East China Normal University
International Summer Session

PHY 12 College Physics I

Term: July 5th –August 8th, 2018
Instructor: James Doyle
Home Institution: Macalester College
Office hours: 11:30 – 12:30 MTWThF
Email: doyle@macalester.edu
Teaching Assistant: TBD

Course Description

This course is a algebra-trigonometry-based college level introduction to the fundamental principles of physics. Topics include kinematics in one and two dimensions, vectors, Newton's Laws of Motion, work and conservation of energy, conservation of momentum, circular motion and gravitation, rotational motion, harmonic motion, sound, and heat and thermodynamics. In addition to the physics content knowledge students will develop quantitative problem solving skills, critical thinking skills, and in the laboratory part of the course experimental and data analysis skills. Students are expected to have proficiency in basic algebra and trigonometry.

Course Overview

Physics is often considered to be the most fundamental science. The basic principles of physics are foundational to further studies in physics and are highly relevant to other areas of science and technology such as chemistry, geology, and even biology and medicine. The aim of physics is a thoroughly quantitative understanding of the physical world, and the key to mastering the ideas of physics is to *engage in quantitative problem solving.* Effective problem solving consists of understanding the underlying background material and theory, the study of examples where the theory is applied while paying careful attention to common strategies and approaches, and finally applying these approaches to problems that you have not encountered before. You will find that your problem solving skills will improve immensely with experience.

But it is also important to remember that physics is an *experimental science* and its fundamental principles are \based on *empirical observations and careful experiment*. Thus, in this course the essential ideas of mechanics will be explored and reinforced in a series of laboratory exercises, with the goal of understanding the nature of measurement, experiment, and the scientific method.

Course Goals:

A student who satisfactorily completes this course should:
1. Be familiar with the content, methods, and applications of classical mechanics and thermodynamics.
2. To understand how Newton's Laws of Motion provides the foundation for the richness and variety of mechanical phenomena, and how the Laws of Thermodynamics inform our understanding of thermal processes.
3. To understand the fundamental ideas of kinematics, the vector nature of forces, work and the conservation of energy, the conservation of momentum, the description of rotation motion and the ideas of torque and angular momentum, the nature of harmonic motion and sound, fluid mechanics, and heat and thermodynamics.
4. To understand the nature of the scientific method and scientific reasoning as applied to physics.
5. To develop proficiency in quantitative problem solving, data analysis and interpretation, and critical thinking skills.

Required Text

The textbook is *Physics: Principles with Applications (7th Edition) - Standalone book 7th Edition* By Douglas C. Giancoli is required. The text is available as an eTextbook from Amazon.com (ISBN-13: 978-0321625922 ISBN-10: 0321625927).

The lab manual for the laboratories will be provided on the first day of class. Students should purchase inexpensive bound notebook (at least 50 pages) to serve as a *dedicated* laboratory notebook.

Course Hours

The course has 25 class sessions in total. Each class session is 110 minutes in length, for a total of 2750 minutes of in-class time. The course meets from Monday to Friday from July 5 to August 8. ECNU awards 4 credits for this course. Different universities may count course credits differently. Consult officials at your own home institution.

Attendance

Summer school is very intense and to be successful, students need to attend every class. Occasionally, due to illness or other unavoidable circumstance, a student may need to miss a class. ECNU policy requires a medical certificate to be excused. Any absence may impact on the student's grade. Moreover, **ECNU policy is that a student who has more than 3 absences will fail the course. Arriving late or leaving early will count as a partial absence.**

Grading Policy

ECNU awards grades of A, A-, B+, B, B-, C+, D, and F. Most colleges and universities do not award transfer credit for grades of D or F.

In this course, grading will be based on the following:

Midterm Exam	20%
Final Exam	30%
Homework	20%
Laboratory	20%
Reading Quizzes/Discussion	10%

Every non-lab class will begin with a short (~ 5 min) reading quiz followed by a short class discussion to cover the general ideas and "big picture" in the reading. Since the quizzes will be given at the beginning of class, you must arrive at class on time. Your two lowest quiz scores will be dropped. *Missed quizzes cannot be made up.*

There will be 15 Homework assignments each consisting of approximately 10-12 exercises and problems from the textbook. Homework is due at the beginning of class on the due date. You can work together on the homework, but the submitted work must be your own. Late homework will be accepted only in very extenuating circumstances such as serious illness. There will also be some Review Problems assigned for exam review, but these will not be submitted for grading. Students are expected to work Review Problems in preparation for the exams just as if they were assigned homework problems. Solutions to all assigned problems will be posted after the due date.

For the laboratory assignments you will submit your laboratory notebook for grading at the beginning of the next class period.

General expectations:

Students are expected to:

- Attend all classes and be responsible for all material covered in class and otherwise assigned. Any unexcused absence may impact a student's grade. Moreover, ECNU policy is that a student who has more than 3 absences will fail the course. Arriving late or leaving early will count as a partial absence.
- Complete the day's required reading and assignments before class
- Review the previous day's notes before class; make notes about questions you have about the previous class or the day's reading
- Participate in class discussions and complete required written work on time.
- Refrain from texting, phoning or engaging in computer activities unrelated to class during class. Students who do not do this will be asked to leave the class
- While class participation is welcome, even required, you are expected to refrain from private conversations during the class period.

Course Schedules

DATE	TOPIC	READING
WEEK ONE:		
7/5 Thurs:	Introduction and Kinematics in One Dimension	Chapter 1 pp. 2-16 Chapter 2 pp. 22-28
7/6 Fri:	Lab 1: Introduction to Laboratory and Measurement	
WEEK TWO:		
7/9 Mon:	Kinematics in One/Two Dimensions	Chapter 2 pp. 28-41 Chapter 3 pp. 50-58
7/10 Tues:	Kinematics in Two Dimensions	Chapter 3 pp. 58-67
7/11 Wed:	Lab 2 Constant Acceleration	
7/12 Thurs:	Newton's Laws of Motion	Chapter 4 pp. 76-84
7/13 Fri:	Newton's Laws/Circular Motion	Chapter 4 pp. 84-98 Chapter 5 pp. 110-118
WEEK THREE:		
7/16 Mon:	Gravity/Midterm Review	Chapter 5 pp. 119-130
7/17 Tues:	Lab: Newton's Laws of Motion	
7/18 Wed:	Midterm (1 hour Chapters 1-5)/Work and Energy	Chapter 6 pp. 139-145
7/19 Thurs:	Potential Energy and Conservation of Energy	Chapter 6 pp. 145-160
7/20 Fri:	Lab 4: Conservation of Energy	
WEEK FOUR:		
7/23 Mon:	Impulse and Momentum	Chapter 7 pp. 171-182
7/24 Tues:	Conservation of Momentum/Rotational Motion	Chapter 7 pp. 182-187 Chapter 8 pp. 199-208
7/25 Wed:	Lab 5: Conservation of Momentum	
7/26 Thurs:	Rotational Motion/Static Equilbrium	Chapter 8 pp. 208-220 Chapter 9 pp. 231-239
7/27 Fri:	Fluids	Chapter 10 pp. 261-278
WEEK FIVE:		
7/30 Mon:	Lab 6 Rotational Motion	
7/31 Tues:	Oscillations and Waves	Chapter 11 pp. 293-317

8/01	Wed: Sound	Chapter 12 pp. 329-344
8/02	Thurs: Lab 7: Harmonic Motion	
8/03	Fri: Temperature and Kinetic Theory	Chapter 13 pp. 359-381

WEEK SIX:

8/06	Mon: Heat/Laws of Thermodynamics	Chapter 14 pp. 391-406 Chapter 15 pp. 413-420
8/07	Tues: Laws of Thermodynamics/Review for Final	Chapter 15 pp. 420-431
8/08	Wed: Final Exam (110 minute)	

Academic Honesty

Students are expected to maintain high standards of academic honesty. Specifically, unless otherwise directed by the professor, students may not consult other students, books, notes, electronic devices or any other source, on examinations. Failure to abide by this may result in a zero on the examination, or even failure in the course.