

**PHYSICS 342/555: Structure of Matter
Spring 2018**

PARTICULARS

- Instructor:** Prof. Steven Johnston, Department of Physics and Astronomy.
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Office Phone: (865) 974-7837
Office Hours: Mon. & Wed. 2:15 – 3:15 PM or by appointment.
E-mail: sjohn145@utk.edu, or via the Canvas Message system.
Class Time: Mon/Wed/Fri 1:25 PM – 2:15 PM
Class Location: Nielsen Physics Building, Room 306
Communication: The majority of classroom communication will be conducted via the Canvas site for this class.
- Email Policy:**
- Please put “PHYS342” or “PHYS55” in the subject line of all course related emails. This practice will help me identify course related emails and respond promptly.
 - Please allow for up to a 24-hour delay in responding to emails; I will try to minimize such delays, but do not email me on the evening before an assignment is due or before a test expecting an immediate response.
 - Before emailing me with questions about the course, please ensure that the information is not already provided in the course syllabus or on Canvas.

COURSE DESCRIPTION & GOALS

- Overview:** This course is an introductory course on the structure of matter. The primary goal is to familiarize you with the basic ideas underpinning the quantum theory of matter at the scale of atoms. We will also cover some of its applications in the field of semiconductors. While we will be studying some aspects of molecular physics, our primary emphasis will be on understanding crystalline solids. This course could alternatively be titled *Introduction to Solid State Physics* or *Introduction to Condensed Matter Physics*. A tentative list of topics is posted on the Canvas site.
- Credit Hours:** Three
- Prerequisites:** Solid state physics calls upon elements of quantum mechanics, thermal physics, statistical mechanics, and electricity and magnetism. Throughout this course, I will assume you have had some exposure to the basic concepts of these fields. For example, you should be familiar with notions of wavefunctions, quantum particles in a box, the Schrödinger equation, the (quantum) simple harmonic oscillator, electromagnetic waves, and some elementary statistical physics. I *do not* expect you to be an expert on these topics, and we will review many of them as needed; however, there may be times when you will need to review this material.
- Textbook(s):** The primary book for this course is *Introduction to Solid State Physics* by Charles Kittel (ISBN-13: 978-0471415268). I will also be drawing a lot of information from *The Oxford Solid State Basics* by Steve Simon (ISBN-13: 978-0199680771). The author has provided a list of known

errors at: <http://www-thphys.physics.ox.ac.uk/people/SteveSimon/errors.html>.

- Other useful references:** You may find any of the following books useful:
1. "Solid State Physics" by N. W. Ashcroft and N. D. Mermin. (This is an old but good reference book, especially if you planning on pursuing graduate studies in condensed matter physics.)
 2. "Condensed Matter in a Nutshell" by G. D. Mahan.
 3. "Elementary Solid State Physics" by M. A. Omar.
 4. "Solid State Physics: An Introduction" by P. Hofmann.
 5. "Solid State Physics: Essential Concepts" by D. W. Snoke.
 6. "Fundamentals of Condensed Matter Physics" By M. L. Cohen and S. G. Louie. (This is a new and somewhat advanced book. It may be best suited for the students enrolled in PHYS- 555)

GRADING AND EVALUATION

Assignments: I will assign problem sets and exercises at regular intervals. These will contain a mix of short explanations, discussion questions, and calculations. Students enrolled in Physics 555 may be asked to solve additional problems or parts to some questions or provided extended discussions, where appropriate.

The assignments will be turned in during class on the indicated due date. If an assignment is turned in late, I will reduce the mark by 25% for each 24-hour period it is overdue (unless you have made prior arrangements to turn the material in at a later time).

Midterm exams: About half way through the term we will have an in-class midterm exam, which will occur during one of our regular class meetings. The tentative date will be Wednesday, March 7th, 2018; however, this date is subject to change and will be confirmed closer to the event.

Final Exam: We will have an in-class final exam at the end of the semester, which occur during the allotted exam time. **The final exam will be cumulative.**

Both the midterm and final exam will be open book exams; you will be allowed to bring the textbook, a calculator, your writing implements, and a single-page single-sided "cheat sheet." No other materials will be permitted.

Project (PHYS-555): The students enrolled in the course for graduate credit are required to write a short ~6-8 page paper on a topic related to the course. The topic can be any aspect that interests them, and may be related to their research. They will also give a brief 15 to 20-minute presentation at the end of the semester on the same subject. To discourage procrastination, you will be required to meet several milestones throughout the year. The details of this project will be specified in a separate handout, along with a list of potential topics.

Grading: PHYS 342: For the students enrolled in PHYS-342, your grade will be determined using **one** of the following distributions.

1. 50% / 20% / 30% for the assignments, midterm, and final.
2. 50% / 10% / 40% for the assignments, midterm, and final.

PHYS 555: For the students enrolled in PHYS-555, your grade will be determined using one of the following distributions.

1. 30% / 20% / 20% / 30% for assignments, project, midterm, and final.
2. 30% / 20% / 10% / 40% for assignments, project, midterm, and final.

In both cases, I will use the distribution that maximizes your grade. Your letter grade will be obtained using the conversion below.

A	91-100	C	64-66
A-	83-90	C-	60-63
B+	79-82	D+	57-59
B	74-78	D	54-56
B-	70-73	D-	50-53
C+	67-69	F	0-49

OTHER INFORMATION

Group work policy: I encourage students to work together and discuss the homework with each other. Such discussions are one of the most effective ways of assimilating the material. The work you turn in must be written up by you and not be a copy of your peers' work or some other source such as solutions found on the Internet. Any homework assignment that is a direct copy of another person's work without attribution will count as plagiarism and will be dealt with accordingly. Do not take advantage of the work of other people, and do not let anybody benefit from yours.

For Students with disabilities: If you require course adaptations or accommodations because of a documented disability, please contact the Office of Disability Services at 2227 Dunford Hall (telephone/TTY 865-974-6087; e-mail ods@utk.edu). This will ensure that you are properly registered for services. *University Policy forbids me from making special accommodations without a letter from the Office of Disability Services.*

Academic Honesty & Integrity: By taking this course you agree to the following statement: "An essential feature of the University of Tennessee, Knoxville is a commitment to maintaining an atmosphere of intellectual integrity and academic honesty. As a student of the university, I pledge that I will neither knowingly give nor receive any inappropriate assistance in academic work, thus affirming my own personal commitment to honor and integrity."

All work submitted by a student is expected to represent his/her own work. Students are expected to enter their own homework without assistance from others. Students are expected to perform all work in conformance with the University policies regarding Academic

Honesty. I will pursue any cases of academic dishonesty that arise during the course.

**University Civility
Statement:**

Civility is genuine respect and regard for others: politeness, consideration, tact, good manners, graciousness, cordiality, affability, amiability and courteousness. Civility enhances academic freedom and integrity, and is a prerequisite to the free exchange of ideas and knowledge in the learning community. Our community consists of students, faculty, staff, alumni, and campus visitors. Community members affect each other's well-being and have a shared interest in creating and sustaining an environment where all community members and their points of view are valued and respected. Affirming the value of each member of the university community, the campus asks that all its members adhere to the principles of civility and community adopted by the campus: <http://civility.utk.edu/>.