Syllabus

Phys113A-Hutson-Fall 2014

DESCRIPTION AND OBJECTIVES

Phys 113A is the first part of a two-semester, calculus-based course in general physics that is specifically designed for students majoring in the life sciences. This will be a rigorous course in physics with a selection of topics and examples that life science students should find relevant. Topics to be covered include: Newtonian mechanics; conservation of energy; wave propagation; and the microscale description of macroscale phenomena in elasticity, fluid mechanics and thermodynamics. The course is appropriate for pre-med and other pre-professional students. In fact, many of our learning objectives are connected to the objectives outlined in the American Association of Medical Colleges' report *Scientific Foundations for Future Physicians* (*SFFP*). Engineering majors and physics majors may take this course, but are advised that the Phys 116A/B and Phys 121A/B sequences may be more appropriate.

Co-requisites: a physics lab (114A) and a calculus course (Math 140, 150A or 155A)

Click this link to access the REVISED schedule of topics and reading assignments for the semester (or .pdf version).

For each topic, we will start with concrete observations, build conceptual models that explain these phenomena, and then add on mathematical details. I certainly expect you to solve problems at an appropriately challenging level, but I also expect you to use your conceptual knowledge to reason about physical phenomena. Such reasoning requires a deep understanding of physics. Although the topics we will cover require algebra, trigonometry and calculus, don't be fooled – mathematical sophistication without conceptual understanding is not physics. I will emphasize both the conceptual and mathematical aspects of physics and help you build a firm foundation for your future studies.

Overall, I have 10 learning objectives for this course. The first four are content areas that I expect you to understand and use competently. The other six are best characterized as meta-content. Opportunities to practice these skills will appear repeatedly in both the course and associated lab. I want each student:

1. to understand and apply Newtonian mechanics;
2. to understand and apply conservation of energy;
3. to understand and apply wave propagation and interference phenomena;
4. to understand how microscale dynamics yield macroscale phenomena in elasticity, fluid mechanics and thermodynamics;
5. to realize that (most) numbers have units – and are meaningless without such units – but that there are a few special and very informative dimensionless ratios;

6. to competently estimate orders-of-magnitude for various physical parameters – even when given incomplete information;
7. to fluently translate between multiple representations of data – verbal descriptions, pictures, diagrams, graphs and equations;
8. to recognize that experiments have noise, error and uncertainty, but can still be designed to test theories and hypotheses; and
9. to effectively determine when simple models are useful for understanding and predicting system behavior and when more complex models are required; and
10. to apply physics principles to concrete problems in biology, medicine and the everyday physical world.

CLASS STRUCTURE. Over the last 20 years, several groups have looked very carefully at how students learn physics. They have found that student learning improves when students are actively thinking about physics instead of passively listening to a lecture. With that in mind, you will not hear much conventional lecture from me. ***Your success in this course will depend on your active participation.*** To encourage your active participation, I will use two tools: in-class "clicker" questions and pre-class "warm-up" questions (see below for details). Your participation (as measured by these tools) will count 5% of your total grade. You can see how everything works together in this schedule of a typical week.

CLASS TIME AND LOCATION. Tues/Thurs 9:35am-10:50am in Stevenson Center 4327

CONTACT INFORMATION. Professor M. Shane Hutson
Stevenson Center 6835
343-9980 (office) or 319-0027 (cell, until 10 pm)
shane.hutson@vanderbilt.edu

OFFICE HOURS: Tuesday 3:00-5:00pm at the

Physics Help Desk

The Department of Physics and Astronomy has a drop-in help desk available for students enrolled in our introductory physics courses (Phys 113 and 116). The help desk is staffed by graduate students, faculty, and undergraduate physics majors.

Location: Stevenson 6322 (across from undergraduate labs)

Hours: Typically open Monday-Thursday from 1-9 pm
Closed during official holidays and after the last day of classes.

Click here to leave Help Desk Feedback.

Help Desk Schedule for Fall 2013 (coming soon)

; Friday ~~11:00am-noon~~ 1:00-2:00pm at my office

REQUIRED MATERIALS

TEXT. P.R. Kesten and D.L. Tauck, *University Physics for the Physical and Life*

Sciences, 1st Ed., Vol. 1
We will cover parts of chapters 1-9 and 11-15 this semester.

ONLINE HOMEWORK SYSTEM. *Sapling Learning*
When you bought the text for the course, you should have also received a *Sapling Learning* Access Card. Follow its directions to register with *Sapling Learning*. If you bought a used textbook or only want to use the eBook available inside the homework system, you can purchase online access directly from *Sapling Learning*. When registering, make sure to join the right section of the course.

CLICKER. *TurningPoint ResponseCard*
These are the same clickers used across the Vanderbilt campus. I will ask "clicker" questions nearly every class and your responses will count as part of your final grade. See the Clickers page for more details.

GRADING POLICIES

Your grade for the course will be determined by a weighted average:

Midterm Exams (3 @ 20% each)	60%
Final Exam	20%
Homework	15%
Participation (Clickers & Warm-Ups)	5%
TOTAL	100%

If your average exceeds 90, 80, 70, 60 then you will be guaranteed at least an A-, B-, C-, D- respectively. At my discretion, I *may* curve grades up on a single exam or overall at the end of the semester. I will never curve down from the guarantees above. If it helps your average, you may replace your lowest midterm exam grade with your final exam grade.

MIDTERM EXAMS. There are three exams scheduled during the semester. Each will have both and in-class part (multiple choice and short answer) and a take-home part (2-3 problems due before the next class). The in-class part will be closed book - I will provide an equation sheet and you can bring a calculator - but you will be able to use the texbook, online class-linked resources and your notes when working on the take-home part. In making part of the exam a take-home, I am relying on your compliance with Vanderbilt's Honor Code to work completely on your own and to not discuss the material with anyone else. The target dates are:

EXAM 1: ~~Tuesday, September 16~~ Thursday, September 18
EXAM 2: ~~Tuesday, October 14~~ Tuesday, October 21
EXAM 3: Tuesday, November 18

FINAL EXAM. The final examination is scheduled for Monday, December 8 at 3:00 pm.
The final exam is comprehensive and covers topics from throughout the course. There will be some extra emphasis on material that comes after the third exam (i.e., from K&T Chapter 13). Be aware of the final exam date when making end-of-semester travel arrangements. At present, I have no plan to offer an alternate final.

GRADING ERRORS. The course TAs and I are human, and try as we may, will probably make some errors in grading exams. We will be happy to reconsider your score, but such requests must be made in writing. Obviously, if we added up your score wrong, your written request should just show our mistake. If you feel your answer was more

correct than we gave you credit for, then your request must clearly state why this is so (We assume no one will make such a request if we mark a wrong answer right).

HOMEWORK. Homework sets in *Sapling Learning* are **due weekly on Tuesdays at 11:59pm**. You will have unlimited attempts to answer each homework problem. The *Sapling Learning* interface makes the problem solutions available after the due date, so late homework cannot be accepted. Students can request individual extensions of homework due dates, but these requests must be made BEFORE the assignment is due. Requests will be considered and granted at my discretion. If we are running substantially behind schedule in class, I may extend a homework deadline for everyone. If I do, I will send an announcement through OAK.

POLICY ON HOMEWORK COOPERATION. The purpose of the homework is for a student to learn how to solve the problems - solving problems is a measure of understanding the material. Although the homework counts for 15% of your grade, it will have a greater impact on your overall grade via its impact on your learning and thus on your exam performance (80% of your grade). For many, the best way to learn the material is is to do it yourself. If you do not get something the first try, and then you figure it out with hints, you will gain a lot in your understanding, particularly if you consciously think about what you did wrong on the early tries and why it was not correct. That said, the right group dynamics can also be helpful. The dynamics has to be such that every participant contributes and everyone is very stubborn about not moving on until they have a complete understanding. Notice that following the teacher or a friend is not sufficient understanding - you must be able to do the problems on your own (that is what you will have to do on exams). A clear and wrong group dynamic is having a friend solve a problem and you just copy it. This might add a little to your homework grade, but it will add nothing to your understanding, and hence nothing toward the 80% of your grade designed to measure this. Bottom line, you are responsible for understanding the material at a level where you can solve problems on a test in a reasonable amount of time. It is your responsibility to make sure whatever you do on the homework, you gain that level of understanding.

PARTICIPATION. ***Active participation is crucial to your success in this class!***

5% of your final grade will be based on your participation in PRE-class Warm-Up questions and in-class clicker questions. This is just enough to move your overall grade by about half a letter grade. Over the course of the semester, there will likely be about 50 Warm-Up questions (5 pts each) and 100-150 clicker questions (5 pts each). There will also be opportunities to earn large numbers of bonus participation points for completing assessments like the Physics Background Test (50 pts) and CLAS Survey (50 pts). Thus, there will be on the order of 1000 total participation points available. You earn these points almost exclusively based on effort, but I do give a small bonus (7 pts instead of 5) for getting a clicker question right. Both the assessment and correct-clicker-answer bonuses should be seen as an opportunity to make up for missing a day or two or participation (I hope everyone participates everyday, but let's be realistic). As an example, suppose you answered 40 of 50 Warm-Up questions and 80 of 100 clicker questions (getting only 25 of the 80 correct). If you also completed both assessments, then you'd have 750 participation points out of an expected 750 (5*50 + 5*100) and you'd earn the full 5% toward your overall grade. Note that the bonuses cannot be used to earn more than the full 5% toward a student's overall grade.

CLICKERS**. As an aid to active participation, we will be using clickers (aka *TurningPoint* ResponseCards). It is important that you bring your clicker to every class. The clicker questions I will ask are a tool to keep you thinking about and doing physics in

class. As such, I don't want you spending time busily writing down each clicker question in your notes. Instead, I will post all of the clicker questions after class (with answers) in the course's site at Project Galileo's Interactive Learning Toolkit. This is a good resource to use when studying for the exams!

To correlate each student with a particular clicker ID, I need each student to register their clicker using the TurningPoint Clicker Registration Tool. If you need to change your clicker at any point in the semester (occasionally one will stop transmitting), you can return to this tool and resubmit the form. Do not be tempted to submit clicker responses for someone else. Use of a clicker other than the one registered to you will be referred to the Honor Council.

WARM-UPS**. Your participation will also be graded by your submissions to warm-up questions posted in the course's site at Project Galileo's Interactive Learning Toolkit. I'm using this site because it has excellent tools for quickly reviewing and responding to your answers (much better tools than anything available in OAK). Please note that these are PRE-CLASS questions. I will post two warm-up questions at least two days prior to each class. One will be an open-ended question that the assigned reading will help you answer. The other will ask you to comment on what you found particularly interesting and/or difficult about the assigned reading. You should expect to answer such a pair of warm-up questions before EVERY class. Your answers are **due 1.5 HOURS BEFORE the corresponding class (technically at 8:00am)**. Answers will not be accepted after that time. I need this time to review your answers and adjust my plans for class time that day. I will respond to some answers in class and to others via email.

**If a student would like, special arrangements can be made with the instructor to do alternate work to replace the clicker and warm-up grades which together count 5% of the total grade. These arrangements must be made before September 15.

POLICY ON CLASS RECORDINGS. You may take pictures and make audio or video recordings of class sessions, but only for your own personal use in studying. During study sessions, you may allow other students to view the recorded materials, but you must request explicit permission from me (in writing) to post or share these recordings or pictures with others outside the class.