SUNY OLD WESTBURY
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Department of Chemistry and Physics

COURSE NAME: CP 2700-Wave Motion: Light and Sound

INSTRUCTOR: Dr. Fernando Espinoza

OFFICE ADDRESS: NAB 1003

OFFICE HOURS: Monday 11:00-1:00 PM

TELEPHONE: (516) 334-2517

E-MAIL ADDRESS: espinozaf@oldwestbury.edu

COURSE DESCRIPTION

An introductory course in wave phenomena designed to meet the General Education's Natural Sciences (GE7) requirement, with an emphasis on the development of process skills to enhance critical thinking and information management as competencies. Coverage of topics in acoustics and optics, two areas of considerable importance in their applications to modern forms of technology that directly impact our lives. Incorporation of microcomputer-based laboratory (mbl) tasks as the basis for the experimental component. Laboratory activities are exploratory and support content coverage with applications that can be replicated/simulated in inquiry-based tasks that use sensors and mobile devices to collect and analyze data.

Pre-Requisite: Math 1020 (College Algebra)

The designation as an honors section is based on the nature and structure of the course. The concepts and ideas introduced along with their applications go hand in hand. To that extent, the lecture, recitation (problems solving sessions), and laboratory tasks are contiguous. There is no demarcation between how wave concepts are introduced, and their uses in a variety of contexts. Laboratory experiences can sometimes be completed in a session, but typically will require extended periods, thus becoming more like projects. This structure allows for more reflection since the tasks are exploratory, rather than confirmatory, as they commonly are in traditional science courses.

https://www.compadre.org/osp/items/detail.cfm?ID=12399&Attached=1

COURSE OUTCOMES

Participant outcomes expected upon successful completion of the course

Outcome (knowledge)	GE 7 Natural Sciences Learning Outcomes
Demonstrate an understanding of a) the contextual nature of scientific knowledge, as well as its strengths and limitations; b) the reliable but provisional nature of experimental results obtained through various methods.	Gain familiarity with the vocabulary, unifying principles and tools of physics.
Demonstrate the ability to know the distinction between a claim and a cause, between an assertion and an argument, between a hypothesis and a conclusion (similar to that between a prediction and an inference), and between evidence and speculation.	Improve critical thinking skills by making hypotheses and drawing conclusions based on laboratory experiments.
Demonstrate the ability to distinguish between scientific and technological concepts, their intricate relationship through applications, their philosophical differences, and the realization that mathematics is the language of science.	Understand the relationship between mathematics, science and technology.
Outcome (skills)	
Demonstrate an ability to provide qualitative and quantitative observations, to form and extend patterns, make predictions, use of models in representations, and mathematical analysis (i.e. by data interpolation and extrapolation).	• Become familiar with conventional laboratory techniques, record their observations and measurements and draw reasoned conclusions from laboratory experiments. • Improve writing skills by writing laboratory reports.
Demonstrate an ability to select appropriate measurement types, use standard and nonstandard units, use sensors effectively to collect data, and to use measurements as evidence to help explain conclusions.	• Become familiar with conventional laboratory techniques, record their observations and measurements and draw reasoned conclusions from laboratory experiments.

	• Improve critical thinking skills by making hypotheses and drawing conclusions based on laboratory experiments.
Demonstrate an ability to describe relationships among objects and events observed, select appropriate from nonessential information, and exhibit sound reasoning in verbalizing inferences.	• Develop an appreciation for scientific principles and processes at work in their environment. • Improve writing skills by writing laboratory reports.
Demonstrate an ability to suggest several plausible hypotheses to explain observed situations, systematically test for hypotheses and formulate tentative conclusions, and to exhibit transference to a different contextual setting (applications of scientific data).	Improve quantitative skills by working problems, interpreting quantitative data and creating graphical displays of scientific data.
Outcome (dispositions)	
Develop an understanding and a disposition to see that a comprehensive approach can pave the way to discover larger implications, namely the connections among the sciences, the arts, and the humanities.	Understand the way science influences and is influenced by forces in society.
Develop a disposition to view science in social and technological contexts as it is applied to meet human needs in areas such as medicine, industry, and business.	Develop an appreciation for the historical setting in which scientific progress has been made.

Instructional methods implemented in the course:

- Direct instruction
- Reflection through discussion
- Small group cooperative project work
- Use of media and technology specifically related to course content

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Textbook:
"*Wave Motion as Inquiry-The Physics and Applications of Light and Sound"*

(F. Espinoza) Springer International Publishing (2017). ISBN# 978-3-319-45756-7

Assessment:

Two term Quizzes - 20%
Laboratory component (Experiments) - 40%
Final Examination- 30%
Attendance and Classroom participation- 10%

Dates	Topic and Sections	Homework
May 20th	Introduction to the course objectives and Mathematical review; rationale and organizational details. Introduction to Wave Phenomena.	Preface & Chapter 1. pp. 1-7; Chapter 1. pp. 7-15; Chapter 1. pp. 19-21.
May 21st	**Accuracy and Precision** General Characteristics of Waves	Handout given in class Chapter 2 pp. 25-30
May 22nd	General characteristics, applications to light and sound	Chapter 2 pp. 25-30 & 31-38. Chapter 2. pp. 42-45 & 46-55.
May 23rd	**Speed of Sound** Reflection, plane mirrors	Handout given in class Chapter 3. pp. 59-64.
May 24th	Continuation of Reflection, curved mirrors; **(Quiz #1)**	Chapter 3. pp. 64-70
May 28th	Continuation of Reflection, applications to sound; **Law of reflection and Plane Mirrors.**	Chapter 3. pp. 73 & 74. Handout given in class
May 29th	Refraction, total internal reflection. **Index of Refraction**	Chapter 4. pp. 75-80. Handout given in class
May 30th	Properties of lenses.	Chapter 4. pp. 81-86 & 99-101.
May 31st	Interference and standing waves. **(Quiz #2)**	Chapter 5. pp. 103-110.
June 4th	**Lenses experimental task.** Continuation of Interference and Standing Waves	Handout given in class Chapter 5. pp. 111-116.
June 5th	**Tones, Vowels, and telephones Experiment;** Diffraction	Handout given in class Chapter 6. pp. 117-125.
June 6th	Changes in properties of waves **Doppler Effect Experiment**	Chapter 8. pp. 149-156. Handout given in class.
June 7th	**Final Exam**	

NO MAKE-UP EXAMS

ATTENDANCE

Attendance is mandatory since several activities will be planned and executed that may require extensive preparation. ***More than one unexcused absence, or several (more than two) instances of lateness will result in a full grade reduction***. The use of electronic media (laptops, iPads, cell phones, etc.) for non-academic purposes in the classroom/laboratory, has been found to *distract students around those engaging in it*, so please be mindful and considerate of your neighbors (including the professor), thank you.

ACCOMODATIONS FOR STUDENTS WITH SPECIAL NEEDS

If you have or suspect you may have a physical, psychological, medical or learning disability that may impact your course work, please contact Stacey DeFelice, Director, The Office of Services for Students with Disabilities (OSSD), NAB, 2065, Phone: 516-628-5666, Fax (516) 876-3005, TTD: (516). The office will help you determine if you qualify for accommodations and help you get them. All support services are free and all contacts with the OSSD are strictly confidential. SUNY/Old Westbury is committed to assuring that all students have equal access to all learning activities and to social activities on campus.

SCHOOL OF ARTS AND SCIENCES- POLICY ON ACADEMIC INTEGRITY

Plagiarism and cheating are condemned at all institutions of higher learning. These acts detract from the student's intellectual and personal growth by undermining the processes of studying, reading, note-taking and struggling with one's own expression of ideas and information. Moreover, cheating inevitably involves secrecy and exploitation of others. See "Academic Integrity" and related topics in the *Old Westbury Catalog, 2006-2008,* p.46.

Plagiarizing means "presenting somebody else's words or ideas without acknowledging where those words and ideas come from" (Ann Raimes, *Keys for Writers,* 5th ed., p.188). Examples include:

- copying material from the Internet or other sources and presenting it as your own
- using any author's words without quotation marks; using any quotation without credit
- changing any author's words slightly and presenting them as your own
- using ideas from any published sources (even in your own words) without exact credit. **Note:** This includes all material from the Internet or electronic databases.
- using long passages in a paper that have been written or rewritten by a friend or tutor
- turning in any assignment written by someone else

However, using quotations or borrowed ideas while giving exact credit is good academic procedure. Other types of academic dishonesty include unauthorized collaboration or copying of

students' work (cheating); falsifying grades or evaluations; and others. They are treated as equivalent to plagiarism. When detected and verified, plagiarism and other academic dishonesty will be punished severely. Normally, the first offense will result in a failure on the specific assignment; a second offense or a particularly flagrant first offense will result in failing the course. Know what plagiarism is and how to avoid it; for guidance see Raimes or any other college writing handbook. **Please note: in this matter, ignorance is never an acceptable excuse.**