UNIVERSITY OF MINNESOTA
School of Physics and Astronomy

Physics 1301.1 – Introductory Physics I with Laboratory Fall 2001

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Office Hours Tu, W 9:00 - 10:00 and by appointment.

Class Times and Place:
Lecture: M Tu W 8:00-8:50 Room 150 Physics **(Bring 4x6 index cards to all lectures)**
Quiz day: F 8:00-8:50, Room 150 Physics

Texts:
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)
Also available: Outline of solutions to all problems in the text (Web)

In addition you may want to get a brief calculus reference such as:
Thompson: Calculus Made Easy. (Bookstore)

Discussion sections and Laboratories will meet beginning the first day of class.

CHANGES IN SECTION ROOMS ARE BELOW IN **BOLD**.

Sec	Discussion time	Discussion room	Lab. time	Laboratory room	TA
101/102	800-850 Th	AmundH 104	1220-1415 M	Phys 140	Bousquet / Nguyen
103/104	800-850 Th	**AkerH 309**	1430-1625 Tu	Phys 153	Zhang
105/106	800-850 Th	AkerH 209	1430-1625 W	Phys 153	Lu
107/108	800-850 Th	**FordH 155**	1220-1415 Th	Phys 153	Grzywacz
109/110	800-850 Th	LindH 229	1430-1625 Th	Phys 153	Lohstreter
111/112	800-850 Th	AmundH 116	1430-1625 Tu	Phys 215	Pan
113/114	800-850 Th	VinH 213	1430-1625 M	Phys 140	Karanth
115/116	800-850 Th	LindH 217	1430-1625 W	Phys 215	Yan
130/131	905-955 Th	VinH 213	1430-1625 M	Phys 153	Yan
132/133	905-955 Th	FordH 127	1220-1415 Tu	Phys 153	Grzywacz
134/135	905-955 Th	PeikH 215	1220-1415 W	Phys 140	Karanth
136/137	905-955 Th	1701U3	1220-1415 Tu	Phys 140	Lu
140/141	905-955 Th	BuH 123	1640-1835 M	**Phys 215**	Lohstreter
142/143	905-955 Th	CivE 213	1430-1625 Tu	Phys 140	Bousquet

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 the fall semester, you begin the study of the interactions of the objects that make up our world. This is the first of many challenging and, we hope, enjoyable courses in the School of Physics and Astronomy. By the end of this semester, you will be able to carefully and mathematically describe the motion of objects and infer from that motion the properties of their interactions. From the properties of those interactions, you will also be able to calculate the effect of those interactions on the motion of any object from galaxies to baseballs to atoms.

This class is required as the first step in the study of every science and engineering major. The reason is to prepare you for work in your chosen field by:

- Having a solid understanding that the diversity of the natural and man-made world comes from a very few fundamental principles of physics.
- Being able to solve complex problems similar to those occurring in real life by applying the fundamental principles of physics.
- Being able to decide on which principles and techniques are applicable to a situation.
- Communicating technical information in an organized and intelligible manner.

This course is designed to help you achieve these goals. 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.** 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 change 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 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. This course is not, and cannot be, self-contained. It assumes a set of common experiences from which to work.

We shall do what we can to facilitate your participation by giving you several different environments in which to work. Each of these learning environments, listed below, is designed to accomplish a different goal in your physics education. Some will be more natural to you than others but it is important that you participate actively in all of them. Preparing for a professional life means learning how to learn in as many different ways as possible.

Lectures: Individual learning in a large class, everyone has the same experiences. In this environment you should be able to:

- Answer the following questions about the lecture material. Why should I care about this? How is it related to other things I know? How can it be used?
- Follow the application of a logical and organized technique to use the basic principles of physics to solve problems.
- Ask questions of the lecturer and your fellow students to make sure the concepts and techniques make sense to you while they are being presented.
- Answer questions to ensure that you follow the concepts and techniques being presented.

Laboratories: Small-group learning in a small class. Each group's experience is generated by the needs and interests of its members. In this environment you should be able to:

- Predict the behavior of real objects to determine whether your ideas of physics agree with reality.
- Apply the physics concepts you have learned to real situations.
- Practice using problem-solving techniques with feedback from reality.
- Develop your technical communication skills by discussing physics concepts and laboratory techniques with your group and other groups.
- Develop your technical communication skills by keeping a detailed written record of your work and thoughts in a laboratory journal.
- Develop your formal technical communication skills by writing laboratory reports.
- Improve your ability to work in a collaboration to accomplish a technical goal.
- Improve your leadership skills when working in a technical collaboration.
- Receive coaching to improve your knowledge of physics concepts and problem solving techniques from your fellow students and instructor.

Discussion sections: Small-group learning in a small class. Each group's experience is generated by the needs and interests of its members. In this environment you should be able to:

- Practice problem solving techniques with feedback from fellow students.
- Apply physics concepts to realistic situations with feedback from fellow students.
- Get help from other students in recognizing where your ideas differ from reality.
- Discuss physics concepts and problem solving techniques with your group.
- Improve your ability to work in a collaboration to accomplish a technical goal.
- Improve your leadership skills when working in a technical collaboration.
- Receive coaching to improve your knowledge of physics concepts and problem solving techniques from your fellow students and instructor.

Office visits: Individual or small-group learning tailored to individual needs. In this environment you should be able to:

- Receive coaching to improve your knowledge of physics concepts and problem solving techniques.

Homework: Individual and group learning. In this environment you should be able to:

- Practice solving problems to determine if you can apply the physics concepts learned using the techniques taught in this course. Remember, only practice using correct techniques is beneficial.

Quizzes and tests: Individual and group learning. In this environment you should be able to:

- Communicate your knowledge of physics concepts and problem-solving techniques .

GRADING:
The grade for Physics 1301 will be based on **4 quizzes**, **laboratory**, **in-class questions**, 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 on quizzes and on the final examination. Problem solutions will be graded based on your written communication of a logical and organized process grounded in the correct assessment of the physics of a situation. Pictures, diagrams, phrases, and a logical mathematical development with well-defined quantities are the key elements in this communication. No credit will be given for disconnected diagrams, isolated equations, or any answer that is not justified by a preceding logical development. In the case of an incorrect solution to a problem, partial credit will be given for the communication of logical and organized solution steps up to the point that the solution departs from a correct analysis of the physics involved. In other words, you will only receive credit if we can determine from your writing: what you are doing, why you are doing it, and that your reasoning is correct.

Quizzes: Quizzes will be given during the scheduled lecture period on the following Fridays: **Sept. 21**, **Oct. 19**, **Nov. 9**, and **Nov 30**. These quizzes will usually consist of one qualitative section and 2 problems (75%) taken individually. The 4th problem of the quiz (25%) will be given during the discussion session the day before (**Sept. 20**, **Oct. 18**, **Nov. 8**, and **Nov 29**). That problem will be solved collaboratively by your group with all group members receiving the same score for that problem. **Only those participating in all discussion sessions during the preceding weeks will be allowed to take the group part of the quiz**. Quizzes will be returned in either laboratory or discussion section the following week.

Laboratory: Because this course satisfies University requirements as a laboratory science class and as a writing intensive course, **you must pass the laboratory to receive a passing grade in the course**. The laboratory grade will be based on the demonstration of a well organized and **correct** written technical communication of the physics concepts of this course in your laboratory journal and laboratory reports, well thought out predictions brought to class, and collaborative skills as evidenced by effective group work. To ensure that you have a conceptual introduction to the physics and mathematical concepts needed for beginning the lab, you will take a computerized quiz on the preparation for each lab. **No one will be allowed to participate in the laboratory unless they have passed the computerized laboratory preparation quiz for that topic**. Failure to participate in the laboratory will result in a laboratory grade of 0 for that topic. **There are no make-up laboratories.** 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. Because you might need help to pass, do not put this off until the last day. If you do not pass this quiz, get help from the instructors of this course and your fellow students. A passing grade is 75%. If you fail to pass the quiz after two attempts, get help. Since the laboratory involves teamwork, no laboratory makeup will be allowed except in situations officially recognized by the University. In that case, the laboratory work must be made up by arrangement with your instructor before your next scheduled laboratory period. Grades for the laboratory work will be determined in part by laboratory reports (one for each laboratory topic). The specific part of the laboratory for which you will write a report will be assigned to you by your instructor at the end of each laboratory topic (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. Reports must be given to your laboratory instructor

for grading no more than **3 days** after they are assigned. Late reports will not be accepted. Graded reports will be returned to you not later than your next laboratory meeting and may be revised based on instructor comments, only with instructor permission, to achieve a higher grade. If a revised report is allowed, it must be given to your laboratory instructor within **2 days**. Details of the laboratory grading are in your laboratory manual. Remember this is a writing intensive course so your grade will depend on your communication skills.

Final examination: A 3-hour final will be given on Tuesday, **Dec 18th** from **18:30 to 21:30**. Extra time that night will be available for those who work more slowly. **No early, late, or make-up finals will be given.**

In-Class Questions: At random times during the lecture you will asked to answer a question on an index card to be handed in. Your answer will be graded as either completely correct or incorrect.

Homework: Homework will not be collected but it is essential that you practice solving problems every day by working out those at the end of the textbook chapter. The number of problems you need to attempt will vary for each person and each topic. It is strongly recommended that you solve at least the problems listed at the end of this syllabus. **At least one quiz problem per test will be adapted from that list of problems.**

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).
(c) The final will count as 35% if one quiz is dropped or 20% if no quiz is dropped.
(d) The laboratory will count as 15%.
(e) In-lecture questions will count as 5%.

All grades will be on a scale of 0-100%. The numerical score will be weighted in accordance with the unit distribution given above, again on a scale of 0-100. The final letter grade for the course will then be assigned as follows:

A : greater than or equal to **88**

A-: less than **88** and greater than or equal to **83**

B+: less than **83** and greater than or equal to **78**

B : less than **78** and greater than or equal to **73**

B-: less than **73** and greater than or equal to **68**

C+: less than **68** and greater than or equal to **62**

C : less than **62** and greater than or equal to **56**

C- :less than **56** and greater than or equal to **50**

D+ : less than **50** and greater than or equal to **45**

D : less than **45** and greater than or equal to **40**

F : less than **40** or a **laboratory grade less than 60%**.

Example of grade calculation: Consider the set of grades: 86%, 59%, 74%, 90% (quizzes); 83% (final); 87% (laboratory); and 100% (in-class). The problem quiz with a score 59% will be dropped. The total numerical score is then (86+74+90)(0.15)+(83)(0.35)+(87)(0.15)+(100)(0.05) = 84.6, yielding a grade of A-. Suppose the scores for the final and the second quiz were exchanged, so that the score on the final was the lowest. Then the total numerical score would be (86+83+74+90)(.15)+(59)(0.20)+(87)(0.15)+(100)(0.05) = 79.8, yielding a grade of B+.

TENTATIVE SCHEDULE

Week 1-2	Describing Straight Line Motion Laboratory I Problem-Solving Techniques	Chap. 1, 2 (not pg. 26) Laboratory Manual Competent Problem Solver Chap. 1, 2
Week 2-3	Motion in a Plane Problem-Solving Techniques Laboratory II	Chap. 3 Competent Problem Solver Chap. 3 Laboratory Manual
Week 4-6	Forces Problem-Solving Techniques Laboratory II, III	Chaps. 4, 5 Competent Problem Solver Chap. 4 Laboratory Manual
Week 7-8	Conservation of Energy Problem-Solving Techniques Laboratory IV	Chaps. 6, 7 not (7.3, 7.4) Competent Problem Solver Chap. 5 Laboratory Manual
Week 9-10	Conservation of Momentum Laboratory V	Chaps. 8 not (8.7, 8.8) Laboratory Manual
Week 11-12	Rigid Body Motion Laboratory VI	Chaps. 9, 10.1 Laboratory Manual
Week 12	Applications - Statics Laboratory VI, VII	Chap. 12 not (12.7, 12.8) Laboratory Manual
Week 13	Conservation of Angular Momentum Laboratory VII	Chap. 10 not (10.5) Laboratory Manual
Week 14-15	Oscillations Laboratory VIII	Chap. 14 Laboratory Manual

You should make sure to 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. **Each quiz will have at least one problem adapted from this list**:

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

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 that 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 have the courtesy to 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'd like to discuss. We will do our best to deal with problems promptly and effectively. We also appreciate hearing about the course from students, and we encourage you to come by and chat any time you'd like to. Please get in touch with us in person or by e-mail. *Our doors are open!*