

Instructor: Daniel Robb
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Class Mtgs: MWF 12:00-1:00 (TREN 272)
Office Hrs: MWF 9-11, Th 9-11
Phone: 375-5250

Course Description:

This is a capstone course that captures the essence of what a Physics major is expected to know. The following is taken from the Roanoke College mission statement for students majoring in physics:

“Students majoring in physics are provided with a curriculum that emphasizes a balance of breadth and depth of knowledge of the field. Physics students learn to address real-world problems through a curriculum that provides a balance between sound theoretical frameworks and practical expertise. Graduates are well prepared for traditional and non-traditional career paths and are capable of contributing broadly to the global scientific community.”

Textbooks:

- *Physics for Scientists and Engineers (with Modern Physics)*, by Serway and Jewett, 8th or 9th edition
[for an equivalent intro textbook including modern physics]

Purpose of the Course:

The purpose of the course is to review and synthesize your knowledge of introductory physics, to work on a meaningful demonstration project, and to become acquainted with the physics research literature.

Specific Goals of the Course:

- 1) To be conversant with the fundamental law of physics and to be able to apply them to solve problems.
- 2) To be able to design and demonstrate understanding of the laws of physics through experimentation.
- 3) To learn to read and discuss selected articles from the physics research literature.

Feedback and Evaluation:

I will assign numerical grades to all your work. I *may* curve your final grades (upward), but otherwise you can expect to receive an “A” for 90-100, a “B” for 80-89, etc. I will assign +/- to your final grades by examining the distribution of grades. These are the categories and percentages that will be used:

<u>Review Material (group):</u>	20%
<u>Oral Exam (individual):</u>	10 %
<u>Demo project (group):</u>	20 %
<u>MCSP reflections/Resume (ind.):</u>	10 %
<u>Article presentation (group):</u>	20 %
<u>Article discussions (individual):</u>	5 %
<u>Final Paper (individual):</u>	15 %

Review Material will consist of groups presenting (teaching) the introductory topic for the day to the rest of the seminar class. You will be divided into groups of 3-4 students. You must all participate in explaining the material to the class, and engaging the class in some relevant activity (problem-solving, question and answer, discussion, etc.). Note you do not have to cover every last subtopic of the day’s material in the textbook, but you should cover the main ideas well.

The Oral Exam will consist of a 30-45 minute individual session with several of the physics professors in which we ask you to solve and explore several introductory problems on the board.

Demo project After changing groups, you will conceive of and build a piece of demonstration equipment to illustrate a physics concept. You’ll first turn in a proposal for approval by me, then work together to bring the piece of equipment to fruition, then demonstrate it to the rest of the class by the end of the semester.

MCSP Reflections/Resume The MCSP department offers a series of discussions that appeal to a broad range of interests related to math, computer science and physics. Members of this class are invited to be involved with all of these meetings; however participation in **at least two** of these sessions is mandatory. Within **one week** of attending a colloquium you must submit (via a link on Inquire) a two-page double-spaced paper reflecting on the discussion. This should not simply be a regurgitation of the content, but rather a personal contemplation of the experience. You will also be expected to create a draft of your resume as part of our discussion of career options for physics majors.

Article presentation After changing groups a second time, you will choose a recent research article from a group of articles I will supply to you. You will work as best you can to understand the article, and then lead a discussion of the article with the rest of the class.

Article discussion You are expected to participate actively in the discussion of the articles led by other groups. In order to participate, **you are responsible for reading the articles being presented by other groups before their presentation.**

Final paper: For your final paper, you will write a report in which you explain and explore one of the four articles presented by a different group in the class. The final paper should be 4-5 pages in length, double-spaced, and should attempt to connect the physics in the article with the introductory physics we have reviewed this semester to the greatest extent possible.

Attendance Policy:

Attendance is very important. You must notify me in advance if you must miss class for a valid reason (an excused absence). Any student who misses a total of five classes unexcused will be dropped from the course with a grade of DF. A warning email (cc'd to your advisor and the registrar) will be sent after the fourth unexcused absence occurs. Note that if a student shows up for class 10 minutes late, walks out in the middle of class, or is caught napping/texting/checking emails/browsing the Internet during class, that student will be given an unexcused absence for the class.

Expected Hours of Work

As a one credit course, this course expects you to spend at least 12 hours per week inside and outside of class.

Policy on Late Work:

I will grade an assignment with a 10% lateness deduction if turned in by 5:00PM on the due date. Following that, assignments will receive a further 10% lateness deduction for each successive school day late (with days considered to end at 5:00 PM). Assignments more than two weeks late will receive no credit.

Academic Integrity:

The College academic integrity policies are vigorously enforced. You should work solely within your group (and possibly with me) on group projects, and on your own for the final paper.

Disability Support Services:

If you are on record with the College's Office of Disability Support Services as having academic or physical needs requiring accommodations, please meet with me during my regular office hours or schedule an appointment as soon as possible. We need to discuss your accommodations before they can be implemented. If you believe you are eligible for accommodations but have not yet formally contacted Disability Support Services, please contact the Coordinator for Disability Support Services at 375-2247 or drop by the Center for Learning & Teaching in Fintel Library.

Course Schedule:

Week	Date	Topic	Deadlines
1	18-Jan 20-Jan 22-Jan	Introduction and overview Review PSE Ch 1-3 (1-d motion, vectors) Review PSE 4-6 (2-d motion, Newton's Laws)	
2	25-Jan 27-Jan 29-Jan	Review PSE 7-9 (conserv. energy, linear momentum) Review PSE 10-12 (rotation, ang. momentum, statics) Review PSE 13-15 (gravity, fluids, oscillations)	
3	1-Feb 3-Feb 5-Feb	Review PSE 16-18 (sound waves, standing waves) Review PSE 19-22 (1 st law, gases, engines/entropy) Review PSE 23-25 (electric fields and potential)	List of demo project ideas
4	8-Feb 10-Feb 12-Feb	Review PSE 26-28 (capacitance, resistance, DC circuits) Review PSE 29-31 (magnetic fields, Faraday's Law) Review PSE 32-34 (inductance, AC circuits)	List of careers for physics majors
5	15-Feb 17-Feb 19-Feb	Review PSE 39 (relativity) Review PSE 40 (intro quantum physics) Review PSE 41 (quantum mechanics)	Resume/CV draft
6	22-Feb 24-Feb 26-Feb	Review PSE 42 (atomic physics) Resume building + Career discussion Demo project draft presentation	Demo project abstract
7	29-Feb 2-Mar 4-Mar	Oral Exams / Demo Project Work Oral Exams / Demo Project Work Oral Exams / Demo Project Work	
8	7-Mar 9-Mar 11-Mar	Spring Break NO classes	
9	14-Mar 16-Mar 18-Mar	Oral Exams / Demo Project Work Oral Exams / Demo Project Work Oral Exams / Demo Project Work	
10	21-Mar 23-Mar 25-Mar	Overview of physics research literature Selection of research articles by groups Good Friday NO Class	
11	28-Mar 30-Mar 1-Apr	Article 1 presentation/discussion Article 2 presentation/discussion Article 3 presentation/discussion	
12	4-Apr 6-Apr 8-Apr	Article 4 presentation/discussion Article 5 presentation/discussion Demo Project Work	
13	11-Apr 13-Apr 15-Apr	Demo Project Work Final paper work Final paper work	Final paper topic
14	18-Apr 20-Apr 22-Apr	Final paper work Demo Project Presentations Demo Project Presentations	Preliminary draft of final paper Demo project documentation
15	25-Apr	Receive commented drafts	
16	29-Apr	Final Paper Due	

Note: Chapters indicated as PSE are from Physics for Scientists and Engineers, Serway/Jewett, 8th or 9th Ed.