

CHM 4143c: Electronics and Instrumentation

Spring Semester 2017 (3 credits)

- Instructor:** Nick Polfer, 311C Chemistry Lab Building (CLB), polfer@chem.ufl.edu, 392-0492
- TA:** John Tokarski, tokarskijt@chem.ufl.edu
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- Office hours:** TBA
- Course description:** CHM 4143c is a combined lecture and laboratory class, providing students with an understanding of the principles and applications of electronic devices and techniques employed in modern computerized scientific measurements in analytical/physical chemistry.
- Objectives:** It is expected that by the end of the course students will be familiar with basics of electronics circuits, including DC measurements, logic circuits, and op-amp circuits. The students will also have acquired sufficient coding experience, and should be able to design a LabView project to automate and control laboratory measurements.
- Textbooks:** The lecture notes will be based on the following textbooks (**no** need to purchase, all lecture material will be provided):
1. The Art of Electronics, Paul Horowitz, Winfried Hill, 2nd Edition, Cambridge University Press, ISBN 978-0-521-37095-0.
 2. Teach Yourself Electricity and Electronics, Stan Gibilisco, 3rd Edition, McGraw-Hill, ISBN 0-07-137730-1.
 3. Practical Electronics for Inventors, Simon Monk and Paul Scherz, Fourth Edition, McGrawHill, ISBN 9780071828611.
- Venue:** **FLI 109** (Flint). Lectures and lab periods will take place in this classroom.
- Lectures:** **M, W 5th period** (11:45 am – 12:35 pm)
The lectures will be made available on an E-learning web environment.
- Exams:** Two exams, one midterm and one final exam, will

review the lecture material.

**Course
Policies:**

Attendance at all class/discussion sessions and **at least 6 hours of lab per week** is expected. Any absences are subject to UF regulations <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>

As a courtesy, it is expected that students arrive on time and that they mute their cell phones during class.

Requirements for class **attendance** and **make-up exams**, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: <https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx>.

Students should also familiarize themselves with the UF Student **Honor Code** posted at www.chem.ufl.edu/~itl/honor.html.

Students with disabilities must first register with the Dean of Students Office; the Dean of the Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting **accommodation**.

The assignment of grade points follows the UF **grading policies**, see undergraduate catalog <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>.

Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These **evaluations** are conducted online at <https://evaluations.ufl.edu>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu>

**Lab
experiments:**

- There are a total of 5 lab units that will be covered as a part of the laboratory part of the

course. The sequence of experiments deal with measurement instrumentation, digital logic, data acquisition using LabVIEW, power supplies, op amps, etc.

- A lab “period” consists of a 3-hour lab session. Students have to choose among two options:
MW 6-8 **or** TR 6-8
- Instructions for the lab exercises will be posted on the E-learning website.
- Students are required to hand in lab reports within **1 week of completing the lab**. Note that performance in these lab units largely determines the grade (see below).
- While discussion of the lab material with colleagues is encouraged, the lab report must be completed independently by each student. **Plagiarism will not be tolerated and will be reported.**
- The final project involves the design of an apparatus or software program that can control or automate measurements in the laboratory. Ideally, this project aids the student’s research endeavors.

EXPERIMENTS: Laboratory experiments will cover the following areas:

Unit 1: Breadboarding, DC Voltage Measurements, Analog Signals

Unit 2: Digital Signals, Logic Gates, Flip-Flops, and Counters

Unit 3: LabVIEW and Virtual Instruments

Unit 4: Operational Amplifiers and Power Supplies

Unit 6: Final Project

Lab #	Topic	# Lab sessions	Max. # Points	Due Date
1	Breadboarding, V measurements	2	15	TBA
2	Digital Logic, Counters	3	25	TBA
3	LabVIEW	5	40	TBA
4	Op Amps and Power Supplies	4	30	TBA
6	Final Projects	5	50	TBA
Lab Total		19	160	
Midterm Exam			50	
Final Exam			50	
Course Total			260	

Suggested grading scale:

Undergraduates	Letter Grade	GPA
240 - 260	A	4.0
225 - 239	A-	3.67
205 - 224	B+	3.33
190 - 204	B	3.0
180 – 189	B-	2.67
170 - 179	C+	2.33
160 - 169	C	2.0
150 - 159	C-	1.67
140 - 149	D+	1.33
130 - 139	D	1.0
120 - 129	D-	0.67
< 120	E	0

Tentative Lecture Schedule CHM 4143C

Date	Topic	Lab Unit
W 01/04	1. Course logistics	
M 01/09	2. DC circuits, Kirchhoff's Laws	
W 01/11	3. Capacitors, diodes, transistors	
M 01/16	<i>No class (MLK Holiday)</i>	1
W 01/19	4. Binary number system, electrically encoded information	1
M 01/23	5. Digital logic, logic families	2
W 01/25	6. <i>Discussion</i>	2
M 01/30	7. LabView Introduction	2
W 02/01	8. Microcomputers (Arduino)	3
M 02/06	9. Guest lecture. LabView applications (Damon Allen)	3
W 02/08	10. DMM, oscilloscope, function generator	3
M 02/13	12. Op amps	3
W 02/16	13. Op amp circuits	3
M 02/20	14. <i>Discussion</i>	4
W 02/22	Mid-term EXAM (in class)	4
M 02/27	<i>Exam discussion</i>	4
W 03/01	13. DC power supplies	4
M 03/06	<i>No class (Spring break)</i>	
R 03/08	<i>No class (Spring break)</i>	
M 03/13	14. RF amplification, AC circuits	6
W 03/15	15. Resonant RF circuits	6
M 03/20	16. Filters, noise, digitization	6
W 03/22	17. <i>Discussion</i>	6
M 03/27	Office hour for project	6
W 03/29	Office hour for project	
M 04/03	Office hour for project	
W 04/05	Presentation of projects	
M 04/10	Presentation of projects	
W 04/12	Presentation of projects	
M 04/17	Presentation of projects	
W 04/19	Presentation of projects	
R 04/27	Final EXAM (10 am – 12 pm)	