PHYS 274 Introduction to Modern Physics  
3 Credits (CRN 60389)  
Tuesdays and Thursdays; 11:30 to 12:45 pm  

INSTRUCTOR: Dr Jacob V Hudson Jr  
OFFICE: Hale Imiloa 130 or 122 (NASA AEL Flight Lab)  
OFFICE HOURS (times students may drop in for help): M-F 12:00 to 2:00 pm  
TELEPHONE: X9112  
EMAIL: jacobh@hawaii.edu  
EFFECTIVE DATE: Spring 2019; 1/7 – 5/10

WINDWARD COMMUNITY COLLEGE MISSION STATEMENT

Windward Community College offers innovative programs in the arts and sciences and opportunities to gain knowledge and understanding of Hawai‘i and its unique heritage. With a special commitment to support the access and educational needs of Native Hawaiians, we provide the Ko‘olau region of O‘ahu and beyond with liberal arts, career and lifelong learning in a supportive and challenging environment — inspiring students to excellence.

CATALOG DESCRIPTION

This course focuses on the study of physical optics, special relativity, quantum mechanics, solid state physics, atomic and nuclear physics, and elementary particle physics.

PRE-REQUISITE

Credit for or registration in Physics 272 or consent of the instructor

STUDENT LEARNING OUTCOMES

As a result of taking this course, students can expect to attain the following outcomes:

1. Describe the theory of special relativity and its effects: time dilation and space contraction.
2. Describe the particle like properties of electromagnetic radiation as demonstrated in the photoelectric effect and Compton scattering.
3. Analyze the wavelike properties of matter known as quantum theory.
4. Identify and describe knowledge of the different properties of solids such as crystal structure, thermal and magnetic properties, and superconductivity.
5. Describe nuclear structure, radioactive decay, nuclear interactions, and their interactions.
6. Identify the different elementary particles and describe their role in the forces that hold matter together.

CONNECTION WITH GLOs

- Develop the ability to perceive how people interact with their cultural and natural environments, through their own worldview and through the worldview of others, in order to analyze how individuals and groups function in local and global contexts.
• Identify information needed in a variety of situations, and access, evaluate, and use relevant information effectively and responsibly.
• Make judgements, solve problems, and reach decisions using analytical, critical, and creative thinking skills.
• Use written, visual, and oral communication to discover, develop, and communicate meaning, and to respond respectfully to the ideas of others in multiple environments.

LEARNING RESOURCES

Text: Fundamentals of Physics (8th Edition); D. Haliday, R. Resnick, & J. Walker
       J. Wiley and Sons, Inc.

In addition to the above-mentioned text, students will need a straight edged protractor, and a ‘non-QWERTY’ type calculator. A graphing calculator (such as a TI-85) is highly recommended.

COURSE PHILOSOPHY

Physics is an interesting and challenging subject. It is also the basic science, the foundation of all other physical sciences. Physics attempts to describe the fundamental nature of the Universe and how it works, striving for the simplest explanations common to its diverse behavior. For example, physics explains why the sky is blue, why rainbows have color, what keeps a satellite in orbit, and what atoms and nuclei are made of. In a rapidly changing environment the key to success is adaptability. There is no other field of study available which offers the student greater flexibility in this high tech society of ours. Whether the student is contemplating a career as a scientist, an engineer, a teacher, a physician, a lawyer, or a businessperson, one can get no better grounding in fundamental, logical and critical thinking then is possible in physics.

ASSESSMENT

Grading: Student assessment will be determined from class participation (~5%), homework (~40%), midterms (~35%) and the Final (~20%). All students are required to take the Final exam.

Class Participation – In addition to the class lecture, students are to take part in the problem solving that will be emphasized each class.

Homework – A homework assignment will be given each class. The assignment is due at the beginning of the next class period. No Late assignments will be collected.

Exams – There are three midterm exams, each yielding approximately 12% of the overall point total of the semester grade. The final exam is at the scheduled time, and is worth approximately 20% of the overall point total of the semester grade.

COURSE CONTENT

Tentative Schedule:

Windward Community College is an equal opportunity, affirmative action institution.
<table>
<thead>
<tr>
<th>Date</th>
<th>Chapter</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/8</td>
<td>Interference</td>
<td>Chap. 35</td>
</tr>
<tr>
<td>1/15</td>
<td>Diffraction</td>
<td>Chap. 36</td>
</tr>
<tr>
<td>1/24</td>
<td>Relativity</td>
<td>Chap. 37</td>
</tr>
<tr>
<td>2/5</td>
<td>EXAM I</td>
<td></td>
</tr>
<tr>
<td>2/7</td>
<td>Photons</td>
<td>Chap. 38</td>
</tr>
<tr>
<td>2/14</td>
<td>Matter Waves</td>
<td>Chap. 39</td>
</tr>
<tr>
<td>2/26</td>
<td>Quantum Theory</td>
<td>Chap. 40</td>
</tr>
<tr>
<td>3/5</td>
<td>EXAM II</td>
<td></td>
</tr>
<tr>
<td>3/7</td>
<td>Atomic Theory</td>
<td>Chap. 41</td>
</tr>
<tr>
<td>3/12</td>
<td>Semiconductors</td>
<td>Chap. 42</td>
</tr>
<tr>
<td>3/28</td>
<td>Nuclear Physics</td>
<td>Chap. 43</td>
</tr>
<tr>
<td>4/9</td>
<td>EXAM III</td>
<td></td>
</tr>
<tr>
<td>4/16</td>
<td>Nuclear Energy</td>
<td>Chap. 44</td>
</tr>
<tr>
<td>4/23</td>
<td>Quarks Model</td>
<td>Chap. 45</td>
</tr>
<tr>
<td>4/30</td>
<td>Standard Model</td>
<td></td>
</tr>
<tr>
<td>5/2</td>
<td>Cosmology</td>
<td></td>
</tr>
<tr>
<td>5/9</td>
<td>FINAL EXAM</td>
<td></td>
</tr>
</tbody>
</table>

### ADDITIONAL INFORMATION

- MySuccess: Students may be referred for extra help or advising through MySuccess. Students can also explore resources at MySuccess.Hawaii.edu and windward.hawaii.edu/MySuccess.

### DISABILITIES ACCOMMODATIONS

If you have a physical, sensory, health, cognitive, or mental health disability that could limit your ability to fully participate in this class, you are encouraged to contact the Disability Specialist Counselor to discuss reasonable accommodations that will help you succeed in this class. Ann Lemke can be reached at 235-7448, lemke@hawaii.edu, or you may stop by Hale ‘Ākoakoa 213 for more information.

### TITLE IX

Title IX prohibits discrimination on the basis of sex in education programs and activities that receive federal financial assistance. Specifically, Title IX prohibits sex discrimination; sexual harassment and gender-based harassment, including harassment based on actual or perceived sex, gender, sexual orientation, gender identity, or gender expression; sexual assault; sexual exploitation; domestic violence; dating violence; and stalking. For more information regarding your rights under Title IX, please visit: https://windward.hawaii.edu/Title_IX/.

Windward Community College is committed to the pursuit of equal education. If you or someone you know has experienced sex discrimination or gender-based violence, Windward CC has resources to support you. To speak with someone confidentially, contact Karla Silva-Park, Mental Health Counselor, at 808-235-7468 or karlas@hawaii.edu or Kaahu Alo, Designated Confidential Advocate for Students, at 808-235-7354 or kaahualo@hawaii.edu. To make a formal report, contact the Title IX Coordinator at 808-235-7393 or wcctix@hawaii.edu.

*Windward Community College is an equal opportunity, affirmative action institution.*
ACADEMIC INTEGRITY
Work submitted by a student must be the student’s own work. The work of others should be explicitly marked, such as through use of quotes or summarizing with reference to the original author.

Students can upload papers to http://www.TurnItIn.com to have papers checked for authenticity, highlighting where the paper potentially fails to appropriately reference sources.

In this class, students who commit academic dishonesty, cheating or plagiarism will have the following consequence(s):

Students will receive a failing grade for plagiarized assignments.

All cases of academic dishonesty are referred to the Vice Chancellor for Student Affairs.

ALTERNATE CONTACT INFORMATION
If you are unable to contact the instructor, have questions that your instructor cannot answer, or for any other issues, please contact the Academic Affairs Office:

Location: Alakai 121
Phone: 808-235-7422
Email: wccaa@hawaii.edu

Windward Community College is an equal opportunity, affirmative action institution.