

# Physics 340: Condensed Matter Physics

## Gustavus Adolphus College Spring 2019

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### Required Textbook:

Fundamentals of Condensed Matter and Crystalline Physics, Sidebottom (2012)

### Other texts used in this course (but not required to buy):

An Introduction to Thermal Physics, Schroeder (2000)

– plenty of senior students should have this to borrow

Solid State Physics: An Introduction, Hoffman (2009)

– I have copies available, as does the library

Modern Physics for scientists and Engineers (2nd ed, 2004), Taylor, Zafiratos & Dubson

– Also used in Quantum Universe this spring so ask a sophomore.

**Course website:** <http://physics.gac.edu/~petricka/courses/340spring.html>

**Writing style guide:** [https://gustavus.edu/physics/concertFiles/media/Writing\\_Style\\_Guide.pdf](https://gustavus.edu/physics/concertFiles/media/Writing_Style_Guide.pdf)

### Course Policy and Evaluation

1. **Class Meetings:** The class will meet three days a week at (MWF) for lecture and discussion. The student will be responsible for reading the text before coming to class.
2. **Homework:** Homework will be assigned on a regular basis, turned in to the instructor, graded and returned. Written homework sets must be neat and organized. Legibility and thorough explanations of answers are required, **thought and solution process will often receive higher emphasis than final answers.** Illegible homework (and exams) will remain unscored at the instructor's discretion. You are encouraged to discuss and work problems with other classmates and me. However, each student must submit their own work; copying or internet solutions are not allowed and is considered cheating.
3. **Laboratory:** There will be approximately ten required laboratory experiments. Students will work in groups of two or three on these experiments, selected by the instructor, and partners will rotate throughout the semester. Each group will maintain a **single (group)** laboratory notebook for these experiments which will be collected and graded each time the groups rotate. Contents of the notebook are expected to be as you learned in PHY-305. A formal report in the style of a short scientific letter (as discussed in PHY-305 and the physics writing style guide) will be prepared by each **group** (you must work together) for several labs (see schedule) over the course of the semester. The due date for the papers is two weeks after the corresponding lab, but it is clearly not in your best interest to wait to do your write up.

4. **Project:** Groups will be formed and each will select a project to be completed in the second half of the semester. The group will be expected to keep a very detailed notebook of their results and write up and present their results at the end of the semester.
5. **Attendance:** Regular attendance at all lectures and laboratories is expected and absenteeism will result in a reduction of the final grade. Participation in all classroom and laboratory activities is expected and is part of the students' final grade. If you miss for any reason you are responsible for the material covered during the class, including any assignments.
6. **Quizzes:** Pop quizzes will be given at the discretion of the instructor.
7. **Exams:** There will be two one-hour exams and a comprehensive two-hour final exam.  
**Note: material learned/covered in the labs will also be included on exams.**
8. **Missed Exams:** Students are expected to arrange in advance to take an exam at other than the announced time. Requests to reschedule exams for non-emergency personal reasons will be declined. Permission to make up a missed exam after the fact will be at the discretion of the instructor and should not be assumed.
9. **Incompletes:** A grade of incomplete will be given only for work not completed due to circumstances beyond the control of the student (college policy).

10. **Evaluation:** The following scale will be used as a guide only:

A	94 - 100	B-	78 - 82	D+	62 - 66
A-	90 - 94	C+	74 - 78	D	58 - 62
B+	86 - 90	C	70 - 74	F	0 - 58
B	82 - 86	C-	66 - 70		

Exam 1: 10%

Homework: 15%

Lab papers: 20%

Exam 2: 10%

In class activities: 10%

Lab notebook: 10%

Final Exam: 15%

Lab effort: 10%

Project component: The effort, notebook and in-class presentation components of the project will be counted toward the regular grade in this course. However, the components of the project **will also be graded separately** for the pass/fail component of PHY-365. For PHY-365 the grading will be **PASS (>76%) / FAIL (<76%)** and the components will count as

10% Project determination and selection	30% Effort	10% Results
30% Lab notebook of project	20% Presentation	

Assignment of final letter grades will also consider the instructor's subjective evaluation of the student's attendance, initiative, class participation, preparation, and evidence of improvement.

12. **Disability:** We work together to ensure 'reasonable accommodation' and non-discrimination for students with disabilities. A student who has a physical, psychiatric/emotional, medical, learning, or attention disability that may have an effect on the student's ability to complete

assigned course work should contact the Disability Services Coordinator in the Advising Center, who will review the concerns and decide with the student what accommodations are necessary.

13. **Laboratory scheduling:** Because of limited resources and student conflicts, we may have to meet by arrangement outside the time scheduled by the registrar. This time is to be agreed upon before the start of the class, and students are expected to be able to attend lab. If everything is working properly and groups manage their time (including pre-lab preparation and quizzes), labs take one lab period to complete.

14. **Course Content and Pacing:** Our content goals are listed in the course schedule. A **definite prerequisite** for this course is the material that you learned in PHY225(QMU) and the lab and writing skills you learned in PHY305(advlab). Material from PHY380(thermal) and PHY390(quantum) overlaps with this course but will not be expected as a prerequisite. Due to the differing preparation level of the enrolled students, this course may seem too slow, too fast, or both at times. Due to the numerous components of this course it may seem like an extraordinary amount of work. Please do not hesitate to contact me about content and pacing, and workload feedback.

## Laboratory written reports:

### INTRODUCTION:

You are a research physicist during the 20th century. Your job is to conduct experiments, make discoveries, and publish results. You hope to become famous and win a Nobel Prize before the age of thirty, so the quality of your publications is very important. The results of your research are to be published in *Condensed Matter Physics* a journal devoted just to you. This journal only accepts results published in “PHY340” style (described below). Good luck making history!

### INSTRUCTOR'S NOTES:

Philosophy of Reports - I want you to take your role as a research physicist seriously! I am the editor of *Condensed Matter Physics*, the journal in which you are trying to get your papers published. You are to write on your **research not just a lab**. Whether or not your papers are accepted for publication (and your lab grade) depend on how well the paper is written and the quality of the scientific evidence you present to support your findings. In addition, you must convince me that your results are real, and worthwhile!

### SCIENTIFIC LETTER FORMAT FOR PHY-340:

The scientific letter style of presenting experimental results is a short paper used to announce significant new findings or discoveries. The writing level, style and general format of your written assignments is that expected from PHY305 and the physics writing style guide. In addition, for this class, the following rules apply:

- The title page should have the title, statement of authorship, and abstract.
- The **body** of the paper should be **no longer** than two typed pages (**of text, 1.5 spaced, 12 point font**) or its equivalent (latex, etc.).
- The body should contain the introduction, theory, experimental setup (no procedure information), results, data analysis, and references sections.
- Except for the references section, section headers should not be used.
- There must be at least two relevant, **non-textbook** / **non-lab manual** / **non-website** (Wikipedia, etc.) references per paper. Use internet journal searches, the instructor, or other means to find relevant papers.
- All figures should be included each on their own page.

### FINAL REMINDERS:

Include anything that you feel supports your conclusions, for example: data tables, diagrams and graphs with captions, and equations.

Any references used should be properly cited.

Figures should have complete captions so that the reader can understand what is being shown without referring to the main text. Each paper should include as many figures as necessary (at least one, but probably not more than three).