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# ECE 463 / 663: Modern Control (3cr)

Spring 2025 - [www.BisonAcademy.com](http://www.BisonAcademy.com)

## Course Information:

Instructor: Jacob Glower  
Class Time: MWF 10am,  
Offerdahl West (ECE) 123 (also live streamed on Zoom)  
Office: ECE 201  
Office hours: Tu/Th 11am - noon (pretty much all day Tuesday & Thursday)  
Email: [jacob.glower@ndsu.edu](mailto:jacob.glower@ndsu.edu)

## Bulletin Description:

Modeling of nonlinear systems. State-space methods for the design and analysis of feedback controllers using pole-placement, optimal control, and state-estimation techniques.

## Course Objectives:

By the end of the semester, students should be able to:

- Determine the dynamics of a nonlinear system using the LaGrangian formulation of dynamics.
- Linearize a nonlinear differential equation and place in state-space form.
- Design a full-state feedback controller using state-space and optimal control techniques, and
- Design a full-order observer to estimate the states of a system.

Note: Extra (more challenging) homework assignments will be included for students signed up for the graduate version of this course (ECE 663).

## Required Student Resources:

All lecture notes are on-line at [www.BisonAcademy.com](http://www.BisonAcademy.com). A reference text-book is also recommended.

Some suggestions are:

- Linear Systems by Thomas Kailath
- Linear System Theory and Design by Chi-Tsong Chen
- Modern Control Theory by William L. Brogan
- Control System Design: An Introduction to State-Space Methods by Bernard Friedland (recommended)
- Applied Optimal Control and Estimation, Frank L. Lewis

## Hy-Flex Model for Spring 2025

Students are welcome to take this course however they like:

- In-Person: Students are welcome to attend class at the designated class time and location.
- Live-Stream: Students are also welcome to live-stream the class. A link with how to connect will be sent out at the start of the semester on BlackBoard and to your NDSU email address.

- On-Line: Students are also welcome to take the class on-line and fit lectures into their own schedule.

Everyone is welcome to use the on-line resources on Bison Academy. These include

- Each day's lecture,
- Detailed lecture notes for each day,
- YouTube videos for each lecture, and
- Solutions to previous homework sets (which are usually similar to this semester's homework)

In addition, midterms and the final will be offered both in-class as well as remotely through BlackBoard. If you opt for BlackBoard, you will typically be allowed to start any time between 8am and 10pm the day of the test. Once you start the test on-line, you have 2 hours to complete the test, 3 hours to complete the final exam.

It's completely your choice how you take the class.

### Evaluation Procedures and Grading Criteria

Grades will be the average of the following:

Tests	Final Exam	Homework
20% each	20%	20%

Grades are rounded to the nearest 1%, with your final grade being

A	B	C	D	F
90% or more	80% - 89%	70% - 79%	60% - 69%	59% or less

### Legal Stuff

Attendance: According to NDSU Policy 333, attendance in classes is expected. How you attend is up to you: in-person, live-stream (zoom), or online (YouTube). Note that all lecture notes, homework sets, and solutions are available on-line at [www.BisonAcademy.com](http://www.BisonAcademy.com)

Students with Special Needs: Any students with disabilities or other special needs, who need special accommodations in this course, are invited to share these concerns or requests with the instructor and contact the Disability Services Office ([www.ndsu.edu/disabilityservices](http://www.ndsu.edu/disabilityservices)) as soon as possible.

Academic Honesty: The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at [www.ndsu.edu/academichonesty](http://www.ndsu.edu/academichonesty).

Academic Honesty Defined: All written and oral presentations must "respect the intellectual rights of others. Statements lifted verbatim from publications must be cited as quotations. Ideas, summaries or paraphrased material, and other information taken from the literature must be properly referenced" (Guidelines for the Presentation of Disquisitions, NDSU Graduate School).

ECE Honor Code: On my honor I will not give nor receive unauthorized assistance in completing assignments and work submitted for review or assessment. Furthermore, I understand the requirements in the College of Engineering Honor System and accept the responsibility I have to complete all my work with complete integrity.

Veterans and Student Soldiers: Veterans and student soldiers with special circumstances or who are activated are encouraged to notify the instructor in advance.