

Physics 399: Senior Seminar in Physics

Gustavus Adolphus College
Fall 2007

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Course Philosophy

This course was created by the department in 1991 in response to requests from students for assistance in preparing for the GRE subject test in physics. This course has taken the form of topical review problem sessions, with two practice exams and some suggestions for improving one's test-taking strategies. Not everyone who takes this course will take the GRE subject test, this semester or ever. We recognize that, and have tried to adjust the course so that it has value to physics majors, whatever their future plans. Independent of the test preparation objectives, the course activities are designed to have value as a means of reviewing physics you have seen before, as well as connect to unfamiliar topics.

The GRE Physics Subject Test is a test of *your* problem solving ability in a timed multiple-choice format. The only way to improve your performance from the beginning of the semester to the end is practice, practice, practice! As you practice, you will find that recalling the necessary concepts and equations becomes easier, and they will become a part of your "physics toolbox."

In the class sessions, the students will lead discussions of problem solving techniques and solutions to sample problems. More general problem solving techniques will also be discussed, including dimensional analysis, dependence analysis (what variables should the solution depend on), symmetry considerations, analogies and process of elimination.

Course Policy and Evaluation

1. Class Meetings: The class will meet, on average, two days per week from 10:30-11:20 for problem discussions. *Students are expected to have read assigned materials and worked assigned problems before coming to class.*

2. Attendance: Students are expected to attend all classes during the scheduled hours. Students are responsible for informing themselves of material and assignments covered during absences. Students must advise the instructor in writing during the first week of class of any scheduled athletic, music, or other college activities that will require their absence during the semester. Such written notice does not imply a waiver of course requirements or an agreement to reschedule exams.

3. Homework: Problems sets will be assigned from each category found on the GRE. These problems will be discussed in one of the next two class meetings. You must come prepared to discuss/present the solutions before the class. A system to insure that all students address roughly the same number of problems per class will be used. No

homework will be graded; the rewards of the homework will be improved performance on the GRE exam.

4. Writing Sample Problems: For some assigned topics, you will write a sample problem that should be similar in difficulty and style to problems on the sample GRE exams. Some of these will be supplement the problems solved in class, and will be used for this course in future years.

5. Phun Phact of the Day: Students will be assigned the responsibility for researching and presenting “phun phacts of the day.”

6. Presentations: We will also devote time, particularly in the 2nd half of the semester, to presentations on current events in physics, recent Nobel Prize winners, and classic experiments. Students will be assigned each period to research a topic and/or individual, and report this back to the class. Since the class consists of senior physics majors, this presentation should be at a level appropriate for this class, and should contain more technical material and links to previous course work than might be in short biographical sketches that may be found on some web sites. These presentations will be graded for both content and the quality of presentation.

7. Outlines: You will be making your own master outline of equations and notes as you review the topics. These sheets should have two columns: Equations and Context/Applicability, the later indicating when and/or when not to use the equations and any other flags. The assigned problems will give the class opportunities to discuss the physics of many of these outline entries.

8. Exams: There will be one 85 minute self-administered exam in the first full week of classes, and a second towards the end of the semester. These exams will consist of 50 questions taken from previous GRE exams; the actual exam is 100 questions in length, and must be completed in 170 minutes. The practice exams will be graded; the results may be viewed in the instructor's office. The resulting score will be reported to the student, and will be kept confidential by the instructor. *The exam results will not enter into the final grade for the course.*

9. Evaluation: The final grade will be based on an average of weekly evaluation of class preparation, participation, presentations, and performance. Attendance is required. Any class missed without a valid reason and prior notification will result in zero credit for that day. From time-to-time, your outlines will be called in for evaluation (with or without notice) and evaluated for organization, completeness and accuracy. You must take both the practice exams to complete the course and receive a grade of C- or above.

10. Incompletes: A grade of incomplete will only be given for work not completed due to circumstances beyond the control of the student. **(This is the college policy).**

Important Dates:

- General GRE: Register As Soon As Possible
- Physics GRE Registration Deadline: September 28, 2007
- Physics GRE Late Registration Deadline: October 7, 2007
- Physics GRE Test: November 3, 2007

Topics Covered

- Introduction and Test Taking Strategies
- First Practice Exam
- Mechanics
- Optics and Waves
- Thermodynamics and Statistical Mechanics
- Electromagnetism
- Special Relativity
- Quantum Mechanics
- Other Modern Physics
- Laboratory Methods and Electronics
- Specialized Topics (Nuclear and Particle Physics, Condensed Matter Physics, ...)
- Second Practice Exam