centerstage.** It is your responsibility to participate fully in the laboratory activities and problem-solving sessions. The more you jump in to participate by asking questions, performing the lab activities and analyzing what you observe, the better your learning experience will be.

Course Content Learning Outcomes

At the end of the course, you are expected to develop quantitative and qualitative understanding of the applications of Newtonian Physics to energy, momentum, oscillations and waves as well as the study of electromagnetic theory. You should be able to

- provide detailed and accurate descriptions of Newtonian physical systems,
- solve multi-step problems in physical analysis,
- identify pertinent elements of physical systems and problems,

- design meaningful experiments and clearly report their conclusions,
- interpret scientific data including the results of experiments designed by others,
- apply the tools of calculus to the solution of complex problems,
- use electronic and numerical instruments as tools for investigation and analysis.

Course Objectives

At a higher level, the course seeks to promote the following skills that are elements of any successful career and lifestyle:

Critical Thinking: This is usually described as the process of critically examining the merits of an intellectual endeavor such as a definition, an essay, a poem or a scientific work and arriving at a judgment regarding the merits of that endeavor. It also means using this mode of thought to arrive at a conclusion, or to create new knowledge that will stand up to critical assessment, including experiments, by others. We will adopt some norms that people commonly accept while involved in critical reasoning. A good critical thinker exhibits the following characteristics:

- He/She recognizes and uses essential components of effective reasoning to evaluate information and to improve the quality of his/her own thinking.
- He/She provides reasons for the conclusions they reach and assess the relevance and adequacy of those reasons. He/She demonstrates active listening and close reading skills.
- He/She connects past learning with current topics.

You will use one or all of these qualities in almost every activity: specifically in quizzes, exams, laboratory sessions and classwork.

Quantitative and Symbolic Reasoning: This is the ability to understand and manipulate abstract mathematical representations. This includes the following specific skills:

- Value quantitative reasoning,
- Become confident in your ability to reason quantitatively,
- Use quantitative reasoning to solve problems, and
- Use quantitative reasoning to communicate.

This course will help you reach the above goals using general problem solving strategies to understand everyday phenomena.

A person with good quantitative and symbolic reasoning skills exhibits the following characteristics:

- He/She demonstrates the ability to acquire appropriate and accurate data, to analyze and summarize this data.
- He/She demonstrates effective case study analysis.
- He/She demonstrates meaningful participation in lecture, discussion, and seminars.

Quantitative reasoning is a campus-wide learning outcome. You will develop this skill throughout the quarter as you work through numerical and conceptual problems in this course.

Assessment

The above learning outcomes will be assessed in the following ways:

- **Weekly Homework:** The homework consists of three parts - Prelectures, Checkpoints and homework problems. As the name suggests, prelectures are online powerpoint presentations that you view *before* you come to class. After viewing the prelectures, you will answer the checkpoint questions. Don't worry if you cannot understand everything that is talked about in the pre-lecture and the checkpoints! The idea behind completing this before you come to class is to help you to start thinking about these ideas. In this spirit, you will be given full credit for the pre-lectures and the checkpoints if you complete it before the due date. We will review the main points of the unit and the checkpoints in class after which you will do the homework on that unit. Pre-lectures, checkpoints will normally be due on Sunday and Wednesday. Homework will normally be due on Tuesday and Thursday. Sometimes more than one Smart Physics homework may be due on the same day just to give you some extra time to work on it or to bring your questions to class. However, please do not wait until the last minute to start your homework. Once again, Smart Physics homework will be graded based on completeness. You will receive immediate feedback as you do the Smart Physics homework problems so by the time you finish it, you will understand the concepts involved in solving the problems. In addition, the instructor may assign additional problems every week. Solutions to these problems will be posted online.
You are strongly encouraged to work as a group on your homework!

The SmartPhysics book is meant to be used as a reference book - refer to it when you do not understand something in the pre-lecture or you missed something in class and forgot to ask the instructor about it.

- **Weekly Quizzes:** There will be a quiz every Friday. The quiz will be based on the homework done that week. The lowest quiz will be dropped. There will be no make-up for quizzes.
- **Midterm Exam:** The midterm will be held towards the middle of the quarter – 5th or 6th week and will be announced at least a week in advance. The midterm exam is mandatory and will constitute 10% of your grade. If you need to make up a midterm exam because of a medical reason, you need to furnish a letter from your doctor.
- **Project:** The solar cell project consists of three parts – the proposal, the experiment and data analysis, the report and presentation. At the beginning of the third week, each team of three students will be presenting a proposal briefly describing their project. Each team will take turns optimizing solar cells for maximum efficiency. Teams will have roughly two classes to test devices.

You will be taking a content pre-test (on the first day) and a pre-course survey (on the second day) to establish a baseline at the start of your project. At the end of the course, you will be taking a content post-test and two post-course surveys. These will be scheduled in the testing center during the first and the last weeks of the quarter.

Solar Cells encompass concepts from different fields – we will be focusing on one aspect of the performance of solar cells. In order to provide a framework for understanding the workings of a solar cell, we will be studying different topics. This study will take the form of online videos, readings and checkpoints to check your understanding. These will also contribute to your homework grade. But more significantly, understanding these concepts is vital to understanding how solar cells work. The better your understanding of the background material, the better your ability to describe it both in the report and the presentation. Participating in this research-like experience will prepare you better for your upper level undergraduate work at a four year school. It may even be possible to continue your work at a research lab at the University of Washington or any other school of your choice.

- **Laboratory work:** In addition to the project, you will be doing several mini-labs. This is an integral part of the course and is blended with the daily classes. Physics is an experimental science and you will learn to design and set up your experiments, record your observations, analyze your data and draw conclusions from it. You are encouraged to work in a group of not more than three students during the laboratory. Laboratory work may be done on any day – there is no specific laboratory session. Instructions for the lab will be given at the beginning of class along with a lab worksheet. You need not turn in the lab sheet unless I have specifically asked you to do so. The lab grade is based on participation in the lab, lab discussions and performance in a lab quiz. *Attendance is critical since it will not be possible to make up missed experiments due to the pace of the course.*
- **Worksheets:** A lot of key ideas in Physics can be understood only through building mental models and solving problems involving simple physical systems. Throughout the quarter, you may be working on worksheets either in class or as part of your homework. Points for worksheets will be added to laboratory points if done in class or to the homework points if they are part of homework.
- **Final Exam:** Last but not the least, comes the **cumulative** final exam. This is an opportunity for you to bring together all the skills and knowledge that you have acquired in the course. It is a critical component of your grade. **For this class the final exam will be held on Wednesday, March 19 from 8am to 10am. If you are an international student and need to plan your trip back home, please schedule your flight after your final exam. You will not be allowed to take the exam early because of your flight.**

Grades

Your grades will be calculated as follows:

Homework	10% (lowest homework will be dropped)
Quizzes	20% (lowest quiz will be dropped)
Midterm	20%
Project	20%
Lab	10%
Final Exam	20%

You are encouraged to keep track of your grade during the course by performing the following calculation:

- Add your homework points and convert to a percentage (HW)
- Add your Quiz points and convert to a percentage (Q)
- Add your Midterm points and convert to a percentage (M)
- Add your laboratory and classwork points and convert to a percentage (L)

Then your percentage for the course at any point in the course is
 $(HW \times 0.1 + Q \times 0.2 + M \times 0.2 + P \times 0.2 + L \times 0.1) \times 1.25$

Remember, your percentage for the course as calculated above could **decrease** as the course progresses since there will be more variables in place (more homework, quizzes, midterm and final). So keep the pressure up on yourself

% Score	Decimal Score
86 - 95	3.1 - 4.0
76 - 85	2.1 - 3.0
66 - 75	1.1 - 2.0
56 - 65	0.1 - 1.0

Keep in mind, some aspects of grading are subjective, so the final grade you get in the course may not exactly match what you have calculated above. The instructor reserves the right to assign the final grade based on student performance in written assessments and participation in the class.

A score below 65% will automatically receive a 0.0.

A grade of ‘I’ will only be given in emergency situations and only if at least 75% of the work is completed satisfactorily. Note that a grade of ‘I’ cannot be given simply to save a grade point average! There must be a **reason** for requesting an incomplete grade.

A grade of ‘P’ or ‘NC’ can only be given if requested in writing at the registrar’s office before the deadline printed in the quarterly schedule. Students should know that completion of a course with a grade of ‘P’ is usually not considered completion of a prerequisite for another class.

Students are NOT obligated to tell their instructors when a course is being taken for a P or NC grade!

You can obtain your final grade for the course via touchtone or by using the web. Instructions can be found in the Schedule of Classes.

Course Policies

Attendance and Participation: Although there are no points explicitly allocated for attendance, class work will be assigned points. This may include class worksheets and/or laboratory work. Please make attending every class a top priority. If you do miss a class due to unavoidable circumstances, please contact me as soon as possible and ensure that you come up to speed with the missed material. **This is an intense, fast-paced course and it is very difficult to make up lost ground later in the course. Also as mentioned earlier, missing class or coming late to class will impact your participation grade.**

Reading Assignments: You will be assigned online pre-lectures through the SmartPhysics website. It is your responsibility to read before you come to class. This will help you formulate questions to ask in class. Since this is a hands-on, minds-on course, lecturing will be kept to a minimum in this course. Class time will be utilized for discussions in which **students are expected to be active participants**. We will address topics you might have had difficulty in understanding in the course of your reading, explore everyday applications of the concepts you learned, solve problems etc. The format of this course forces you to assume responsibility for your own learning and your final grade and knowledge will depend directly on your degree of participation.

No Disruptive Behavior: In accordance with GRCC policy, students who disrupt the academic atmosphere of the class will be asked to leave and will be referred to an academic dean for further action. Disruptions of academic atmosphere include

- Any behavior that interferes with the ability of faculty or other students to perform the work necessary for this class.
- Comments, discussions, or actions of a racist, sexist, or otherwise degrading nature will absolutely not be tolerated.
- No Food or Drinks in the Classroom: Please refrain from bringing food and drinks in the classroom. A few small spills can lead to a very messy classroom/laboratory.
- No cellphones: Please put your cellphone in 'silent' mode while in the classroom as ringing cellphones can be extremely distracting to your classmates.

Cheating: Students who are caught cheating will similarly be referred to an academic dean for further discipline. **The results of this discipline can range from failing the assignment in question to failure of the class and probation or expulsion from GRCC.**

Please keep in mind that you are in college to learn, and if you are cheating you are ultimately only cheating yourself out of learning and skills that you would otherwise take from this class. You don't need to cheat to pass the class. Don't do it.

You are encouraged to work in groups on all assignments. However, every piece of work that is submitted for grading must be individual work. For example, if you are asked to solve a problem for homework, you may discuss the strategies to solve the problem with your friends but you must present the solution with all its steps in your own handwriting. Sources must be acknowledged if you use material that is not your own. Failure to adhere to this standard may result in a lower or failing grade for an individual test, paper, or for the entire course.

Special Needs: Any student who needs special accommodations because of a disability, needs emergency medical information kept on hand, or requires any other special accommodations to be shared with me in the event of a building evacuation, please contact me at (253) 833-9111 extension 4868. If you need an alternative medium for communicating, or are particularly dependent on any one specific medium, please let me know before class so that appropriate accommodations can be made.

If you believe you qualify for course adaptations or special accommodations under the Americans with Disabilities Act (ADA), it is your responsibility to contact the Disabled Students Services Coordinator in the LSC and provide the appropriate documentation. If you have already documented a disability or other condition, which would qualify you for special accommodations, or if you have emergency medical information or special needs I should know

about, please notify me during the first week of class. You can reach me by phone at 833-9111, extension 4868. Or, you can schedule an office appointment to meet me in the SMT Building, office number 338 during my posted office hours or at another mutually determined time. If this location is not convenient for you, we will schedule an alternative place for the meeting. If you use an alternative medium for communicating, let me know well in advance of the meeting (at least one week) so that appropriate accommodations can be arranged.

Syllabus Quiz

Phys &223A

Self Assessment Sheet

Due Friday, January 10, 2013

Name_____

Points: 10

- 1) What Physics have you had before coming to this class? What topics do you remember studying in that class?

- 2) What Math course are you currently enrolled in? Please give the name of the course and the number.

- 3) What are two things the instructor can do to help you learn the material?

- 4) What are two things that you can do to help you learn the material?

- 5) Is it possible for you to see Chitra during her office hours? If not, when can you see Chitra?

- 6) What is the late policy on homework?

- 7) What is the policy for missed quizzes and midterm?

- 8) What is your major? Why did you choose this major?

- 9) When do you plan to transfer? To which school?

Acknowledgement of the Syllabus

I have received, read and clarified my questions regarding the syllabus for Phys &223A (Spring 2013). I understand that it is possible that some changes may be made to the syllabus and the course plan at the instructor's discretion to suit the pace of the course. I give permission to the instructor, Chitra Solomonson, to post grades online using the 4 digit Unique Identifier in Smart Physics. Write this number below:

Unique Identifier for Smart Physics

Student's Signature

Student's Name