Syllabus

PHYS 115: General Physics II – For Students of the Life Sciences

Spring 2016

This syllabus applies to both lecture sections (001 and 002) and all studio sections (501-505 and 507-510)

COURSE INFORMATION

Description: Basic principles of physics including fluids, electromagnetism, optics, nuclear and quantum physics, and 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 taken PHYS 105 or PHYS 117 may not receive credit for PHYS 115.

Pre-requisites: Physics 114 and Math 231 or equivalent

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; and
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 PHYS115.001.SP16)

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. Laurie McNeil
Office: Chapman 325
Email: mcneil@physics.unc.edu
Phone: (919) 962-0963  
Office Hours: 10:30-12:30 Tuesdays, or by appointment.

Instructor: Dr. Colin Wallace  
Office: Phillips 162  
Email: csphys@email.unc.edu  
Phone: (919) 962-7160  
Office Hours: 1:00-3:00 pm Thursdays, or by appointment

LOCATIONS, TIMES, AND INSTRUCTORS

Lecture

Location: Chapman 201

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

Studio

Location: Phillips 275

Time: MW 10:10 am – noon (Sec 501) OR MW 12:20 pm – 2:10 pm (Sec 502) OR MW 2:30 pm – 4:20 pm (Sec 503) OR MW 4:40 pm – 6:30 pm (Sec 504) OR MW 6:45 pm – 8:35 pm (Sec 505) OR TTh 10:00 am - 11:50 am (Sec 507) OR TTh noon – 1:50 pm (Sec 508) OR TTh 2:00 pm – 3:50 pm (Sec 509) OR TTh 4:00 pm – 5:50 pm (Sec 510) (check your schedule)

Midterm Exams

Location: TBD

Time: 8:00 am - 8:50 am (Section 001) and 9:05 am – 9:55 am (Section 002) on Feb. 12, Mar. 4, Apr. 1, and Apr. 22 (all Fridays)

Review Sessions

Location: Chapman 201

Time: Every Friday from 8:00 am – 9:55 am except exam days

REQUIRED MATERIALS


Cost: Physical copies are $275.60 new or $169.50 used in UNC’s bookstore.

Notes: 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

Cost: $56 new or $42 used

Online Homework System: MasteringPhysics (http://masteringphysics.com)

Cost: $65.95 by itself; however, you can buy the textbook and a MasteringPhysics access code together at the bookstore for $297.85. You can also buy MasteringPhysics and an e-text version of the textbook for $113.95.

Notes: You will need the Course ID “PHYS115001SP16” if you're in Section 001 (MW 8:00 am-8:50 am) or “PHYS115002SP16” if you're in Section 002 (MW 9:05 am-9:55 am) in order to access the site for PHYS 115.

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 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 4:00 pm on Thursday and due on Sunday at 6:00 pm and Tuesday at 6:00 pm. 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.

**Homework (10% of final course grade):** Homework assignments are typically made available on MasteringPhysics no later than 8:00 am on Wednesday and due the following Wednesday at 8:00 am. Assignments and their due dates will be posted on the Mastering Physics site. Students are encouraged to discuss the exercises with one another, but must submit individual responses to the questions. For quantitative questions, you will 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.

**Midterm Exams (each is 8% of final course grade):** There are four midterm exams. Make-up exams will only be given with the instructors’ permission and only for those students who have been granted an excused absence.

**Final Exam (23% of final course grade):** There is a common final exam for both lecture sections on Saturday, April 30 from 8:00 am – 11:00 am. 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.

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

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<thead>
<tr>
<th>Grade</th>
<th>Percentage Range</th>
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<tbody>
<tr>
<td>A</td>
<td>95-100</td>
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<tr>
<td>A-</td>
<td>90-94</td>
</tr>
<tr>
<td>B+</td>
<td>87-89</td>
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<tr>
<td>B</td>
<td>83-86</td>
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<tr>
<td>B-</td>
<td>80-82</td>
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<tr>
<td>C+</td>
<td>77-79</td>
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<td>C-</td>
<td>70-72</td>
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<tr>
<td>D+</td>
<td>67-69</td>
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<tr>
<td>D</td>
<td>63-66</td>
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<tr>
<td>F</td>
<td>62 and below</td>
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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 Dr. Wallace, who must be informed in advance of the date of the absence except in cases of sudden illness or other emergency.

Unless you have made arrangements with Dr. 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). No credit will be awarded for homework and warm-up assignments submitted after the due date.

**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.