PHYS 1C
Waves, Optics, and Modern Physics

Summer Session I, 2012

Instructor: Grigor Aslanyan, aslanyan@physics.ucsd.edu
Office hours: Tuesday, Wednesday, 2:00-3:00pm, MHA 4514

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Office hours: Monday, Thursday, 11:00am-12:00pm, MHA 2702 (physics tutorial center)

Course webpage: http://physics.ucsd.edu/students/courses/summer2012/session1/physics1c

Textbook: Serway, Jewett, "Physics I" (UCSD Custom Text), volumes 1 & 2, Edition 4

Lectures: Monday, Tuesday, Wednesday, Thursday, 3:30-4:50pm, YORK 2622
Problem sessions: Tuesday, 6:00-7:50pm, CENTR 222
Holiday: Wednesday, 07/04/2012 (no lecture or office hours)
Midterm 1: Wednesday, 07/11/2012, 3:30-4:50pm, YORK 2622
Midterm 2: Wednesday, 07/25/2012, 3:30-4:50pm, YORK 2622
Final exam: Saturday, 08/04/2012, 3:00-6:00pm, TBA

Course description (informal): This course will connect different branches of physics and introduce you to new fascinating phenomena. The main object under discussion will be waves; we will start from simple mechanical waves, including sound waves, then study the propagation of electric and magnetic fields as waves. Light is one example of electromagnetic waves. We will study the propagation of light through media and get un understanding of optical instruments. The limits of your imagination will be challenged as you learn about how elementary particles can behave as waves, which results in very counterintuitive phenomena. We will then get a deeper understanding of the source of the periodicity of the table of chemical elements. Finally, we will discuss some basic properties of atomic nuclei and nuclear reactions.

Course description (formal): Oscillations and waves: mechanical oscillations, mechanical and electromagnetic waves, superposition and standing waves. Optics: reflection and refraction of light, mirrors and lenses, interference and diffraction of light. Quantum physics: wave-particle duality, uncertainty principle, hydrogen atom, spin, exclusion principle, periodic table, nuclear physics.

Homework: Homework will be assigned each week but not collected for grading. Each weeks assignment will be posted on the course webpage on or before Monday. The solutions will be posted later in the week to give you enough time to work on your own, with the exception of weeks 2 and 4 (midterm weeks) when they will be posted together with the homework. It is strongly encouraged to do the homework **before** the problem session. Homework solutions should be checked only after considerable effort on your own. Doing the homework is the best way to prepare for the exams. Each of the exams will contain at least two problems almost (or completely) identical to a homework problem.

Grading: The overall course grade will be based on two midterm exams (**25% each**) and the final exam (**50%**). Attendance to the exams is **mandatory** and there will be **no makeup exams**. Make sure to **bring your student ID** to all three exams, you may not be allowed to take the exam without it. You need a **scantron** X-101864-PAR-L, a number 2 pencil to fill in the scantron, and a calculator for each

exam. You are not allowed to have anything else during the exams, the main equations you need will be provided (the equation sheet will be posted on the course webpage 1-2 days in advance). Exam grades will be posted with your unique 3-digit code numbers on the course webpage. The codes will be emailed to you during the first week of classes, you **need to know your code number** at every exam.

Tentative Course Schedule

Week 1	
Mon, 07/02	Introduction to oscillatory motion, energy conservation, simple pendulum: 12.1-12.4
Tue, 07/03	Physical pendulum, damped and forced oscillations, introduction to waves: 12.5-12.7, 13.1-13.2
Wed, 07/04	Holiday
Thu, 07/05	Wave equation, waves on strings, reflection and transmission, energy transfer, sound waves, Doppler effect: 13.3-13.8
Week 2	
Mon, 07/09	Superposition, interference, standing waves, beats: 14.1-14.6
Tue, 07/10	Review and examples
Wed, 07/11	Midterm 1
Thu, 07/12	Displacement current, Maxwell's equations, electromagnetic waves: 24.1-24.3
Week 3	
Mon, 07/16	Energy, momentum, and pressure of EM waves, spectrum and polarization: 24.4-24.8
Tue, 07/17	The ray model, reflection and refraction, Huygens's principle, total internal reflection: 25.1-25.8
Wed, 07/18	Flat and spherical mirrors, ray diagrams: 26.1-26.2
Thu, 07/19	Images formed by refraction, thin lenses: 26.3-26.5
Week 4	
Mon, 07/23	Interference, double-slit experiment, thin films: 27.1-27.5
Tue, 07/24	Review and examples
Wed, 07/25	Midterm 2
Thu, 07/26	Diffraction, resolution of apertures, diffraction grating, crystals, holography: 27.6-27.10
Week 5	
Mon, 07/30	Introduction to quantum physics, photoelectric effect, wave-particle duality, uncertainty principle: 28.2, 28.5, 28.7, 28.8
Tue, 07/31	Hydrogen atom, spin, exclusion principle, periodic table: 29.1, 29.2, 29.4, 29.5
Wed, 08/01	Introduction to nuclear physics, binding energy, radioactivity: 30.1-30.4
Thu, 08/02	Review and examples
Sat, 08/04	**FINAL EXAM**