PHYS 353 SYLLABUS Fall 2018

CATALOG DESCRIPTION: PHYS 353 Solid State Physics
A study of solids including crystal structure and binding, lattice vibrations (phonons) and thermal properties, the free electron Fermi gas, energy bands, and semiconductor crystals.
Prerequisite: PHYS 252 and MATH 232 One semester; three credits

TEXT: Required: none; notes in pdf format are available on the course web page.
Recommended: Introduction to Solid State Physics, any edition by Kittel,
or Solid State Physics, any edition, by J.R. Hook & H.E. Hall

INSTRUCTOR: Dr. Johnny B. Holmes, Professor of Physics

PREREQUISITES BY TOPIC:
Newton's laws of motion, conservation of energy and conservation of momentum, an introduction to Maxwell's equations, at least a brief introduction to ideas of modern physics (basic introduction to Schrodinger's Equation), differential equations, vector calculus.

GOALS:
1. To deepen the student's understanding of the basics behind the thermal, mechanical, and electrical behavior of materials including semiconductors.
2. To show how science attempts (very often successfully) to explain the often seemingly strange behavior of nature in terms of basic laws and parameters.
3. To increase the student's ability to apply scientific and mathematical principles and methods in general by applying them to a particular area of investigation.

TOPICS:
1. Crystal structure and x-ray diffraction
2. Lattice vibrations, phonons, heat capacity and thermal conductivity
3. Free electron Fermi gas, energy bands and electrical conductivity
4. Semiconductors

GRADING: Half of your grade will be based on tests, and half on homework.
Tests: There will be **four tests** each of which will count as one grade. The questions for the four tests will come for the most part from the study questions on the study guide for each part. For each test you may bring in one 8½"x11" sheet of paper with whatever you want **written** on one side - no duplicated copies! If it will help your grade, the lowest of the four test scores will be dropped if you have two or fewer absences. There will be a **final exam** which will count as one grade. For the final you can bring in two 8½"x11" sheets of paper with writing on one side each (or one sheet with writing on both sides). The questions on the final will for the most part come from the previous four tests. The average of these four (or five) tests will count as **half** of your grade. The other half will be your homework grade.
Homework: There will be **34 homework problems** found in the Study Guides for each part which will be graded and which will **count as half of your final grade**. ***YOU MUST HAVE AT LEAST A 60% ON THE HOMEWORK TO PASS THE COURSE!*** If you have met the homework requirement, then I will average your overall test average with your homework grade to determine your final grade based on the following scale:
A: 90-100; B: 80-90; C: 65-80; D: 60-65; F: 0-60.
(An 79.9 is a C, an 80.0 is a B.)

COLLECTED HOMEWORK ASSIGNMENTS: The 34 collected homework problems are found in the study guides for each part. Each problem will normally be worth a maximum of 10 points if turned in on or before the due date. Late, or redone, homework will incur a late penalty of 2 points if submitted after the test for that section and before the last class. Homework will not be accepted after the last class of the semester.

Your homework grade will be figured by adding up your total homework points, dividing this by 340 points, and then multiplying this fraction by 100%. **You must have at least 60% on the homework grade to pass the course!**

Homework should be legible and easily follow-able. The seven step paradigm does not have to be followed exactly, but the following should be done: any equations used should be identified by words, intermediate mathematical steps should be included, and answers should be shown to be reasonable by arguments based on common sense whenever possible. Homework will generally be returned at the next class and may be redone and re-submitted based on the comments or corrections, but the re-submitted homework will be subject to the same grading time-frames as the original specified above unless otherwise specified at the time.

Tentative schedule for tests and due dates for homework problems:

Tuesday	Thursday
Aug 21	23 – P1
28 – P2	30 – P3, P4
Sept 4 – P5	6 – P6
11 – **Test 1**	13 – P7
18 – P8	20 – P9
25 – P10,11	27 – P12, P13
Oct 2 – P14, P15	4 – **Test 2**
9 – P16, P17	11 – P18, P19
Fall break	
23 – P20, P21	25 – P22, P23
30 – P24	Nov 1 – P25, P26
6 – P27	8 – **Test 3**
13 – P28, P29	15 – P30
20 – P31	*Thanksgiving*
27 – P32	29 – P33
Dec 4 – P34	6 – **Test 4**
Final exam week	