

Course Syllabus

CHEN 4570 Instrumentation and Process Control (aka “Control”)

Spring 2022, Nuttelman

<u>Lecture Time</u>	<u>Location</u>	<u>Instructor</u>	<u>Email</u>
T/Th 1:00-2:15 PM	BIOT A108	C.R. Nuttelman	charles.nuttelman@colorado.edu

<u>Lab</u>			
M/T/W/Th (Time varies per section)	BIOT B171	Grad TAs	(see below)

NOTE: The first two weeks of class are completely online (remote). Use the following ZOOM link (password = “control”): <https://cuboulder.zoom.us/j/97452033215>. Lectures on ZOOM will be recorded; you need to be logged on and watching during normal class time. ZOOM WILL NOT BE USED AFTER THE FIRST TWO WEEKS OF CLASS (i.e., when classes resume to in-person). All in-person lectures will be recorded (the classroom capture in the BIOT building is notorious for unreliability, so please don’t rely on these recordings – I do my best!).

Office Hours

I will hold office hours during the following times at the following location:

- 11:00 AM – 12:00 PM on Tuesdays in my office (BIOT D1B14 – please wear a mask!)
- 2:00-3:00 PM on Wednesdays in BIOT E1B25 (if there are no students in this room after 10 minutes then I will go to my office, see above)

Required Textbook

I find that all textbooks on control theory are WAY too thick and there’s no way we’d ever get through even half of these textbooks. Rather than “flooding” and overwhelming you with an overabundance of course material, I prefer to focus on a few core control theory topics. There is no required textbook for this course. Students in the past have appreciated this approach to focus on depth of a few core topics vs. only a shallow understanding of many topics.

Clickers

Most days in class (not every day), I’ll ask one to several Clicker questions. Clickers are worth 5% of your final grade in the course and I will drop the lowest 10% of scores at the end of the semester due to absences (illness, job interviews, grad school visits, conferences, etc.). No need to let me know if you will be absent unless you have an extended absence; in that case, we can discuss alternate arrangements.

Please visit this link to register your Clicker account: <https://join.iclicker.com/GX43M>

Required Software

Microsoft Excel

MATLAB (Student license available from OIT)

Additional Resources (Optional)

Practical Electronics for Inventors, Paul Scherz and Simon Monk.

Exams

There will be 3 evening exams during the semester (plus the final exam). The following outlines the times/places of the exams:

Exam	Time	Location
Midterm Exam 1	Wednesday, 2/16, 7:00-9:00 p.m.	BIOT A115
Midterm Exam 2	Wednesday, 3/16, 7:00-9:00 p.m.	BIOT A115
Midterm Exam 3	Wednesday, 4/20, 7:00-9:00 p.m.	BIOT A115
Final Exam	Saturday, 4/30, 1:30-4:00 p.m.	Tentatively BIOT A108, but I'm trying to find more space

NOTE: For each of the midterm exams, one class is cancelled. On the following days, there will be no class:

- Thursday, 2/24 (my birthday, being selfish here!)
- Thursday, 3/17 (get a start on your last spring break!)
- Thursday, 4/21 (day after Midterm Exam 3)

Grading

Element	Percentage
Labs	20%
Clicker Questions	5%
Homework	25%
Exams (3 of these)	30% (10% each)
Final Exam (cumulative)	20%

Teaching assistants

Name	Lab section
Ziyue "Travis" Dong (Ziyue.Dong@Colorado.EDU)	Mondays, 3:00-5:20 PM
Parker Bowden (Parker.Bowden@Colorado.EDU)	Tuesdays, 2:30-4:50 PM
Emma Lietzke (Emma.Lietzke@Colorado.EDU)	Wednesdays, 3:00-5:20 PM
Sam Kennedy (Samuel.Kennedy@Colorado.EDU)	Thursdays, 2:30-4:50 PM

Learning Goals:

1. Apply concepts of automatic control, including measurement, feedback and feedforward regulation for the operation of continuous and discrete systems.
2. Design and implement systems utilizing analog and/or digital control devices.
3. Apply the concepts of chemistry, physics, and electricity/electronics to measurement and control systems.
4. Apply the concepts of digital and microprocessor systems and functionality of system components/devices for the automation of processes.
5. Apply the concepts of measurements and sensor selection.
6. Communicate the technical details of control systems using current techniques and graphical standards.
7. Apply the concepts of mechanics, fluid mechanics, and heat transfer to the design of process control systems.
8. Understand and utilize programmable logic controllers (PLC) for control of manufacturing and processing systems.

Requirements for COVID-19

As a matter of public health and safety, all members of the CU Boulder community and all visitors to campus must follow university, department and building requirements and all public health orders in place to reduce the risk of spreading infectious disease. Students who fail to adhere to these requirements will be asked to leave class, and students who do not leave class when asked or who refuse to comply with these requirements will be referred to [Student Conduct and Conflict Resolution](#). For more information, see the policy on [classroom behavior](#) and the [Student Code of Conduct](#). If you require accommodation because a disability prevents you from fulfilling these safety measures, please follow the steps in the "Accommodation for Disabilities" statement on this syllabus.

CU Boulder currently requires masks in classrooms and laboratories regardless of vaccination status. This requirement is a precaution to supplement CU Boulder's COVID-19 vaccine requirement. Exemptions include individuals who cannot medically tolerate a face covering, as well as those who are hearing-impaired or otherwise disabled or who are communicating with someone who is hearing-impaired or otherwise disabled and where the ability to see the mouth is essential to communication. If

you qualify for a mask-related accommodation, please follow the steps in the “Accommodation for Disabilities” statement on this syllabus. In addition, vaccinated instructional faculty who are engaged in an indoor instructional activity and are separated by at least 6 feet from the nearest person are exempt from wearing masks if they so choose.

If you feel ill and think you might have COVID-19, if you have tested positive for COVID-19, or if you are unvaccinated or partially vaccinated and have been in close contact with someone who has COVID-19, you should stay home and follow the further guidance of the [Public Health Office](mailto:contacttracing@colorado.edu) (contacttracing@colorado.edu). If you are fully vaccinated and have been in close contact with someone who has COVID-19, you do not need to stay home; rather, you should self-monitor for symptoms and follow the further guidance of the [Public Health Office](mailto:contacttracing@colorado.edu) (contacttracing@colorado.edu).

Accommodation for Disabilities

If you qualify for accommodations because of a disability, please submit your accommodation letter from Disability Services to your faculty member in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities in the academic environment. Information on requesting accommodations is located on the [Disability Services website](#). Contact Disability Services at 303-492-8671 or dsinfo@colorado.edu for further assistance. If you have a temporary medical condition, see [Temporary Medical Conditions](#) on the Disability Services website.

IMPORTANT: On the Monday before each exam (not earlier, please), Dr. Nuttelman will have a physical signup sheet for you to choose to take one of the 2 special accommodations exams. You can sign up in person (please do not sign up via email) through the end of class period on that Wednesday, after which Dr. Nuttelman will schedule rooms and set up proctors. These alternate exams will occur on the same day (Thursday) as the exam from 10:00 AM – 1:00 PM and 6:00-9:00 PM (last 2 hours coincide with normal exam). The signup sheet will indicate exam location.

Preferred Student Names and Pronouns

CU Boulder recognizes that students' legal information doesn't always align with how they identify. Students may update their preferred names and pronouns via the student portal; those preferred names and pronouns are listed on instructors' class rosters. In the absence of such updates, the name that appears on the class roster is the student's legal name.

Observance of Religious Holidays

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance.

See full details at http://www.colorado.edu/policies/fac_relig.html

A comprehensive calendar of the religious holidays most commonly observed by

CU-Boulder students is at <http://www.interfaithcalendar.org/>

Classroom Behavior

Both students and faculty are responsible for maintaining an appropriate learning environment in all instructional settings, whether in person, remote or online. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with race, color, national origin, sex, pregnancy, age, disability, creed, religion, sexual orientation, gender identity, gender expression, veteran status, political affiliation or political philosophy. For more information, see the policies on [classroom behavior](#) and the [Student Conduct & Conflict Resolution policies](#).

Sexual Misconduct, Discrimination, Harassment and/or Related Retaliation

CU Boulder is committed to fostering an inclusive and welcoming learning, working, and living environment. The university will not tolerate acts of sexual misconduct (harassment, exploitation, and assault), intimate partner violence (dating or domestic violence), stalking, or protected-class discrimination or harassment by or against members of our community. Individuals who believe they have been subject to misconduct or retaliatory actions for reporting a concern should contact the Office of Institutional Equity and Compliance (OIEC) at 303-492-2127 or email cureport@colorado.edu. Information about university policies, [reporting options](#), and the support resources can be found on the [OIEC website](#).

Please know that faculty and graduate instructors have a responsibility to inform OIEC when they are made aware of incidents of sexual misconduct, dating and domestic violence, stalking, discrimination, harassment and/or related retaliation, to ensure that individuals impacted receive information about their rights, support resources, and reporting options. To learn more about reporting and support options for a variety of concerns, visit [Don't Ignore It](#).

Honor Code

All students enrolled in a University of Colorado Boulder course are responsible for knowing and adhering to the Honor Code academic integrity policy. Violations of the Honor Code may include, but are not limited to: plagiarism, cheating, fabrication, lying, bribery, threat, unauthorized access to academic materials, clicker fraud, submitting the same or similar work in more than one course without permission from all course instructors involved, and aiding academic dishonesty. All incidents of academic misconduct will be reported to the Honor Code (honor@colorado.edu; 303-492-5550). Students found responsible for violating the academic integrity policy will be subject to nonacademic sanctions from the Honor Code as well as academic sanctions from the faculty member. Additional information regarding the Honor Code academic integrity policy can be found on the [Honor Code website](#).

IMPORTANT – Academic sanctions from the Department of Chemical and Biological Engineering: If you are caught for academic dishonesty associated with any assignments (lab, homework, exam, other), the Department of Chemical and Biological Engineering recommends that

1. All involved students **fail the course**.
2. The incident is reported to the Honor Code Council honor@colorado.edu.