

MENG 405/L – Dynamic Systems and Controls

Spring 2020

Location: MSEC 103

2 credit hours (Tuesdays, Thursdays 12:30-1:45pm) + 1cr. hr. lab

Instructor: Dr. Arash K. Mousavi, Assistant Professor of Mechanical Engineering

Office: Weir 211

E-mail: arash.mousavi@nmt.edu (Allow 48 hours to respond. If urgent or haven't got response call 575-835-5003)

Office Hours: (Prone to change.)

Tuesdays 8:00am-9:00am

Thursdays 8:00am-9:00am

Textbook: Control Systems Engineering, 6TH Ed., Norman S. Nise, Wiley

Pre-requisites/Co-requisites: ES 332, MENG 305, MATH 335, MENG 405L/ES 405L, ES 111 or consent of instructor

Course Description: A practical survey course examining the basic components of instrumentation, measurement, and process control systems common to the field of engineering. Sensing and measurement (temperature, pressure, flow rate, level, stress - strain, concentration, etc.), signal generation and data acquisition, control loops and controllers, and process control theory.

Place in Curriculum: Required course for Mechanical Engineering

Student Course Learning Outcomes: The student will develop the knowledge of applying the linear control theory on real life examples and situations. By the end of this course, students will demonstrate the following ABET attributes:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

Program Learning Outcomes: The Department of Mechanical Engineering at New Mexico Tech will produce Bachelor of Science graduates who are independent thinkers, taking ownership in identifying problems and determining effective solution strategies in a timely manner.

Grading:

Note: Different exams will have different rules about cheat sheets and use of calculators. This will be informed before each test.

Homework 50%

Tests (including popup quizzes and in class questions) 50%

Extra Credit 5%

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Letter Grade	Percentage Boundaries
A	95-100
A-	90-95
B+	87-90
B	83-87
B-	80-83
C+	77-80
C	73-77
C-	70-73
D	60-70
F	0-60

By the end of this course you should be able to

- Find the time Response of 1st and 2nd order systems
- Draw Root locus
- Study the stability of a systems
- Understand the frequency response of a system

Tentative Schedule (This is prone to change as the semester goes on)

Week	Activity
1	Ch1, Introduction
	Ch2, Frequency Domain, Laplace Derivation
2	Test 1 (Review) Review test from Laplace Transformation and Partial Fraction Expansions
	Ch2, Frequency Domain, Laplace Tables, Partial Fraction Expansion
3	Ch2, Frequency Domain, Partial Fraction Expansion, Frequency Domain
	Ch2, Frequency Domain, Partial Fraction Expansion, Frequency Domain
4	Ch2, Frequency Domain, Transfer Function, Passive Circuits
	Test 2 (Review) Review Test from Taylor/ Maclaurin Series, Closed everything, calculator allowed
5	Ch2, Frequency Domain, Transfer Function, Active Circuits
	Ch2, Frequency Domain, Transfer Function, Translational Systems
6	Ch2, Frequency Domain, Transfer Function, Translational Systems
	Ch2, Frequency Domain, Transfer Function, Linearization
7	Ch2, Frequency Domain, Transfer Function, Linearization
	Ch4, Time Response, 1 st order
8	Ch4, Time Response, 1 st order
	Test 3 Test from Ch 1&2, Closed Everything. Calculators Allowed.
9	Ch4, Time Response, 2 nd order
	Ch6, Stability, Routh -Hurwitz
10	Spring Break
	Spring Break
11	Ch6, Stability, Routh -Hurwitz

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	Test 4 Test from Ch 4 (previous chapters needed) Closed Everything. Calculators Allowed.
12	Ch6, Stability, Routh -Hurwitz
	Ch8, Root Locus
13	Ch8, Root Locus
	Test 5 Test from Ch 6 (previous chapters needed) Closed Every Thing. Calculators Allowed.
14	Ch8, Root Locus
	Ch10, Frequency Response, Bode Diagram
15	Ch10, Frequency Response, Bode Diagram
	Test 6 Test from Ch 8 (previous chapters needed) Closed Everything. Calculators Allowed.
16	Ch10, Frequency Response, Nyquist Diagram

Test Schedules & Notifications:

It is students' responsibility to frequently check Canvas and the google calendar page of the course for Test dates, Updates and Changes

Reasonable Accommodations

New Mexico Tech is committed to protecting the rights of individuals with disabilities. Qualified individuals who require reasonable accommodations are invited to make their needs known to the Office of Counseling and Disability Services (OCDS) as soon as possible. To schedule an appointment, please call 835-6619.

Counseling Services

New Mexico Tech offers mental health and substance abuse counseling through the Office of Counseling and Disability Services. The confidential services are provided free of charge by licensed professionals. To schedule an appointment, please call 835-6619.

Academic Honesty: New Mexico Tech's Academic Honesty Policy for undergraduate students is found starting on page 64 of the NMT Undergraduate Catalog, [http://www.nmt.edu/images/stories/registrar/2015-2016 UNDERGRADUATE Catalog FINAL.pdf](http://www.nmt.edu/images/stories/registrar/2015-2016%20UNDERGRADUATE%20Catalog%20FINAL.pdf)

New Mexico Tech's Academic Honesty Policy for graduate students is found starting on page 62 of the NMT Graduate Catalog, [http://www.nmt.edu/images/stories/registrar/2015-2016 GRADUATE Catalog FINAL.pdf](http://www.nmt.edu/images/stories/registrar/2015-2016%20GRADUATE%20Catalog%20FINAL.pdf)

You are responsible for knowing, understanding, and following this policy.

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Respect Statement: New Mexico Tech supports freedom of expression within the parameters of a respectful learning environment. As stated in the New Mexico Tech Guide to Conduct and Citizenship: “New Mexico Tech’s primary purpose is education, which includes teaching, research, discussion, learning, and service. An atmosphere of free and open inquiry is essential to the pursuit of education. Tech seeks to protect academic freedom and build on individual responsibility to create and maintain an academic atmosphere that is a purposeful, just, open, disciplined, and caring community.”

Title IX Reporting:

Sexual misconduct, sexual violence and other forms of sexual misconduct and gender-based discrimination are contrary to the University’s mission and core values, violate university policies, and may also violate state and federal law (Title IX). Faculty members are considered “Responsible Employees” and are required to report incidents of these prohibited behaviors. Any such reports should be directed to Tech’s Title IX Coordinator (Dr. Peter Phaiah, 20D Brown Hall, 575-835-5187, titleixcoordinator@nmt.edu). Please visit Tech’s Title IX Website (www.nmt.edu/titleix) for additional information and resources.

Lab: MENG 405L at Cramer 114, 1 credit hours.

The lab includes laboratory exercises involving instrumentation and basic control systems.

Lab Grading:

Attendance 50%
Lab Reports 50%

Course Policies:

- Lecture Attendance:
 - Mandatory (student will be dropped if more than 3 absences)
- Lab Attendance:
 - Mandatory (student will be dropped if more than 1 absences)
- Handling Absences:
 - For an absence to be considered legit, student needs to arrange an *Absentee Notification* email to be sent to me from Dean of Students Office (located in Fidel).
 - Lab Makeups are generally not possible
 - Test makeups are possible only for legit absences
- Late submissions:
 - Up to 1 day: 15% automatic subtraction
 - Up to 2 day: 30% automatic subtraction
 - More than 2 days 100% subtraction
- Tests:
 - Individual calculators on tests. Cannot share it or use a cellphone/laptop instead.
 - The students can see their graded paper-based tests during office-hours or a pre-requested appointment.
 - The graded paper-based tests should stay at the professor’s possession. A grade of zero will be assigned for missing papers. The students will need to stop by at instructor’s office to review their papers.

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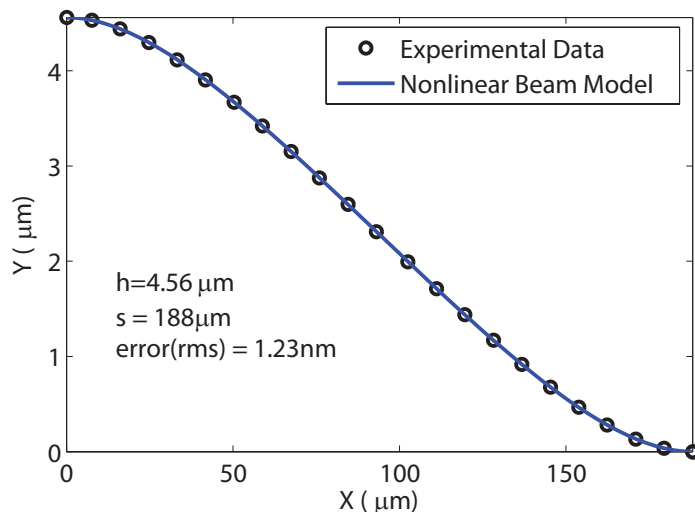
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- Homework submission is accepted only through Canvas in the form of a single pdf file. Follow the instructions for requested supplementary files.
- All submissions/HW/tests should include your name and 900-number otherwise won't get graded.
- Homework needs to be prepared individually unless instructed differently.
- Student cellphones need to be set to vibrate only.
- No laptops/tablets or cellphones allowed unless arranged with the instructor.
- No web surfing, texting or headphones.
- Email etiquette: Only NMT emails will be answered (NMT policy) also emails should have proper structure and properly written.
- Homework/Tests needs to be written completely readable and understandable to get graded.
 - Can be only single column and in sequential order. A maximum of two columns are accepted only if the separated by a vertical line all the way through.
 - The final answer for every section should be clearly marked in a rectangle.
 - The material for each question should finish before your answer for the next question starts.
 - Hand drawn diagrams need to be made by connecting clearly marked points by a solid line.
 - Dashed lines should connect each point to the corresponding value at the axes.
 - A side table with aligned data sets should always accompany every diagram.
 - Typed HW is encouraged but unless specifically said so, not obligatory.
 - Use of software for diagrams are highly recommended to accompany hand-drawn ones.
 - In a printed diagram, texts should be easily readable after printing as shown in this sample:



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