

Physics 369: Instrumentation Electronics
MW 7:05 pm - 9:55 pm in room BBH 237
College of Arts & Sciences Syllabus

COURSE INFORMATION

Credit Hours: 4.000

Course Description: Lecture and laboratory course on the properties and uses of electronic scientific instruments used in making physical measurements, including computer interfacing. The instruments are studied from input transducer to final output. A major emphasis is placed on laboratory work, where actual instrumentation circuits are built and tested. The course culminates with each student building an actual scientific instrument. Lecture 2 hours, Lab 4 hours.

Course Prerequisites: none

FACULTY INFORMATION

Instructor: Dr. Orin Harris

Office Location: BBH 217B

Office Hours: MW 6:05 pm - 7:05 pm, TR 2:00 pm - 3:00 pm, or by appointment

Phone Extension: 5561

Email: O-Harris1@neiu.edu

COURSE MATERIALS

List of Required Texts/Materials:

There is no text for this course. Instead, the instructor will make available, in class or through D2L, the reading materials, or in other cases, provide references to materials for each topic.

You will need to keep a lab notebook that will periodically be collected at the end of class.

If you have access to a laptop, please bring it to class.

Useful texts, references:

Getting Started in Electronics by Mims

Practical Electronics for Inventors by Scherz & Monk

The Art of Electronics by Horowitz & Hill

COURSE OBJECTIVES / STUDENT LEARNING OUTCOMES

Major topics to be covered in this course:

- Electromagnetism, electric charge, voltage, current, resistance, electrical and mechanical work, power
- Measurement of current, voltage, resistance, and use of digital multimeters
- Voltage sources, batteries, power supplies, direct and alternating current, rectification, resistive loads
- Circuit analysis, principle of superposition, Thevenin's Theorem, Kirchoffs voltage and current laws, voltage and current division
- Capacitance, inductance, LRC circuits, filters and time constants, complex phase, differential equations involving charge transfer
- Nonlinear/non-ohmic devices, semiconductors, diodes, transistors, amplifiers, transducers, flip-flops and multivibrators
- Breadboard circuit prototyping
- Logic gates, programming, computer interfacing with microcontrollers

Student learning outcomes:

- Provide students with a broad understanding and appreciation of the physical principles and laws governing the universe.
 - Students will gain an appreciation of the quantitative methods used in Physics and in other STEM disciplines.
- Prepare students for success in their chosen careers by emphasizing critical thinking and scientific reasoning through an inquiry-based curriculum.
- Develop quantitative, analytical and problem-solving skills in majors and non-majors to ensure that students emerging from the coursework/program are equipped with the set of competencies required in the STEM (Science, Technology, Engineering and Mathematics) workplace.
 - Students will demonstrate proficiency in analyzing and solving problems in physics and related STEM fields.
- Develop scientific proficiency in majors and non-majors to ensure that students in the program will demonstrate a breadth and depth of scientific understanding, and be able to translate their scientific knowledge across STEM disciplines.
- Develop proficiency in technical and communication skills.

STUDENT TASKS / ASSIGNMENTS / REQUIREMENTS:

Assignments: Homework will be assigned each week on D2L and collected the same day the following week unless otherwise specified. Credit for homework problems will only be given if you show your work, as well as draw illustrative diagrams when necessary to understand what the symbols you have written refer to. Further, units must be specified when giving numerical results, and points will be deducted for incorrect use of significant figures. Homework assignments turned in late will be given a 10% penalty, and homework will not be accepted more than one class period beyond the due date, and must be turned in at the beginning of class.

Quizzes: Quizzes will be given once a week, focusing on problem solving methods related to the previous week's lecture and reading assignments.

Lab Notebooks: A lab notebook must be kept. The notebook should contain all of the work the students have performed during the lab. This should be kept up to date and organized. The lab notebook will be included in the assessment of class participation, and will periodically be collected at the end of class.

Final project: A final project will be completed, along with a presentation or a paper written about the project. Groups will choose a final project at approximately the course's halfway point.

Grading Policies and Formulae:

Homework	10% of the total grade
Class participation and lab notebook	30% of the total grade
Quizzes	40% of the total grade
Final Project	20% of the total grade

Any student who achieves a percentile score of above 90%, 80%, 70%, 60% is guaranteed to receive an A, B, C, or D respectively. These percentile scores may be adjusted downwards based on a class curve and other considerations.

COURSE POLICIES AND STATEMENTS

Use of class time: Approximately half of class time will be dedicated to lecture and/or quizzes, typically followed by lab work.

Reading: Reading assignments for each week will be provided on D2L. I expect you to have finished reading each week's assignment before lecture.

Course communication: All pertinent class communications between the instructor and students is conducted exclusively through NEIU e-mail. Thus it is the responsibility of students to check their NEIU e-mail account for all significant information and updates on class cancellations in the event of threatening weather conditions.

I will send information weekly with updated reading assignments, homework, associated due dates.

Absence Policy: There is a grade based on participation in class. If there is an unexcused absence, you will receive no participation points for that class. Additionally, if the absence prevents the normal upkeep of the lab notebook, this will also be reflected in the grade.

Academic Integrity Policy: By enrolling in this course, you are bound by the NEIU Student Code of Conduct: <http://www.neiu.edu/university-life/student-rights-and-responsibilities/student-code-conduct> You will be informed by your instructor of any additional policy specific to your course regarding plagiarism, class disruptions, etc.: Plagiarism is forbidden. No headphones, cell phones being used, or other distractions in class.

ADA Statement: Northeastern Illinois University (NEIU) complies with the Americans with Disabilities Act (ADA) in making reasonable accommodations for qualified students with disabilities. To request accommodations, students with special needs should make arrangements with the Student Disability Services (SDS) office, located on the main campus in room D104. Contact SDS via (773) 442-4595 or <http://www.neiu.edu/university-life/student-disability-services>.

Campus Safety: Emergency Procedures and Safety Information can be found on NEIUport on the MyNEIU tab or as follows: http://homepages.neiu.edu/neiutemp/Emergency_Procedures/MainCampus/.

Incomplete Grade Policy: An Incomplete (“I”) grade is temporary and exceptional, and can be given only to students whose completed coursework has been qualitatively satisfactory but who have been unable to complete all course requirements because of illness or other circumstances beyond their control. An “I” grade is not to be awarded in place of a failing grade or when the student is expected to attend additional class meetings or to re-register to complete the course requirements. Additionally, an “I” grade is not a means for the student to raise his/her grade by doing additional work.

A request for an “I” grade must be made by the student to the faculty member before the last official day of the semester or term. The faculty member retains the right to make the final decision on granting a student’s request for an “I” providing the student meets the provisions above, even though the student may meet the eligibility requirements for this grade. Students have up to one semester, excluding summer, to complete the work.

It is the responsibility of the student to complete and submit the remaining coursework before the assigned deadline. The faculty member will submit a grade change converting the “I” to a letter grade by or before the last day of the semester in which the outstanding coursework is to be completed. If the student does not meet the deadline, the “I” will be converted automatically to a final grade of an “F.” Since the “I” grade is temporary, faculty may not issue a terminal “I” grade.

Upon receipt of the grade change, the Registrar Services Office will post the grade to the students record and recalculate the GPA. Although students have up to one semester, excluding summer, to complete the work to change the grade of Incomplete, the students academic standing will be reassessed only if the grade change is received by the Friday of the first full week of the semester immediately following the one in which the “I” grade was assigned. Students will not be allowed to graduate with “I” grades on their records.