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Syllabus

PHYS 114: General Physics I – For Students of the Life Sciences

Spring 2019

This syllabus applies to both lecture sections (001 and 002) and all studio sections (501-507)

COURSE INFORMATION

Description: This course investigates the basic principles of physics including forces, energy, oscillations, diffusion, heat transfer and random processes, and focuses on how to apply these concepts to understand biological systems and processes. This course is intended to meet the needs of, but is not restricted to, students majoring in the life sciences. Students who have received credit for PHYS 104, PHYS 116 or PHYS 118 may not receive credit for PHYS 114.

Pre-requisites: none (although Math 231 or equivalent is also recommended)

Goals: This course has three primary goals:

1. To gain a fundamental understanding of matter and its interactions.
2. To be able to apply that fundamental understanding to analyze biological systems and processes.
3. To enhance skills in quantitative analysis of physical systems and phenomena.

Throughout this course you will have the opportunity to analyze the physical world around you and improve your critical thinking skills. The instruction for this course places significant emphasis on qualitative physical reasoning as an important foundation to quantitative problem solving.

Website: <https://www.unc.edu/sakai/> (The course is PHYS114.001.SP19)

Format: The course is conducted in a “Lecture/Studio” format. Each module comprises a 50-min. lecture meeting followed by a 110-min. studio session. Many classes will introduce one or more biological “driving questions” and the physics concepts relevant to those questions. During class (both the lecture and the studio parts of each module) you will spend most of your time performing hands-on, minds-on activities including responding to conceptual questions, discussing ideas with your classmates, performing experiments, and working

with computers and computer simulations. The basic aim of this format is to allow you to take charge of your own learning, with the curriculum materials and your instructor as guides.

Attendance: Attendance is mandatory at all lectures, exams, and studios.

CONTACT INFORMATION

Instructor: Prof. Frank Tsui

Office: Chapman 333

Email: ftsui@physics.unc.edu

Phone: (919) 962-0305

Office Hours:

Instructor: Prof. Colin Wallace

Office: Phillips 246

Email: cswphys@email.unc.edu

Phone: (919) 962-7160

Office Hours:

LOCATIONS, TIMES, AND INSTRUCTORS

Lecture

Location: Murphey 116

Time: MW 8:00-8:50 am (Section 001) or MW 9:05-9:55 am (Section 002)

Studio

Location: Phillips 335

Time: MW 3:35-5:25 pm (501), MW 5:45-7:35 pm (502), TTh 8:00-9:50 am (503), TTh 10:00-11:50 am (504), TTh noon-1:50 pm (505), TTh 2:00-3:50 pm (506), TTh 4:00-5:50 pm (507), TTh 6:00-7:50 pm (508)

Midterm Exams

Location: TBD

Time: 8:00-8:50 am or 9:05-9:55 am on Feb. 8, Mar. 8, and Apr 12 (all Fridays)

Q&A Sessions

Location: Murphey 116

Time: F 8:00-8:50 am and 9:05-9:55 am (except exam days)

Note: Whenever possible, please save your content-related questions for the Q&A sessions and/or for the forums on Sakai. Please do not e-mail us with content questions. This is to help us efficiently and quickly answer as many content questions for students as possible. Chances are good that if you have a question on some part of the content, other students have that same question, so it is better to have it answered where everyone can hear and/or see the answer, rather than having us send out the same e-mail response to multiple individuals.

PTC Hours

Location: Phillips 237

Time: TBD

REQUIRED MATERIALS

Text: Knight, Jones, and Field, *College Physics: A Strategic Approach*, 4th ed. (2018).

Note: You have the option to purchase a physical copy of this book, its e-text version (see the note for MasteringPhysics below), or both.

Classroom Response System: iClicker

Notes: Please make sure to register your iClicker using the link on the left-hand column of the class Sakai site.

Online Homework System: Modified MasteringPhysics (<http://pearsonmylabandmastering.com>)

Notes: You can buy the textbook and a Modified MasteringPhysics access code together. You can also buy Modified MasteringPhysics and an e-text version of the textbook. You will need the Course ID "wallace06093" in order to access the site for PHYS 114. When you first enroll in the course, you can wait up to 14 days before you have to purchase the access code.

Laptop for studio sections

Loose Leaf College-Ruled Notebook Paper or Perforated College-Ruled Notebook for studios

Scientific or graphing calculator

Notes: During exams, you are forbidden to use cell phones, tablets, or any other device that can connect to the Internet or another person. Students caught violating this policy should expect to receive the maximum punishment allowed by the university, including (but not limited to) receiving an F on the exam, failing the course, and being referred for further disciplinary action.

INSTRUCTIONAL PHILOSOPHY

Through this course, you will have the opportunity to use physics to analyze the biological world and improve your critical thinking skills. The instruction for this course places significant emphasis on qualitative physical reasoning as an important foundation to quantitative problem solving. Numerous studies conducted over multiple decades have consistently pointed to the same conclusion: No matter how eloquent or entertaining a lecturer is, you won't learn much unless your mind is actively engaged with the material. Achieving this level of active engagement is virtually impossible if you are only lectured at. Therefore, you should expect that there will be daily collaborative group activities during the lecture and studio portion of this class. These collaborative activities are designed to actively engage you and your classmates with the material and help prepare you for the exams.

Note that the instructors will act more as "coaches" who facilitate student learning, as opposed to "lecturers" who transmit knowledge without necessarily requiring thought or action on the part of the students. Since the instructional focus is on learning, students are expected to take more responsibility for their own learning than might be required in a more traditional lecture format. At the same time, frequent course assignments are designed to keep students "on track" through the learning process. To the extent possible, the instruction is aimed to meet a variety of learning styles. Performing the required reading and warm-up exercises will be essential for your success in this class. Most students who take this introductory physics course will not pursue advanced physics degrees. Consequently, you will not be required to memorize lots of physics equations, but you will be required to comprehend and apply physics concepts to a variety of situations. The reason that many students find physics difficult is that it goes beyond memorization by requiring higher level thinking skills. Learning physics is also like learning a foreign language since new words and symbols must be understood and applied correctly within the context of various physical situations. To this end, a variety of teaching techniques will be used throughout the

semester. These may include – but are not limited to – Pseudo-Socratic Dialog, Peer Instruction, and Cooperative Group Problem Solving.

- Pseudo-Socratic dialog*: Student questions are not answered directly. Instead, the teacher will ask students leading questions to facilitate the students to answer the questions themselves.
- Peer Instruction*: Lectures consist of short presentations on key points. Students are then asked a conceptual question related to the topic at hand. They are given time to think about it and then to discuss it with their neighbors. Answers are then given and discussed as a class.
- Cooperative Group Problem Solving*: A supportive environment is fostered in which students can practice using problem-solving strategies within the classroom setting.

Science is a group activity. Working in groups will help you develop skills that will benefit you throughout life. In addition, group work will actually help you learn physics. By discussing the concepts and problems with others you will discover alternative ideas and solutions. You will also have the opportunity to teach others what you have learned. Nothing tests your understanding of an idea better than trying to explain it clearly to someone else. You are strongly encouraged to study together – or at least with other people in the class, even if they are not in your assigned group. Any work submitted individually for a grade must be your own work. Any group assignments will receive group grades.

GRADING

Warm-up assignments (5% of final course grade): Before the beginning of each module, each student must complete a warm-up assignment. The assignment may include a reading assignment, a video to view, or other preparation for the week's activities. For quantitative questions, you will be given five attempts without penalty. For multiple-choice questions, you will be given five attempts, with a deduction of 15% for each incorrect attempt. Warm-up assignments will typically be made available on *MasteringPhysics* **at least two days before they are due** and are due at **11:59 pm the night before their associated lecture**. All warm-up assignments and their due dates will be available on the class *MasteringPhysics* site.

Personal responses in lecture (5% of final course grade): Each lecture, you will use your iClicker to respond to questions posed by the instructor. These questions actively engage you with the material, help deepen your understanding and prepare you for the exams, and provide in-class feedback on your mastery of the material. You are only graded for participating; wrong answers will not hurt your final course grade. In order to account for any technology failures, we will drop your lowest three daily response averages when calculating your final course grade. Note: If the average of all your exams (the four midterms and the final) is higher than your participation grade, then we will replace your participation grade with your exam average.

Homework (10% of final course grade): All homework assignments are available on *MasteringPhysics*. **Each**

module's homework assignment is due at 11:59 pm 1 week after that module is covered in lecture and studio. Please see *MasteringPhysics* for a complete list of assignments and their due dates. Students are encouraged to discuss the exercises with one another, but must submit individual responses to the questions. For quantitative questions, you will be given five attempts without penalty. For multiple-choice questions, you will be given five attempts, with a deduction of 15% for each incorrect attempt. No points will be deducted for using the hints, but students who do not use the hints will receive bonus points (2%).

Studio assignments (25% of final course grade): At the end of each studio section, your group will submit a single set of loose leaf sheets with your responses to questions from that day's studio activity. Since this is a group assignment, you are expected to work collaboratively. There are no make-up studios. In order to account for a day you might have to miss due to illness, we will drop your lowest studio grade when calculating your final course grade. If you need to miss more than one studio, you will need to provide documentation of your illness, conflict, etc.; see the Attendance and Late Policy section below. Please note that material covered in studio is fair game for the exams, so please avoid the temptation of skipping a studio just because you have yet to use your "free" missed studio.

Midterm Exams (each is 10% of final course grade): There are three midterm exams: Exam 1 is Feb. 8, Exam 2 is Mar. 8, and Exam 3 is Apr. 12. *Please note that Exam 2 is the Friday before Spring Break. Do not plan to leave town early.* Make-up exams will be only offered at the instructor's discretion and only if you have an excused absence. See the section on Attendance and Late Policy below for more information on what constitutes an excused absence.

Final Exam (25% of final course grade): The final exam is April 30 from 8:00-11:00 am (location TBD). This is a cumulative exam and it will be given in compliance with UNC's final exam regulations and according to UNC's final exam schedule.

Regrade Requests: If you believe there is an error with the grading of your exam, please fill out the Exam Regrade Form (available on Sakai in the "General Course Resources" folder). This form must be completed, stapled to the front of your exam, and submitted no more than 48 hours after an exam is returned. If 48 hours have passed and you have not submitted a regrade request, then your grade will not be changed. Please read the guidelines on the Exam Regrade Form and make sure you understand the expectations and consequences.

Extra Credit: In order to make sure all students are evaluated equally and fairly, no special extra credit opportunities offered to individual students on a case-by-case basis. There will be a limited number of opportunities for all students to earn a small amount of extra credit:

- There will be surveys given at the beginning, middle, and end of the semester. Each survey is worth 1/3 of a percentage point toward your final course grade.
- If the response rate for the official university course evaluation surveys (to which you will receive a personalized link in an e-mail from the university) is at or exceeds 90%, then every student will receive an extra 2 points (not percentage points) on their final exams.
- In order to encourage students to use the online forums on Sakai and to help each other out, we will give 5 extra points (not percentage points) on the final exam to the student who responds to the greatest number of posts with serious attempts to answer other students' questions. If more than one student are tied, then all will receive this bonus.

While additional extra credit opportunities may possibly be offered to the whole class at some point during the semester, I am under no obligation to do so.

Grading Scale: Grades will be based on the following scale:

A 93-100 C+ 77-79

A- 90-92 C 73-76

B+ 87-89 C- 70-72

B 83-86 D+ 67-69

B- 80-82 D 60-66

F 59 and below

Grading is based on demonstrated mastery of the course objectives. We will not grade on a curve and we have no pre-defined distribution of grades we are aiming for. **You are not competing with your classmates for a limited number of As and Bs.** In principle, if everyone achieves the requirements for an A, then everyone will earn an A! However, previous experience suggests that this is unlikely, and our department encourages instructors to aim for a median grade of B-/C+ so that about half the students in a course will likely receive grades of A or B. Consequently, the level of difficulty of the course is structured with this in mind.

ATTENDANCE AND LATE POLICY

Students are expected to attend all class meetings and participate in all activities in lecture and studio meetings. Excused absences can be granted only by Prof. Wallace, who must be informed in advance of the date of the absence except in cases of sudden illness or other emergency. There are no make-up studios and you cannot attend a studio section for which you are not registered. If you have an excused absence for a studio, then that studio will not count toward your final course grade (although you should still review the material since it will be fair game for the exams). For more information, please see the document "Introductory Physics Courses Excused Absence Policies," which is posted on Sakai under "Resources -> General Course Information." At the end of this document, you will find the "Excused Absence Request" (EAR) form. If you need to request an excused absence and/or an extension or excuse from an assignment, please fill out this form, print it out, and submit a hard copy of it to Prof. Wallace as soon as possible.

Unless you have made arrangements with Prof. Wallace prior to the due date for studio sessions or have an official university excused absence, you will receive a 0 for that studio. If you only attend a fraction of a given studio, then you may only receive a fraction of the points for that studio (e.g., if you only attend half of the studio, you may only earn half of the points that the rest of your group earns). If you oversleep or otherwise miss an exam and you do not have an excused absence, then Prof. Wallace is under no obligation to offer you a make-up exam; however, he may choose to offer such a make-up exam with an automatic reduction of your total score by 20%. No credit will be awarded for homework and warm-up assignments submitted after the due date.

An absence will be excused only if it is

- associated with participation in a university-sanction event (e.g., a music or athletic performance in which you are a member of the band or team);
- associated with attending a field trip or other activity for another course for which there is an unavoidable conflict;
- a religious observance;
- an unavoidable and documented illness (physical, emotional, or psychological);
- to mourn the death of a loved one; or
- a job interview, training session, graduate or professional school visit, conference attendance, or other degree- and career-related activity that has an unavoidable conflict with class (note: some activities that could fit in this category may not necessarily qualify as an excused absence, such as a workshop on how to write a grad school application essay).

An absence will not be excused if it is

- associated with attending an event (including university-sanctioned events) for which you are not a member of the participating group (e.g., missing class for a UNC basketball game is only excused if you are a member of the basketball team, the cheerleading squad, the band, or some other official UNC group that is performing at

that game);

- simply due to the fact that you are "busy" with other courses or responsibilities;
- to mourn the death of pet or other non-*Homo sapien*;
- a vacation (including vacations planned for school days before you knew your class and examination schedule);
- normally excused, but you failed to inform Prof. Wallace in a timely manner (e.g., e-mailing Prof. Wallace at 3 am the day of an exam to claim that you cannot attend the exam because of a graduate school interview).

Prof. Wallace will make the final determination about whether a given absence is excused or not.

HONOR CODE POLICY

The Honor code and the Campus Code, embodying the ideals of academic honesty, integrity and responsible citizenship, have for over 100 years governed the performance of all academic work and student conduct at the University. Acceptance by a student of enrollment in the University presupposes a commitment to the principles embodied in these codes and a respect for this significant University tradition. Your participation in this course is with the expectation that your work will be completed in full observance of the Honor Code.

Academic dishonesty in any form is unacceptable, because any breach in academic integrity, however small, strikes destructively at the University's life and work. If you have any questions about the Honor Code, please consult with someone in the Office of the Student Attorney General or the Office of the Dean of Students.

Students are expected to abide by the Honor Code in all classroom activities. Collaboration is explicitly allowed on assignments that are designated as group submissions. Discussion with other students prior to submitting an individual answer is also permitted on personal response activities in lecture and on homework exercises, as described above. All other graded assignments (warm-ups and exams) must be submitted without any aid not explicitly authorized by the instructors.

CHANGES TO SYLLABUS

The instructors reserve the right to make changes to the syllabus, including due dates and test dates. These changes will be announced as early as possible.