Spring 2-1-2017

PHSX 323.01: Intermediate Physics Lab

Paul H. Janzen
University of Montana - Missoula, paul.janzen@umontana.edu

Let us know how access to this document benefits you.
Follow this and additional works at: https://scholarworks.umt.edu/syllabi

Recommended Citation
https://scholarworks.umt.edu/syllabi/5039

This Syllabus is brought to you for free and open access by the Course Syllabi at ScholarWorks at University of Montana. It has been accepted for inclusion in Syllabi by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.
PHSX 323 -- Intermediate Physics Lab Spring 2017

Instructor: Paul Janzen
Office: CHCB 128
Office hours: M 10:00 - 11:00, MW 4:00 - 5:00, F 1:00 - 3:00, and by appointment
Phone: 243-2374
Email: paul.janzen@umontana.edu
Lecture: Mondays and Wednesdays 3:00 - 3:50 PM in CHCB 012
Lab: Tues 12:30-4:20 PM or Thurs 12:30-4:20 PM
Prerequisites: PHSX 217N-218N or PHSX 207N-208N
PHSX 311 (Oscillations and Waves)
Credits: 3

Description:

This is a laboratory course in the application of analog and digital electronics to experimental physics, with additional emphasis on data analysis techniques.

Goals:

To introduce a variety of electronic circuits, circuit analysis and design, and measurement techniques.

To advance the ability to perform data analysis, including the propagation of uncertainties.

To begin the transition from pre-prepared laboratory apparatus to experiments that need to be designed, built, and optimized by the student.

Learning Outcomes:

- Will be skilled in the use of oscilloscopes, digital multimeters, and other electronic measurement devices
- Will be able to explain the physical principles underlying the operation of diodes and transistors, and underlying the frequency response of various circuits
- Will be able to design, build, and analyze basic op-amp circuits
• Will be able to interface a variety of measuring devices to computers in order to accomplish specific measurements
• Will be able to set up and document experiments, and take measurements, correctly and appropriately for a physics laboratory environment, and analyze the data statistically

Grading:

At the end of Monday's lecture, a homework assignment will be given out. It will be due by the start of your next lab period. Late assignments, unless approved in advance, will automatically receive a 50% reduction. The homework assignment is designed to give you some practice in the type of calculations you will need to complete the laboratory efficiently.

Lab notebooks will be due by 5 PM Friday. One experiment, later in the course, will require a full formal write-up beyond the lab notebook.

One test will be given during the semester (March 29). In addition, there will be a written comprehensive final exam (May 9, 3:20 PM).

Laboratory Notebook: 45%
Lab Report: 10%
Homework Assignments: 15%
Test: 10%
Final Exam: 20%

This course can be taken for a traditional letter grade only.

Notes:

Add/Drop can be performed online until February 10. Add/Drop can be performed with the instructor's and advisor's signatures until April 3.

All students must practise academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. The Code is available for review online at http://www.umt.edu/vpsa/policies/student_conduct.php

Students with disabilities may request reasonable modifications by contacting me. The University of Montana assures equal access to instruction through collaboration.
between students with disabilities, instructors, and Disability Services for Students. "Reasonable" means the University permits no fundamental alterations of academic standards or retroactive modifications.

**Tentative Course Outline**

<table>
<thead>
<tr>
<th>Week</th>
<th>Laboratory Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC circuits</td>
</tr>
<tr>
<td>2</td>
<td>Capacitors and AC circuits</td>
</tr>
<tr>
<td>3</td>
<td>Filters and diodes</td>
</tr>
<tr>
<td>4</td>
<td>Cables and Impedance Matching (Speed of Light)</td>
</tr>
<tr>
<td>5</td>
<td>Transistors</td>
</tr>
<tr>
<td>6</td>
<td>Op-amps I</td>
</tr>
<tr>
<td>7</td>
<td>Op-amps II</td>
</tr>
<tr>
<td>8</td>
<td>FETs</td>
</tr>
<tr>
<td>9</td>
<td>Review and test of analog electronics</td>
</tr>
<tr>
<td>10</td>
<td>Logic and flip-flops</td>
</tr>
<tr>
<td>11</td>
<td>Lock-In Amplifier</td>
</tr>
<tr>
<td>12</td>
<td>Modern physics experiment</td>
</tr>
<tr>
<td>13</td>
<td>Computer interfacing I</td>
</tr>
<tr>
<td>14</td>
<td>Computer interfacing II (embedded controllers)</td>
</tr>
</tbody>
</table>