Instructor: Sally Koutsoliotas, Olin 152, 7-3105, koutsllts@bucknell.edu

Hours: Lectures: Monday, Wednesday, Friday 1:00–2:00, Olin 275
        Thursday 11:00–12:00, Olin 254

Description: This course will provide an overview of the important ideas and experiments that lay
the foundation for modern physics. Our emphasis will be on the physics of the microscopic, de-
scribed by quantum mechanics. Topics such as the structure of the hydrogen atom, the uncertainty
principle, and the wave-particle duality of nature will be discussed.

To truly appreciate the developments of early twentieth century physics, a strong grounding in both
the particle model and the wave model is essential. While the classical particle model is presented
in PHYS 211 and more fully explored in PHYS 221, the mechanics of waves is developed in the
first section of this course. Specifically, the first few weeks will focus on a detailed and thorough
introduction to wave mechanics, including the development of the classical wave equation.

This class has four hour-long meetings each week. While the majority will be lectures, there will
also be opportunities for problem sessions, experimental projects, and small group activities. These
activities will complement the material introduced in lectures, and provide another opportunity to
reinforce concepts. The mathematical tools needed to study this subject will also be developed and
accompanied by a practical guide to using Mathematica.

Where possible, the reading associated with each lecture has been indicated in the course schedule.
It is expected that you will do the reading BEFORE coming to class. Class lectures will
focus on presenting the context for the material detailed in the text, and not on specifics relating
to derivations. You are expected to work through the derivations during your reading, and come
to office hours when further clarification is needed.

Required Textbooks: Vibrations and Waves, by A.P. French.
                 Modern Physics, by P.A. Tipler and R.A. Llewellyn.

Alternate References (On Reserve):
                 Waves (Berkeley Physics Course, vol.3), by F.S. Crawford, Jr.
                 Modern Physics, by K.S. Krane.
                 Concepts of Modern Physics, by A. Beiser.
                 Modern Physics, by H.C. Ohanian.
                 Quantum Physics (Berkeley Physics Course, vol.4), by E.H. Wichmann.
                 Newtonian Mechanics, by A.P. French.

Useful Introductory Texts:
                 Physics for Scientists and Engineers (5th edition), by Tipler and Mosca.
Related Books of Interest:

- *Thirty Years That Shook Physics*, by G. Gamow.
- *Mr Tompkins in Wonderland*, by G. Gamow.
- *Alice in Quantumland*, by R. Gilmore.
- *The Flying Circus of Physics (with Answers)*, by J. Walker.
- *Div, Grad, Curl, And All That*, by H.M. Schey.

*Office Hours*: Tuesday 4–5  Thursday 4–5  or by arrangement.
Other times to be announced.

*Problem Sets*:
Problem sets will be assigned twice a week, collected, and graded. Late assignments will NOT be accepted. Solutions will be made available through the ERes services of the library. Collaboration in the analysis of problems is encouraged, but the final write-up must be your own work entirely. Collaborators’ names should be noted at the top of the first page. Discussing questions arising from the problem sets during office hours is also encouraged, especially before the work is submitted.

*Participation*:
Quick-response questions will be asked regularly throughout the course. Typically, responses will be made via email.

*Project*:
Details will be announced in class.

*Assessment*:
The overall grade will be made up of the following components:

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Problem Sets</td>
<td>20%</td>
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<tr>
<td>Test 1</td>
<td>15%</td>
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<tr>
<td>Test 2</td>
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<td>Test 3</td>
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<tr>
<td>Project/Participation</td>
<td>10%</td>
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<tr>
<td>Final Examination</td>
<td>25%</td>
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**TOTAL** 100%

The percentage on your final exam will replace the lowest test score, if that will help your grade.