Tentative Syllabus for Physics 1301W.100

Introductory Physics for Scientists and Engineers

Spring 2004

Instructor: Peter J Litchfield.

Office: Phys 259, phone 624-9804, e-mail PJL@PHYSICS.UMN.EDU

Office Hours: M,T,W after class 13.10-14.00 or by appointment, either e-mail or come by my office and we can fix a time.

Class Times and Place:

Quiz days: Thursdays and Fridays, February 12th, 13th, March 4th, 5th, April 1st, 2nd & 22nd, 23rd

Final: Wednesday May 12th 08.30-11.30

Necessary Materials:

Tipler: Physics for Scientists and Engineers 4th Edition (Chap 1-10, 12, 14) (Bookstore)
The Competent Problem Solver - Calculus Version (Bookstore).
Physics Laboratory Manual for Science and Engineering: Mechanics (Bookstore)
Laboratory journal University of Minnesota 2077-S (Bookstore)
An Educue transmitter (Bookstore)

Supplementary materials:

Outline of solutions to all problems in Tipler are on the web at https://www.physics.umn.edu/resources/classes/solutions/tipler
The Tipler student website http://www.whfreeman.com/tipler
Thompson: Calculus Made Easy. (Bookstore)

The Class
Welcome to Physics 1301. This is the first semester of a three-semester introductory course in physics for science and engineering students. In it we will study the motion and interaction of the objects that surround us. It is the physics of Newton and his contemporaries, which enables us to predict the behavior of objects from galaxies to airplanes to baseballs. This class is required as the first step in the study of every science and engineering major. Not only will it reveal the workings of nature but it will also introduce you to a method of problem solving by the step by step application of logical
and fundamental principles, which is applicable far beyond the confines of physics or even science in general.

We will do our best to help you understand the concepts presented at a level that will enable you to apply them to new situations. We emphasize the importance of applications by giving quizzes in which you will face situations for the first time. The pace of this course should allow you to understand the material in depth but it does move right along. Don't fall behind. It is extremely difficult to catch up and the longer you leave it the harder it is. Learning physics is no different from learning anything else. It requires your active participation. What you get out of a course depends on the productive effort and quality time you put into it.

The course begins with material you would have in a good high school physics course. For the few people who did not have high school physics, this gives you a chance to catch up. If you did have high school physics, this is the time to reflect on the material and really master it. We assume that you have a good working knowledge of algebra, geometry, trigonometry, and are beginning an acquaintance with differential and integral calculus. Throughout this sequence of physics courses you will meet mathematical techniques that you have not yet had in a mathematics class. Don't worry. We will introduce this mathematics to you when it is needed. In addition to mathematics, we will require that you always use and communicate a logical and organized problem solving technique such as that thoroughly explained in a booklet prepared especially for this course (The Competent Problem Solver). Since physics is about reality, the course will draw on a large amount of knowledge from your personal experiences, reading, movies, and TV. All of your knowledge is relevant, and it is assumed that you will use it in class and on tests.

The course contains a number of different components

Lectures:

In my lectures I will follow the structure of the text in Tipler. I will tell you which parts of the text will be covered in the forthcoming lectures. **To get the most out of the lectures it is important that you read the text BEFORE the lecture.** This will ensure that you can follow the lecture and that you can ask about things that are not clear.

This is a big class and it is difficult to have much interaction between you and me. However **PLEASE ASK QUESTIONS WHEN YOU DON'T FOLLOW SOMETHING.** If you don’t understand it, it is guaranteed that there are others in the same boat. Don’t be shy. If I don’t see you with your hand up, shout. Also shout when you ask the question, it is difficult for me and the rest of the class to hear in the big room. If you don’t get satisfaction in the lecture, come and ask afterwards or in office hours.

The lectures will be available on the web after the lecture. You do not need to take
notes unless you find that doing so improves your concentration.

**Laboratories:**

The laboratories give you the opportunity to practice the principles that you have learnt in real life situations. Physics is an experimental science. Theories are constructed based on observation. From these laws one can predict the behavior of systems that have not been previously encountered.

This will be the basis of the laboratories. You will be asked to predict the behavior of the system under test and then see how the measurements you make bear out your predictions. You will work in small groups. Learning to work in groups with each member contributing to the overall objective is an important part of the course and will be an important part of your subsequent career at the university and beyond.

The writing of laboratory reports is the main writing part of the course. The ability to produce logical and good English to communicate technical information is an essential skill for the modern world. Reports will be graded and you need to obtain at least a 60% grade on the laboratory to pass the whole course.

**Discussion sections:**

In the discussion sessions you will solve problems similar to those which will occur in the quizzes and finals with the help of your TA and a small group of your fellow students. Again the interaction of the group is an important part of the course. You often learn more by discussion and trial and error amongst your peers than you can from the text book or lectures.

**Office visits:**

If you are having problems with the course do not hesitate to ask me or your TA for help. We can give individual coaching on specific topics.

**Homework:**

Homework gives you the opportunity to practice what you have learnt. Just as you need to practice to master a sport or a skill such as playing an instrument, you need to practice to be able to solve physics problems, particularly under the time strain of a quiz. Keep trying questions until they become easy.

**Quizzes and tests:**

Quizzes and test prove that you have learnt the subject and mastered the skills that have been taught.

**GRADING:**
The grade for Physics 1301 will be based on 4 quizzes, in class questions, laboratory, homework, and a final examination.

The majority of your grade in this course will be based on your ability to communicate your physics knowledge by solving problems in quizzes and in the final examination. Problem solutions will be graded based on a logical and organized answer grounded in the correct physics of a situation. You will get very few points for just giving the correct numerical answer with no indication of how it was obtained. No credit will be given for disconnected diagrams, isolated equations, or any answer that is not justified by a preceding logical development. On the other hand, numerical errors in an answer, well written and based on correct physics, will not be heavily penalized. Credit will be given for partially correct solutions. However, you will only receive credit if we can determine from what you have written, what you are doing, why you are doing it, and that your reasoning is correct.

Quizzes: Quizzes will be given on the following Thursdays and Fridays; February 12th, 13th, March 4th, 5th, April 1st, 2nd, and April 22nd, 23rd. The individual quizzes on Fridays will usually consist of a multiple choice section (25%) and 2 problems (50%). The 4th problem of the quiz (25%) will be given during the discussion session on the Thursday before. That problem will be solved collaboratively by your group with all group members receiving the same score. (Note the 10 minute rule: if you arrive at the discussion session more than 10 minutes late you cannot join your group and you will have to do the quiz by yourself). If you have missed one discussion session in the previous two weeks you will get only half the group score, if you have missed two you will get zero score. Quizzes will be returned in either laboratory or discussion section the following week.

Final examination: A 3-hour final will be given on Wednesday 12th May from 08:30 to 11:30. Some extra time will probably be available for those who work more slowly. An extra, make-up final will be available only if you previously obtain permission on the basis of a clash with another final exam.

In Class Questions: The classroom is equipped with receivers that will log your responses to occasional multiple-choice questions. You will use an Educue transmitter, which you have to buy at the bookstore, to respond. This is much like the audience’s help in 'who wants to be a millionaire'. You will get one point for any registered answer and two points for a correct answer.

Laboratory: Because this course satisfies University requirements as a laboratory science class and as a writing intensive course, you must pass the laboratory (60% of possible marks) to receive a passing grade in the course. The laboratory grade will be based on the demonstration of a well organized and correctly written technical descriptions of the experiments in your laboratory journal and laboratory reports. To ensure that you understand the physics and mathematical concepts needed for the lab, you must pass a computerized quiz in the preparation for each lab. You will not be able to participate in the laboratory and will score zero for that laboratory if you do not pass
the test. The laboratory preparation quiz is available on the web. It is an open book, open note quiz. The quiz may be taken as often as necessary but must be passed at least one hour before your scheduled laboratory session. **Make sure you take the test well before the lab so that if you have trouble you can get help from your TA or fellow students.** There are no make-up laboratories as equipment can only be put out during the defined lab period. The specific topic from the laboratory for which you will write a report will be assigned to you by your instructor at the end of each laboratory period (about every two weeks). Reports should be no longer than 5 nor shorter than 3 typed pages (using a word processor is encouraged and such facilities are supplied by the University) including all necessary predictions, graphs, data tables, and calculations. Your laboratory instructor will set the deadline for submission of reports. Late reports will not be graded. Graded reports will be returned to you not later than your next laboratory meeting and may be revised, based on instructor comments and on a time scale defined by the instructor, to achieve a higher grade. Remember this is a writing intensive course so your grade will depend on your communication skills. Your use of English and your grammar and spelling are important and will be graded.

**Homework:** Two homework problems will be handed out in the recitation sessions and will be due in the recitation the following week. One of the problems will be chosen at random for grading for 4 points. An additional 1 point will be given for handing in the other problem (zero for a blank sheet of paper!). These 5 points will count towards your final grade.

In addition to these problems it is essential that you practice solving the problems at the end of each textbook chapter. The number of problems you need to attempt will vary for each person and each topic but in general the more you do the easier they will be for you. It is strongly recommended that as a minimum you solve at least the problems listed at the end of this syllabus and given out in the lectures. The quiz problems will be similar to and adapted from that list of problems. The solutions are given on the Tipler web page but it is only useful to you if you attempt the problem **before** looking at the solution. Only look when you have a solution or become incurably stuck.

**Course grade:** The course grade will be determined by combining the grades from the various components of the course in the following way.

(a) Each of the 4 quizzes will count as 15% (your lowest quiz may be dropped).
(b) The final will count as 25% if one quiz is dropped or 10% if no quiz is dropped.
(c) The laboratory will count as 15%.
(d) The homework will count for 10%
(e) The in class quizzes will count 5%

The quizzes and final may be scaled on the basis of giving 100% to the highest grade obtained if that is significantly below 100%.

The final letter grade for the course will then be assigned as follows:
A: 83%-100%  
B: 68%-82%  
C: 50%-67%  
D: 40%-49%

F: less than 40% or a laboratory grade of less than 60%

The dividing lines will not be adjusted upwards but may be adjusted a point or two downwards. The dividing lines between the +, - subdivisions are not specified in advance.

TENTATIVE SCHEDULE

Week 1-2

Describing Straight Line Motion, Chaps. 1, 2 (not pg. 26)

Laboratory I, Laboratory Manual

Problem-Solving Techniques, Competent Problem Solver Chap. 1, 2

Week 2-3

Motion in a Plane, Chap. 3

Problem-Solving Techniques, Competent Problem Solver Chap. 3

Laboratory II, Laboratory Manual

Week 4-6

Forces, Chaps. 4, 5

Problem-Solving Techniques, Competent Problem Solver Chap. 4

Laboratory II, III, Laboratory Manual

Week 7-8

Conservation of Energy, Chaps. 6, 7 not (7.3, 7.4)

Problem-Solving Techniques, Competent Problem Solver Chap. 5

Laboratory IV, Laboratory Manual

Week 9-10

Conservation of Momentum, Chap. 8 not (8.7, 8.8)
You must read and study the assigned chapters before the lecture because ideas and definitions in the text will be used freely in the lectures. The problems and questions at the end of each chapter offer an opportunity for you to test your understanding of the material.

We suggest the following problems as a minimum for practice and quiz preparation.

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Suggested Problems</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14, 24, 38, 50, 56</td>
</tr>
<tr>
<td>2</td>
<td>12, 36, 66, 83, 87</td>
</tr>
<tr>
<td>3</td>
<td>40, 69, 77, 85, 98, 102, 110</td>
</tr>
<tr>
<td>4</td>
<td>8, 35, 44, 47, 66, 72, 100, 104</td>
</tr>
<tr>
<td>5</td>
<td>24, 38, 41, 59, 75, 105</td>
</tr>
<tr>
<td>6</td>
<td>14, 18, 28, 76, 80</td>
</tr>
<tr>
<td>7</td>
<td>28, 33, 56, 82, 84, 95</td>
</tr>
<tr>
<td>8</td>
<td>9, 35, 49, 77, 90, 114, 123</td>
</tr>
<tr>
<td>9</td>
<td>5, 24, 34, 65, 72, 74, 85, 92, 113, 132</td>
</tr>
<tr>
<td>10</td>
<td>38, 41, 54, 55, 83</td>
</tr>
<tr>
<td>12</td>
<td>13, 20, 31, 35, 48, 83</td>
</tr>
<tr>
<td>14</td>
<td>14, 58, 62, 92, 122</td>
</tr>
</tbody>
</table>
**Responsibilities:**

The University of Minnesota assumes that all students enroll in its programs with a serious learning purpose and expects them to be responsible individuals who demand of themselves high standards of honesty and personal conduct. All students are expected to behave at all times with the utmost respect and courtesy toward all of their fellow students, their instructors, and are expected to have the highest standards of honesty and integrity in their academic performance. Any behavior which disrupts the classroom learning environment or any attempt to present work that the student has not actually prepared as their own work or to pass an examination by improper means, is regarded as a serious offense which may result in the expulsion of the student from the University. The minimum penalty for such an offense is a failing grade for this course. Aiding and abetting the above behavior is also considered a serious offense resulting in equally severe penalties.

**Classroom Courtesy:**

Lectures end when the idea or technique under discussion has been concluded and the lecturer has clearly indicated that the students are free to leave. For this reason lectures are rarely expected to end exactly at the end of class time. Every student is expected to respect fellow students and the lecturer by being attentive until the class is dismissed. Packing up books, putting on coats, or standing up while the lecture is in progress interferes with the learning of other students and shows disrespect for all members of the class and for the educational process. Those few students who know they must leave the class before the lecture ends should have the courtesy and respect to sit in the rear of the class and near an aisle so that they can exit the classroom without disturbing the other students. Students who do not have a crucial appointment before the end of the lecture, should not sit in these seats but sit toward the front and center of the class. Only students sitting at the ends of rows are permitted to leave class before it is dismissed by the instructor.

**Open-Door Policy:**

If any difficulties or problems arise in this course that interfere in any way with your learning or optimum performance, we would very much like to hear about it. Please stop by to see any of the instructors in this course at any time with any matter that you would like to discuss. We will do our best to deal with problems promptly and effectively. We also appreciate hearing about the course, either congratulations or complaints, from students, and we encourage you to come by and chat any time you would like to. The end of the course is too late to complain for it to make any difference for you. Please get in touch with us in person or by e-mail. Our doors are open!