**Navajo Technical University** http://navajotech.edu
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# ME 305 System Dynamics
## 3 Credits Spring 2022

**Instructor: Dr.Osama Fakron**
**Email:** fakron@navajotech.edu
**Office Location**: Nursing Building 214, **Office Phone:** N/A
**Class Location**: Tech Building 322

**Office hours:** **MWF** 4:00- 5:00 PM & By appointment**.**

**Required Text:** Ogata, K., System Dynamics, 4th Edition, Pearson, 2003, ISBN: 978-0131424623

### Course Description

ME 305 - Introduction to System Dynamics is an undergraduate course introducing the principles of modeling the response of dynamic systems. Topics covered include state space, time and frequency domain analyses, and classical control theory. Numerical solution of dynamic models are performed in MATLAB. Applications to mechanical, fluid, electrical, and thermal systems are provided throughout the course.

### Topics

- Review of complex algebra
- Review of differential equations
- The Laplace transform and inverse Laplace transform
- Lumped parameter modeling
- Energy methods in mechanical engineering
- Transfer functions and block diagrams
- State space modeling
- Time domain analysis
- Frequency domain analysis
- Classical control theory and stability analysis
- Feedforward and feedback control, PID controllers
- Applications to mechanical, fluid, electrical, and thermal systems

### Homework and Other Assignments

Preferably assignments are to be typeset in a word processor and submitted electronically in PDF format to the instructor's email address before the start of class on the due date of the assignment. If submitting assignments written by hand, please use pencil or blue/black ink. Submissions must be legible, or they will not be graded. Late assignments will not be accepted without documented exceptional circumstances. Homework solutions will be provided but not all assigned problems may be graded. All computer programs will be submitted as email attachments in a file format that is ready to be successfully executed by MATLAB; computer programs will be graded as submitted without any modification from the instructor.

**Exams**
There will be two midterm exams and one final exam given. The first midterm will be given roughly one third of the way into the semester and will focus on the course material covered from the first week to the first midterm exam date. The second midterm will be given roughly two thirds of the way into the semester and will focus on the course material covered from the first midterm exam to the second midterm exam date. The final exam schedule will be provided in class and the final exam may include any material covered throughout the entirety of the course. Students absent to an exam without documented exceptional circumstances will be given a grade of 0 points. Make up exams will only be provided for those with documented exceptional circumstances.

**Grading Policy**

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| Homework | 20% |
| Midterm Exam 1 | 25% |
| Midterm Exam 2 | 25% |
| Final Exam | 30% |

**Extra Credit**

There will be several opportunities for extra credit throughout the course. These will usually take the form of challenging homework problems. Extra credit points will be added to the combined midterm and final exam grades when determining the final grade.

## Course Policies:

Please turn off Cell Phones during lectures. Please, be courteous to others around you and treat each other with professionalism. Feel free to work together to help others with their questions on homework. Quizzes and tests will be done without help or input from others. Students are expected to spend two hours studying course materials for every hour in the class.

## Attendance Policy:

You are expected to attend every class session and participate. Your **primary** job or employment is as a student. After you are absent, it is your responsibility to complete missed assignments. Attendance will account for **5**% of the final grade. Students are subject to being dropped after three (3) unexcused absences.

## Academic Integrity:

Integrity (honesty) is expected of every student in all academic work and every scientist or engineer working professionally. The guiding principle of academic integrity is that a student's submitted work must be the student's own. Students who engage in academic dishonesty diminish their education and bring discredit to the college community. Avoid

situations likely to compromise academic integrity such as: cheating, facilitating academic dishonesty, and plagiarism; modifying academic work to obtain additional credit in the same or another class unless approved in advance by the instructor, failure to observe rules of academic integrity established by the instructor may result in student being dropped from class.

## Diné Philosophy of Learning:

From the culture of the proud people of this land, derived from the wisdom of generations, the Dine" philosophy of learning is expressed through these words: nitsahakees-thinking, your increased skills, nahata-planning to meet these goals, iina-implement the work required to learn, practice your new skills, sihasin-evaluate your skills, use them. Each exercise includes these processes of **THINKING, PLANNING, IMPLEMENTING, and REFLECTION.**

## Students with Disabilities:

The Navajo Technical College and the Industrial Engineering Program are committed to serving all enrolled students in a non-discriminatory and accommodating manner. Any student who feels he/she may need an accommodation based on the impact of disability, or needs special accommodations should inform the instructor privately of such so that accommodations arrangement can be made. Students who need an accommodation should also contact the Vocational Rehabilitation Counselor, Virginia Edgewater (505) 387-7396.