

ME 717: ADVANCED CONTROLS FOR MECHANICAL SYSTEMS: 3 CREDITS

SPRING 2024

BASIC INFORMATION

Instructor: Inbae Jeong
Office location: Dolve 101C
Office hours: Tu/Th 2:00 pm – 3:00 pm, or anytime by appointment
Email Address: inbae.jeong@ndsu.edu

BULLETIN DESCRIPTION

This course trains graduates on the principles analyzing dynamical systems, choosing control objectives, and designing control systems that meet specified control objectives. In so doing, students will learn limitations in the current state of the art control systems and be challenged to overcome those limitations through research.

Pre-req: PHYS252 and PHYS252L.

TEXTBOOKS

Required Textbook: There is no required textbook for this course; the instructor will provide handouts and other reading materials.

Recommended Textbook: Access to any of the following books is strongly recommended.

1. Jean-Jacques E. Slotine and Weiping Li; *Applied Nonlinear Control*, Pearson
2. Hassan K. Khalil; *Nonlinear Systems*, Pearson

COURSE OBJECTIVES

The proposed course has two main objectives: (a) to equip students with foundational skills for analysis, design and development of robust control systems, and (b) to enable students understand limitations in the state of the art control systems and challenge them to research for better control systems.

EXPECTATIONS OF STUDENTS

1. All assignments, solutions and class-related materials will be posted at the Blackboard website. Students should check the announcements at Blackboard regularly. It is the student's responsibility to keep up with the class material and be aware of any class-related announcements.
2. Students should contact the instructor for extra office hours if the regular office hours do not work for their schedule. The instructor will make the effort to accommodate such requests. Students should feel free to email the instructor questions at any time.
3. The use of cell phones and computers for anything other than class note taking in class is strictly prohibited. Anyone who is caught using cell phones or computers for non-class related activities will be asked to leave the classroom immediately.

COURSE SCHEDULE – TENTATIVE

Week(s)	Topic
1	Introduction – Nonlinear Control
2	Phase Plane Analysis
3	Lyapunov Theory
4, 5	Stability of Non-Autonomous Systems
6, 7	Function Analysis
8, 9	Feedback Linearization
10, 11	Sliding Control
12, 13	Adaptive Control
14, 15	Multi-Input Systems
16	Final Term Project Preparation
17	Final Term Project Presentation

Note: The instructor reserves the right to change any of the course requirements, the topics to cover, class activities/assignments, and schedule for any reason.

EVALUATION PROCEDURES AND GRADING CRITERIA

Students will be evaluated through a midterm exam, presentations, and the final term project. Scores will be apportioned according to:

- Midterm exam 35%
- Presentations 15%
- Final term project 50%

Grades will be awarded as follows

Grade Policy: Passing grades will be distributed to scores as follows

90-100%	A	70-79%	C
80-89%	B	60-69%	D

Below 60% is a failing grade (F).

ATTENDANCE STATEMENT

According to [NDSU Policy 333 \(www.ndsu.edu/fileadmin/policy/333.pdf\)](http://www.ndsu.edu/fileadmin/policy/333.pdf), attendance in classes is expected. Students who won't be able to attend classes for any reason, private or on University-sponsored activities, must notify the instructor, and will be provided an opportunity to make up for any missed class assignments.

Veterans and student service members with special circumstances or who are activated are encouraged to notify the instructor as soon as possible and are encouraged to provide Activation Orders.

AMERICANS WITH DISABILITIES ACT FOR STUDENTS WITH SPECIAL NEEDS STATEMENT

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 Center for Accessibility and Disability Services (www.ndsu.edu/disabilityservices) as soon as possible.

FAMILY EDUCATIONAL RIGHTS AND PRIVACY ACT (FERPA) STATEMENT

Your personally identifiable information and educational records as they relate to this course are subject to FERPA.

APPROVED ACADEMIC HONESTY STATEMENT

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.