



Bridgewater College - Fall 2011

PHYS 305 Modern Physics

Course Syllabus

Instructor: [Dr. Richard L. Bowman](#)

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Office: MCK 239 M, W, F: 10:00-11:30 a.m.

M, W, F: 3:00-4:00 p.m.

Other times by appointment or as available

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- **Introduction**

From the beginning of the 20th Century until the present, a lot of strangely different physics has emerged through

experiments and the theoretical models that have helped us to understand the observed phenomena. Some of this has become part of our everyday life so that even persons who are not physicists know and accept such ideas as that particles cannot accelerate to speeds faster than the speed of light and the idea that all of normal matter is composed of electrons and quarks. In addition, lasers are so common that a person can buy a laser pointer for under \$10 US. In this course we will explore many of these experiments and theories.

By the end of this course, each student will have:

1. Learned to describe much of the strange behavior of particles as their velocities near the speed of light.
2. Been introduced to the basis for the particle-wave duality of light and particles.
3. Explored some of the quantum mechanical models of how electrons behave in atoms.
4. Studied the basic ideas of solid state physics.
5. Been introduced to nuclear structure, radioactivity and reactions and the conservation laws involved.
6. Learned something about the menagerie of elementary particles and their classifications and quark compositions.
7. Explored the basic ideas of general relativity.

8. Become acquainted with some of the theories of cosmology.

These goals will be approached through the use of lectures, discussions, and homework assignments. Evaluation of how well a student is meeting these objectives will be accomplished by the grading of quizzes, homework, and exams as described below.

• **Textbook**

Kenneth S. Krane, *Modern Physics*, 2nd Edition. Wiley, 1996.

Most of the topics presented in chapters 1-7 and 11-16 will be covered during this semester.

<u>Dates</u>	<u>Week</u>	<u>Topic</u>
Sept. 7, 9	1	Special Theory of Relativity
12, 14, 16	2	
19, 21, 23	3	
26, 28, 30	4	Particle-Wave Duality
Oct. 3, 5, 7	5	Introduction to Quantum Mechanics
12, 14	6	
17, 19, 21	7	
22, 24, 26, 28	8	

31, Nov. 2, 4	9	Solid-State Physics
7, 9, 11	10	Nuclear Structure and Reactions
14, 16, 18	11	
21	12	Elementary Particles
28, 30, Dec. 2	13	General Relativity
5, 7, 9	14	Cosmology
Dec. 13		Final Exam

• Homework

One of the best ways to truly learn physics concepts is through solving problem involving the concepts covered in the class. Thus during the discussion of the material covered each chapter in the textbook, problems will be assigned from the textbook. The instructor will also include instruction in using *Mathematica* for solving physics problems and will assign additional work that must be done in *Mathematica*. For the best learning experience, students should attempt to solve these assigned problems first by themselves before seeking assistance from the instructor or fellow students. Straight copying of work from another student is cheating.

• Grading Policies

Homework	100
Exams (3)	<u>300</u>
Total	400

The first two exams will be on **Friday, October 7**, and **Friday, November 11**. The third exam will be over the material covered in the last third of the course and will be given during finals week on **Tuesday, December 13, 8:00 a.m.**

Final letter grades for the course will be assigned as follows:

<u>Grade</u>	<u>Percentage of Maximum Points</u>
A	100-90
B	90-75
C	75-60
D	60-50
F	below 50

Special Note:

1. Attendance at all class activities is expected of each student. When sickness, sports or other such events or emergencies make it impossible for a student to attend a class activity, then it is the responsibility of the student to notify Dr. Bowman in person, by e-

mail or by phone. If at all possible, this should be done prior to the time of the scheduled activity.

2. While there is no explicit penalty in the grading formula for this class for not attending class, non-attendance will invariably result in reduced understanding of the covered material and thus it can result in lower scores on homework and exams. This cause and effect has been observed so regularly over the years that the wise student should be sufficiently warned that **class attendance is very important**.
3. Any homework, exam or other class assignment not completed will be given a grade of zero points.
4. Missed exams may only be made up when given prior approval by Dr. Bowman or in acceptable emergencies.
5. "Ethics, honor, and integrity are the fundamental principles at the core of the Bridgewater College experience. Our community can only flourish in an environment of trust and respect and these notions of personal honor, integrity, and faith are the fundamentals of the Bridgewater Honor System. The Code of Honor prohibits lying, cheating, and stealing and Bridgewater College's commitment to ethics, integrity, and values is embodied in the Code of Ethics. Violation of these Codes demonstrates harm to the community and an all-student Honor Council administers regulation of this Honor System. It is the goal of Bridgewater College's Honor Council to

assist in the development of students' ethical and moral base." (BC Catalog)

6. "The Academic Support Center, located in the Bicknell House, promotes learning skills and personal development through academic counseling, advising, tutoring services, disability services, and a transition program for selected new students." (BC Catalog) Further information may be found at <http://www.bridgewater.edu/AcademicAffairs/AcademicSupportCenter> .

Created and maintained by: [Richard L. Bowman](#) (last updated: 9-Sep-11)