

ECE 516: Elements of Control Systems

Syllabus

Spring 2024

Sections 001: EB2 01230, Monday/Wednesday, 8:30 am – 9:45 am

Instructor: Dr. Andy Rindos
ajrindos@ncsu.edu

Office Hours: After class or by appointment

Teaching Assistants: TBD

Course Content

Linear (continuous & discrete time) MIMO control systems, emphasizing Modern Controls (time domain analysis); time-invariant (emphasis) and time varying solutions (including state transition matrices); canonical state space representations and similarity transformations (including diagonal and Jordan canonical forms); controller/observer design, controllability and observability; stability analysis; linearization, Cayley-Hamilton and MFDs; intro to optimization.

Prerequisites

ECE 308 (ECE 436 recommended)

GER Information

This course is not designated as a General Education Requirement.

Textbook and Fees

There is one suggested textbook for this course:

Norman S. Nise
Control Systems Engineering, 8th edition {7th edition is also acceptable}
Wiley, 2019, ISBN 978-1-119-47421-0 (PBK), ISBN 978-1-119-49305-9 (EVAL)

Assignments and Grading

The overall class grade will be a weighted average of the following components:

- Homework (20%) -- each HW assignment weighted equally
- Project (10%)
- Midterm exam (30%)
- Comprehensive final exam (40%)

Homework

There will be 5 homework assignments, approximately one every 2 or more weeks. The fifth assignment will be extra credit.

All homework is to be done *individually*. Though you can discuss concepts with other students, the instructor, and the TA, it is crucial that you know how to do every homework assignment on your own. This is the same material that will be on the exams. Evidence of copying or other unauthorized collaboration will be investigated as a potential academic integrity violation. **The minimum penalty for cheating on homework is a grade of -100 on the assignment.** If you are tempted to copy because you're running late, you will be better off missing the assignment and taking a zero.

Exams

All exams will be closed book, with one sheet of notes permitted. No calculators will be allowed. Regular exams will be administered during regular class periods. The final exam will be given according to the university schedule.

Final exam (001): Friday, April 26, 2024, 8:30-11 am

Evidence of cheating on any exam will be investigated. If there is sufficient cause, the incident will be referred to the Office of Student Conduct as an Academic Integrity violation. **The minimum penalty for cheating on an exam is a grade of zero on the exam.** See the NCSU Code of Student Conduct for information about what constitutes cheating.

Final Course Grade

The final grade for the course will be based on a weighted average of the above components. The +/- grading system will be used for this course.

Numerical Score	Letter Grade
$97 \leq \text{score} \leq 100$	A+
$92 \leq \text{score} < 97$	A
$90 \leq \text{score} < 92$	A-
$87 \leq \text{score} < 90$	B+
$82 \leq \text{score} < 87$	B
$80 \leq \text{score} < 82$	B-
$77 \leq \text{score} < 80$	C+
$72 \leq \text{score} < 77$	C
$69 \leq \text{score} < 72$	C-
$65 \leq \text{score} < 69$	D+
$60 \leq \text{score} < 65$	D
$57 \leq \text{score} < 60$	D-
$0 \leq \text{score} < 57$	F

Class Policies and Resources

Preferred Means of Communication:

The best way to reach me is through email at ajrindos@ncsu.edu.

Office Hours

As I work at IBM during the week, you should arrange a meeting by appointment.

Late Assignments

Assignments will not be accepted after the due date, except for University-excused absences. In the case of an excused absence, the assignment is due within 24 hours of your return to school. (For extended absences with multiple missed assignments, talk to the instructor.)

Incomplete Grades

Incomplete grades will be assigned when a student cannot complete the course due to *unforeseeable* conflicts or obstacles. Incomplete grades will normally be made up by completing the work during the following semester, on a schedule agreed upon by student and instructor.

Missed Quizzes and Exams

Attendance at all exams is mandatory. Only University-approved excuses will be accepted, provided that they are accompanied by the appropriate official documentation. Makeup exams may be given for excused absences at the discretion of the instructor. If you miss an exam without an acceptable excuse, you will receive a zero for that exam.

For more information about University-approved absences, see:

<http://policies.ncsu.edu/regulation/reg-02-20-03>

Academic Integrity

Consultation on assignments is encouraged, but copying of solutions is not. Evidence of copying or any other use of unauthorized aid on exams, homework, programming assignments, or problem sessions will be investigated and potentially referred to the Office of Student Conduct as a violation of the Code of Student Conduct.

For more information on the Code of Student Conduct, see:

<http://studentconduct.ncsu.edu>

<http://policies.ncsu.edu/policy/pol-11-35-01>

Any work submitted for this class (homework, problem session, exam, programming assignment) is subject to the *Honor Pledge*: “I have neither given nor received unauthorized aid on this test or assignment.” An Honor Pledge statement must be signed for every exam. For other assignments, it is the understanding and expectation of the instructor that the submission of work with your name on it means that you neither gave nor received unauthorized aid.

Students with Disabilities

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with Disability Services for Students at 1900 Student Health Center, Campus Box 7509, 515-7653. <http://dso.dasa.ncsu.edu/>

For more information on NC State's policy on working with students with disabilities, please see:

<http://policies.ncsu.edu/regulation/reg-02-20-01>

Inclement Weather

The class will follow the University's closure policy. If classes are not cancelled, I will make every effort to be in class on time, and so should you. Please do not send me email asking whether class is going to meet. Instead, check the University website or the weather hotline (513-8888). If possible, I will provide video material to make up for a cancelled class.

Remote sites: If your local site cancels class due to inclement weather, I do not expect you to come to class. Extended and widespread power outages can result in deadline extensions.

Laboratory Safety, Physical Activity, and Field Trips

There is no laboratory, physical activity, or field trip associated with this course.

Extra Expenses

This course has no extra expenses beyond the costs of the required textbook and Top Hat subscription.

Transportation

As there are no field trips or internships associated with this course, there are no expected transportation requirements.

Course Evaluation

Class evaluations will be available for students to complete during the last weeks of class.