What am I Getting Myself Into Anyway?

What is Physics?
"What is Physics?" is a very difficult question to answer in a meaningful way. Let's suffice to say that it is the study of our physical universe. More specifically, it is an attempt to explain physical phenomena which occur all around us. The explanation will, hopefully, result in a few general ideas called concepts or theories. If these theories are useful they can be used to extend our knowledge and understanding of the world around us. A world that we may yet to have seen or experienced.

Physics is one of the oldest of all sciences. In fact, most other sciences and some engineering disciplines - such as electrical engineering - have evolved from it. Science evolves through various stages: [1] The first stage is characterized by systematic observation of naturally occurring events. The primary question guiding the observer is, "What is happening?" To answer such a question, careful observation is necessary. During class please observe carefully what is happening and carefully note what you see. [2] The next stage is the origin of an empirical science. Now one attempts to determine how variables involved in our observations are related. We try to achieve this through experimentation. Equations which result from experimentation are called empirical relations. We may not know why the variables behave as they do. For example, we have a very good explanation of how gravity affects us, but have no idea of what causes these gravitational effects. The purpose of this class will be to better understand the concepts underlying a phenomena; however, sometimes we will want to gain experience developing empirical relations. [3] The final step in the evolutionary growth of a science is the theoretical stage. Theories arise which attempt to explain the results of the previous stage. Theories build an underlying structure upon which the science will grow because it can now predict new ideas which can be tested experimentally. Science in this final stage can be very abstract. Mathematics is the language of an abstract science. As a result, many people often get the impression that science is "just a bunch of mathematical equations to master." Physics is in this latter stage; but our hope is that you will not go away with such an impression!! Bear in mind that understanding the underlying ideas and concepts must come well before mathematical analysis.

Richard Feynman wrote in his book, Lectures in Physics, Vol 1 page 3-10, "A poet once said, "The whole universe is in a glass of wine." We will probably never know in what sense he meant that, for poets do not write to be understood. But it is true that if we look at a glass of wine closely enough we see the entire universe. There are the things of physics: the twisting liquid which evaporates depending on the wind and weather, the reflections in the glass, and our imagination adds the atoms. The glass is a distillation of the earth's rocks, and in its composition we see the secrets of the universe's age, and the evolution of the stars. What a strange array of chemicals in the wine? How did they come to be? There are the ferments, the enzymes, the substrates, and the products. There in the wine is found a great generalization: all life is fermentation. Nobody can discover the chemistry of wine without discovering, as did Louis Pasteur, the cause of much disease. How vivid is the claret, pressing its existence into the consciousness that watches it! If our small minds, for some convenience, divide this glass of wine, this universe, into parts -- physics, biology, chemistry, geology, astronomy, psychology, and so on -- remember that nature does not know it! So let us put it all back together, not forgetting ultimately what it is for. Let it give us one more final pleasure: drink it and forget it all!"

The Text

The text is Fundamentals of Physics extended by Halliday, Resnick and Walker (Sixth Edition). A textbook is a required item.
Goals of this course
A. Build and develop a foundation understanding of fundamental physics concepts and ideas involving forces and motion.
B. Further develop strong problem solving skills which are heavily utilized in a wide array of scientific disciplines.
C. Be better able to critically view the world we live in by asking and discovering why and how things happen and behave the way they do.

The Map (Where we are going)
Learning and understanding physics is not a "spectator sport". Learning does not occur by ESP, nor revelation, nor by mere note taking followed by their memorization. One must be an active participant in the process. As with any other sport, activity, or endeavor; practice, practice, practice is the only way to improve one's abilities. In-class assignments are designed to aid you in understanding the ideas being studied. Any in-class assignments will be handed in at the end of the class period. [No make up on these.] Develop the habit of inquiry. Ask what the ideas being discussed in class really mean and how does that idea apply to different examples. Work on available homework problems, beyond those assigned to be handed in, as your time permits.

Major Topics of Study
1. Newton's Laws of Motion
   Force, Mass, Acceleration
   Free Body Diagrams
2. Conservation of Momentum
   Relation to Newton's Laws
   Collisions
3. Conservation of Energy
   Definitions of Kinetic and Potential Energy
   Heat and Friction
   Work Energy Theorem
   Collisions
Other topics will include:
1. Kinematics
2. Gravitation
3. Rotation
4. Fluids
5. Wave Motion

Course Organization
This course will be a combination of lecture, example problems and small group discussion. Increased class attendance invariably results in increased grade performance, both directly and indirectly. During class please ask any questions which arise during lecture. By asking questions and understanding the underlying ideas and concepts related to these questions, a better insight of the physical world will be developed. Student evaluation will be based on attendance and participation, quizzes and exams.

Exams: There will be a comprehensive final exam. In addition there will be four exams throughout the semester.

The final exam is Tuesday May. 8th, 8:00 - 10:00. Make travel plans accordingly.

Quizzes: There will be a short, one question quiz given every day of class. The quiz may occur at the beginning, middle or end of the class period. These quizzes should not be feared nor dreaded. Their purpose is to further the understanding of the material and to help develop a confidence and comfort with reasoning skills. Each quiz will be worth 2 points, one point for simply taking the quiz and one point depends on your answer. There will be no makeup quizzes.

Homework assignments: I will provide you with a list of recommended homework problems. These are the minimum number of problems from the text which I expect you to work on and solve. As your time allows you should also work on extra problems as well. Copies of the solutions manual for this text will be on reserve in the library. You should use this resource to check your work on the problems you do. The homework problems will not be collected and graded. This doesn't mean you don't have to do them. Odds are, if you don't put SIGNIFICANT time and effort into working on these problems, you will fail the course. We will spend time in the recitation sections going over
homework problems and questions about homework problems so come prepared with questions to ask.

**Makeup Test Policy:** Regular exams will begin at 8:00am. You are expected to take the test then. If you have not spoken to me prior to the scheduled test time, and do not show up during that period, you will not be allowed to make up the exam. If you know ahead of time that you will not be able to be at class on the scheduled date, talk to me well in advance and we will see if arrangements can be made. Arrangements will be made only if I feel it is appropriate. You are only entitled to a makeup exam if I decide you are. If you miss any exam, a comprehensive, general 1 hour makeup exam will be given on the Saturday after prep week, May 5th at 8:30 a.m., which you may take to substitute for a missed exam. If you have taken all the exams, you may also take the makeup exam to substitute for your lowest exam score.

**Grading policy is as follows:**
Each of the components of student evaluation will be weighted as follows.

- **Final Exam** - 200 pts.
- **Regular Exams** - 100 pts each.
- **Daily Quiz average** - 100 pts total.

**Determining the final grade:** A weighted percentage of the total possible points will be computed using the fractions shown above. The total weighted percentage will converted to a grade using the scheme shown below.

- 90% and above  ->  A
- 86.0% - 90%   ->  A-
- 82.0% - 86.0% ->  B+
- 78.0% - 82.0% ->  B
- 74.0% - 78.0% ->  B-
- 70.0% - 74.0% ->  C+
- 66.0% - 70.0% ->  C
- 62.0% - 66.0% ->  C-
- 60.0% - 62.0% ->  D+
- 54.0% - 60.0% ->  D
- BELOW 54.0%  ->  F

This table represents the guaranteed grade for a specific total percentage of the total possible course points. I reserve the right to adjust individual grade for the student's benefit if appropriate.

**Special Needs**
If you need course adaptations or special accommodations because of a disability, or if you have emergency medical information, or if you have special needs in the event that the building needs to be evacuated please contact me in Herak 258 or at extension 6768 during office hours listed below. If you use an alternative medium for communication please let me know so that appropriate accommodations can be made.

**Office Hours:**  M,F 9-10 am; Tues. 2-4 pm; W 2-3;
Other times by appointment or catch me.

**Office location:** Herak 258   Ext: 6768
**Website:**  http://www.phy.gonzaga.edu/jeff.html
**Email:**  bierman@gonzaga.edu

You will see that ideas build upon each other during the semester. Thus if some idea is not clear be sure to come in right away so that new problems are not overlaid upon those which are unclear.