

PATTERNS IN NATURE

(PHY 100 section 91)

Syllabus, Fall 2016

Instructor: Dr. Gurmohanjeet S. Bevli

Course Summary: An important and distinguishing quality of us humans is our ability to discern patterns and use this ‘pattern recognition’ ability to understand nature which, in turn, gives us the ability to predict and then pass on this information to succeeding generations for further refinement and improvement. In the present day many of these topics and techniques have come to be classified under the subject heading of physics. This course will explore some interesting patterns in nature that have been recognized and analyzed using fairly sophisticated techniques developed over several centuries. Since this is a freshman introductory general education course, the emphasis will be on *understanding* the essential physics principles and recognizing their manifestations in everyday life. Students will be exposed to the two seemingly contradictory but complementary entities *viz.* waves and particles. To this end, first matter waves and then electromagnetic waves will be studied in sufficient detail. Next the particle nature of matter will be understood by studying atoms and their behavior. Following this, the idea of wave particle duality will be presented as the true nature of matter. The course will be rounded off with a discussion on special and general relativity.

Goals and Objectives: By the end of this course, students should be aware of the essential differences between waves and particles. They should be able to point out the main features that are used to characterize waves and particles. They should be able to understand the difference between matter and electromagnetic waves, different types of waves such as transverse and longitudinal and explain wave phenomena such as interference, refraction etc. They should be able to understand radioactivity, atomic spectra etc. and their importance in showing matter as particles. They should be able to understand the deficiencies of either the particle or wave approach as the true nature of matter and that the true nature of matter is a synthesis of both these models.

Lectures and course meetings: Tuesdays 3:00 – 4:30 PM.

Office hours: M, W, F: 9:45 – 10:45 AM and Tu, Th: 9:45 – 11:00 AM in NSM D-229

Office Telephone: 310 243 2035 (unreliable) **Instructor’s E-mail:** gbevli@csudh.edu (very reliable)

Phone for live questions during lecture: 1-800-339-1193

Email for live questions during lecture: askdhtvlive@gmail.com

Materials: (1) The class text is *Conceptual Physics* (11th Ed) by Paul Hewitt (Pearson, 2012). The parts to be covered are: chapters 19–36. Parts of some chapters which require considerable additional readings may be skipped. Used copies of the class text are typically available for around \$40 (oftentimes less). (2) A subscription to an online HW utility called Webassign is required. A link to this utility is put up in the tools section on blackboard. This will cost about \$30. Thus, it is estimated that the total cost to buy materials for this course is about \$70 (give or take a few dollars).

Assessment: Students will be assessed on the basis of their performance on HW assignments, a comprehensive final examination, tests (held several times during the semester), and several quizzes. Questions in tests will be multiple choice type and will try to assess conceptual understanding and draw heavily from HW questions. Quizzes will be short (4-6 questions) and given out before beginning a chapter or topic. The final exam will be multiple choice and comprehensive, in that questions will be from all the material covered in this course. Homework will be assigned online through Webassign. Students will have to buy a subscription to this service. The overall grade will be computed based on the following weightage chart and *tentative* grading scale:

Homework	20%	Greater than 90 %	A-, A
Tests	35%	75 % to 90 %	B-, B, B+
Quizzes	15%	60 % to 75 %	C-, C, C+
Final	20%	45 % to 60 %	D, D+
Participation	10%	Less than 45 %	F

Participation will be judged by the instructor on the basis questions asked during live sessions (either by calling in or through email) and also on responses to questions posed by the instructor. Sufficient time (several hours) will be given for responding to these questions. In addition, student progress and punctuality on HW assignments, quizzes and tests shall be monitored and also used to decide the participation score.

Policies: Webassign will be set up for automatic extensions with a penalty on unearned points. In addition, every student is entitled to **one** unpenalized HW extension during the semester for which students have to send a manual extension request to the instructor. Quizzes will open on blackboard on Tuesday night after class and students have until Monday night of the following week to complete them. Most quizzes will be less than 5 minutes long. Instructions and readings for quizzes will be announced on blackboard. No make-ups for Tests and Quizzes. The **Final exam** is compulsory and will be put up online during finals week (Dec 8 - 14, 2016).

Statement on Academic Integrity: Cheating, plagiarism, and other types of academic dishonesty will not be tolerated. For details on student responsibilities concerning academic integrity and this topic in general please consult the current CSUDH University Catalog.

Revisions: Please note that these policies and the class schedule following this page are subject to revision to account for unforeseen developments during this course.

SCHEDULE		
Date	Events, Topics	Chapters, Readings
08/23	Introduction, Preliminaries, Vibrations and Waves	Ch 19, Syllabus
08/30	Syllabus, Grading, Waves, Sound, Music ; Quiz 19	19, 20, 21, Syllabus
09/06	Waves, Sound, Music ; Quiz 20-21	19, 20, 21
09/13	Musical Sounds, Electrostatics ; Quiz 22	20, 21, 22
09/13	TEST 1: Tue, Sept 13 at 5:30 PM – Sat, Sept 17 at 5:30 PM	19 – 21
09/20	Electrostatics, El. Current ; Quiz 23	22, 23
09/27	El. Current, Magnetism ; Quiz 24-25	23, 24
10/04	Magnetism, Electromagnetic Induction ; Quiz 26-27	24, 25
10/11	EM Induction, Light, Color	24, 25, 26
10/11	TEST 2: Tue, Oct 11 at 5:30 PM – Sat, Oct 15 at 5:30 PM	22 – 25
10/18	Light, Colors, Reflection, Refraction ; Quiz 28-29	26, 27, 28
10/25	Refraction, Light waves, Light Emission ; Quiz 30-31	29, 30
11/01	Light Waves. Light Emission, Light Quanta	29, 30, 31
11/01	TEST 3: Tue, Nov 1 at 5:30 PM – Sat, Nov 5 at 5:30 PM	26 – 29
11/08	Light Quanta, The Atom and Nucleus ; Quiz 32-33	31, 32, 33
11/15	Radioactivity, Nuclear Fission ; Quiz 34	33, 34
11/22	Nuclear Fission and Fusion ; Quiz 35-36	34
11/29	Nuclear Fission and Fusion, Special Relativity	34, 35
11/29	TEST 4: Tue, Nov 29 at 5:30 PM – Sat, Dec 3 at 5:30 PM	30 – 34
12/06	Special and General Relativity	35, 36
12/06	TEST 5: Tue, Dec 6 at 5:30 PM – Thu Dec 8 at 5:30 PM	35, 36
12/08	Final Exam: Thu, Dec 8 at 12:01 AM – Wed, Dec 14 at 11:59 PM	19-36