San José State University
Department of Physics and Astronomy
Phys 122, Modern Physics, Sect. 1, Fall 2018

Course and Contact Information

Instructor: Ken Wharton
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Email: Kenneth.wharton@sj-su.edu
Office Hours: TR 2:00-3:00pm
Class Days/Time: TR 12:00-1:45pm
Classroom: SCI 242
Prerequisites: Phys 122, Phys 130 (or equivalent Linear Algebra Math Course)

Faculty Web Page
Course materials such as syllabus, handouts, assignments, etc. can be found on the Canvas web page; login at https://sj-su.instructure.com/. You are responsible for regularly checking Canvas to learn of updates.

Course Description
This is a survey course of modern physics for science majors, covering special relativity, basic quantum mechanics, atomic and molecular physics, solid state physics, nuclear and particle physics, and cosmology. The historical foundations of these topics will also be presented.

Course Learning Outcomes (CLO)
Your learning objectives are to learn the concepts behind the above topics with sufficient understanding as to solve new quantitative problems that you have not yet encountered. This includes learning the mathematical approaches necessarily for solving such problems.

Upon successful completion of this course, students will be able to:

1. Solve basic mechanics problems in different reference frames, utilizing special relativity.
2. Determine the behavior of simple small-scale systems, utilizing concepts from quantum theory.
3. Solve problems concerning basic atomic, nuclear, and particle physics phenomena.

Required Texts/Readings
Textbook

Other Readings
Will be linked to the course website as needed.

Course Requirements and Assignments

Solving a vast majority of the homework problems is crucial for success in this course; one cannot achieve the course learning outcomes without spending the necessary hours working through the problems. Homework will be assigned on a weekly basis; in general late homework will not be accepted. The total homework score is 25% of the final grade.

You are also expected to participate in class-based problem-solving, both on your own and in a small group. On occasion you will have to explain your work to the class.

There will be a research project, consisting of both a written paper and an oral presentation to the class. Writing and presenting technical/scientific concepts is a crucial skill that will be stressed in this course; with this in mind, drafts of the paper and the presentation will be turned in before the due date, in time to incorporate feedback.

There will be three midterm exams, and one comprehensive final exam.

Final Examination
The final exam will be a comprehensive test, in the same style as the midterms (multi-step problem solving).

Grading Information

- Not all homework problems receive the same weight; more complicated solutions get more points. For each homework problem scoring below 80%, please review the material, as such a score indicates at least some lack of conceptual understanding (as opposed to small mathematical errors).
- A similar grading approach applies to the problems on exams.

Determination of Grades

- The mean grade for this class is usually a B; other grades are distributed above and below based on the total percentage score only.
- Extra credit is usually not available; when it is offered, it will be offered to the entire class.
- The final grade is determined by the following: Homework (25%), First midterm (10%), Second midterm (15%), Third Midterm (15%), Research Project (15%), Final (20%).
- Missed work will receive no credit. Late work may be accepted, but usually with a substantial penalty.

Classroom Protocol
I expect you to attend class, as this material is almost impossible to learn directly from a textbook, and there is a very strong relationship between class attendance and performance. Cell phones, of course, must be silenced.
University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/"

**Phys 122, Fall 2018 Course Schedule**

This schedule and the exam dates are approximate and subject to change with fair notice (via class and email).

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics, Readings, Due Dates (Plus usually one homework due each Tuesday)</th>
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<tbody>
<tr>
<td>1</td>
<td>Overview, Special Relativity (chapters 1,2)</td>
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<tr>
<td>2</td>
<td>Special Relativity (Chapter 2). <strong>Research Topic Due Thurs. 8/30</strong></td>
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<tr>
<td>3</td>
<td>Special Relativity (Chapter 2).</td>
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<td>4</td>
<td>Review, <strong>Midterm #1 Thurs 9/13</strong></td>
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<td>5</td>
<td>Electrons and Light (Chapter 3). <strong>Outline of Research Paper Due, Thurs 9/20</strong></td>
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<td>6</td>
<td>Bohr Atom (Chapter 4), Quantum Mechanics (Chapter 5)</td>
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<td>7</td>
<td>Quantum Mechanics, Hydrogen (Chapters 5,6,7)</td>
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<td>8</td>
<td>Periodic Table (Chapter 8), Review</td>
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<td>9</td>
<td><strong>Midterm #2, Tues 10/16</strong>, Statistical Physics (Chapter 9)</td>
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<td>10</td>
<td>Bonds and Lasers (Ch. 10), Semiconductors (Ch. 11). <strong>Draft Paper due, Thurs 10/25</strong></td>
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<td>11</td>
<td>Nuclear Physics (Chapters 12, 13)</td>
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<td>12</td>
<td>Particle Physics, (Chapters 14,15). <strong>Draft Presentation due, Thurs 11/8.</strong></td>
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<td>13</td>
<td>Cosmology (Chapter 16), Review</td>
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<td>14</td>
<td><strong>Midterm #3, Tues 11/20 -- (no class on Thurs 11/22)</strong></td>
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<td>15</td>
<td><strong>Research Paper due Tuesday 11/27!</strong> Bonus Topics, <strong>Presentations</strong></td>
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<tr>
<td>16</td>
<td><strong>Presentations</strong>, Review for Final</td>
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