1: Course Number and Name

a. **MENG 4352**: Dynamical Systems, Spring 2022
b. Section 010, MWF 10:00 – 10:50 am

2: Credits and Contact Hours

a. **Credits**: 3
b. **Contact Hours**: 3 hours/week (Classroom)

3: Instructor Information

a. **Course Coordinator**: Armita Hamidi
b. **Instructors**: Armita Hamidi
Email: armita.hamidi@angelo.edu.
Phone: 325-486-5518
Office: VIN 273.
c. **Office hours**: Mondays & Wednesdays 3:30 pm -5 pm (face to face in VIN 273 or virtual through Blackboard Collaborate).
Please try to make an appointment by email for face to face meeting. When sending an email, make sure to include class and section number (e.g. MENG 4352, 010).

4: Required Course Materials

Franklin, G.F., Powell, J.D., Emami-Naeini, A. and Powell, J.D., "*Feedback control of dynamic systems*" Eighth edition.

Other Readings materials will be posted Blackboard.

5: Technology Requirements

- To successfully complete this course, you need to use Matlab & Simulink. It is not free software for students but is available at the Engineering Computer Lab VIN 245. It is an expensive piece of software, so you are not required to purchase it for your personal computer and you can also virtually access it through VMware Horizon View Client by connecting to the lab computers.
- Access to exams and quizzes may be through Respondus Lockdown Browser and will be video recorded via Respondus Monitor. Respondus requires a desktop computer or laptop and a webcam. For best results, use an ethernet cable to connect to your Internet source instead of relying on Wifi. Refer to the Blackboard course for Respondus installation instructions. For secure online testing, you need to install Respondus and Respondus LockDown Browser and require a webcam.

6: Specific Course Information

a. **Catalog Description:** System modeling and rigorous analytical and numerical treatment of complex problems arising in engineering and the sciences.
c. **Prerequisites**: MATH 3324 Applied Mathematics for Engineering
d. **Required or elective**: Technical elective for BSME Major.

7: Specific Goals for the Course

a. Course Learning Outcomes:

1. Describe dynamic systems, i.e., systems that evolve with time.

2. Describe mathematical models of mechanical, electrical, fluid, and thermal systems.
3. Analyze the response of dynamic systems to inputs and initial conditions.
4. Describe how to design (control) systems that ensure desirable properties
5. Providing engineering examples of dynamic systems
6. Draw a general knowledge of how to design a control system by defining input, error, output, disturbances, and noises.

b. Course Learning Outcome Mapping to ABET Criterion 3 Student Outcomes:

Table 1: Course Learning Outcomes mapped to ABET Student Outcomes

ABET Student Outcomes	1	2	3	4	5	6
1. Solve Problems		X	X	X	X	
2. Design	X			X	X	X
3. Communication						
4. Ethics & Professionalism					X	
5. Teamwork						
6. Experimentation				X		X
7. Acquire New Knowledge						X

8: Topics Covered

1. Introduction to dynamic systems
2. Review of Complex numbers & Laplace Transform
3. Modeling dynamic systems
4. Block diagrams
5. Transfer function
6. Frequency response
7. Stability
8. Root-locus method

9: Course Delivery and Communications

9.1: Delivery Method(s)

This is a face-to-face course with learning resources and supplemental materials posted in Blackboard.[1]

9.2: Communications

Faculty will respond to email within 24 hours during working hours Monday through Friday. Weekend messages may not be returned until Monday.

Written communication via email: All private communication will be done exclusively through your ASU email address. Check frequently for announcements and policy changes. In your emails to faculty, include the course name and section number in your subject line.

Virtual communication: Office hours and/or advising may be done with the assistance of the Team viewer, Zoom, Collaborate, Skype, etc.

10: Professionalism

Professional engineering standards apply in this class. You are expected to demonstrate a behavior consistent with the conduct of an individual practicing in the engineering profession. You are expected to: (1) come prepared for class; (2) respect faculty and peers; (3) demonstrate responsibility and accountability for your own actions; (4) demonstrate sensitivity and appreciation for diverse cultures, backgrounds, and life experiences; (5) offer and accept constructive criticism in a productive manner; (6) demonstrate an attitude that fosters professional behavior among peers and faculty; (7) be punctual to class meetings; (8) maintain a good work ethic and integrity; and (9) recognize the classroom as a professional workplace.

11: Graded Material

11.1: Class Attendance, Participation, and Timeliness

The number one complaint of engineering clients is the timeliness of deliverables (reports, drawings, specifications, etc.). As a professional engineer, you will be expected to arrive at scheduled meetings on time and prepared. Late proposals are not generally accepted. Late specifications or drawings may cost the engineer a monetary penalty. Professional engineering standards apply in this course.

You are expected to meet every class meeting on time and prepared. Attendance will be taken. Should you find it necessary to miss a class for any reason, you are expected to notify your instructor as early as the absence is known—preferably before the absence. It's important that you communicate clearly your instructors.

Your online assignments will be due at the time specified on Blackboard. Any assignments submitted in hard copy are due at the beginning of class on the due date. Your instructor may assess penalties for late work.

11.2: Reading Assignments and Homework

You will be given reading and homework assignments nearly every lesson. Reading assignments will come from the assigned textbooks or other materials provided or available via the web. The homework assignments will consist of questions to be answered during your reading and preparation for class. Reading and homework assignments will be distributed via the Blackboard.

11.3: Quizzes

Instructors may give in-class quizzes. The quizzes will be unannounced and unscheduled. The quizzes are intended to determine whether or not you have completed the pre-class work and are prepared for class.

11.4: Exams

This course will have three exams.

11.5: Grades: Weighting and Letter Grades

The weighting system shown in Table 2 will be used in determining the final grade for the course

Table 2: Grade Weighting

Item	Percent
Homework	30%
Quizzes	10%

Item	Percent
Exam 1	20%
Exam 2	20%
Final Exam	20%
Total	100%

The instructor will determine letter grades for the course using his professional judgment, and the following standards as described in the University Catalog:

A = excellent work B = good work C = average work D = poor work F = failing work

12: Classroom and University Policies and Student Support

12.1: General Policies

All students are required to follow the policies and procedures presented in the Angelo State University Student Handbook[2] and Angelo State University Catalog[3].

12.2: Student Disability Services

ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs, and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at ADA@angelo.edu. For more information about the application process and requirements, visit the Student Disability Services website[4]. The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dallas Swafford
Director of Student Disability Services
Office of Student Affairs
325-942-2047
dallas.swafford@angelo.edu
Houston Harte University Center, Room 112

12.3: Title IX at Angelo State University

Angelo State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. In accordance with Title VII, Title IX, the Violence Against Women Act (VAWA), the Campus Sexual Violence Elimination Act (SaVE), and other federal and state laws, the University prohibits discrimination based on sex, which includes pregnancy, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination and unwelcome behavior of a

sexual nature. The term includes sexual harassment, nonconsensual sexual contact, nonconsensual sexual intercourse, sexual assault, sexual exploitation, stalking, public indecency, interpersonal violence (domestic violence or dating violence), sexual violence, and any other misconduct based on sex.

You are encouraged to report any incidents involving sexual misconduct to the Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator, Michelle Miller, J.D. You may submit reports in the following manner:

Online: Incident Reporting Form[5]

Face to Face: Mayer Administration Building, Room 210

Phone: 325-942-2022

Email: michelle.miller@angelo.edu

Note, as a faculty member at Angelo State, I am a mandatory reporter and must report incidents involving sexual misconduct to the Title IX Coordinator. Should you wish to speak to someone in confidence about an issue, you may contact the University Counseling Center (325-942-2371), the 24-Hour Crisis Helpline (325-486-6345), or the University Health Clinic (325-942-2171).

For more information about resources related to sexual misconduct, Title IX, or Angelo State's policy please visit: www.angelo.edu/title-ix[6].

12.4: Observance of Religious Holy Day

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 Student Absence for Observance of Religious Holy Day[7] for more information.

12.5: Incomplete Grade Policy

It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. See ASU Operating Policy 10.11 Grading Procedures[8] for more information.

12.6: Information About COVID-19

Please refer to ASU's COVID-19 (Coronavirus) Updates[9] web page for current information about campus guidelines and safety standards as they relate to the COVID-19 pandemic.

12.7: Student Conduct Policies

12.7.1: Academic Integrity

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

The College of Science and Engineering adheres to the university's Statement of Academic Integrity[10] (Page 97).

12.7.2: Plagiarism

Plagiarism is a serious topic covered in ASU's Academic Integrity policy[11] in the Student Handbook. Plagiarism is the action or practice of taking someone else's work, idea, etc., and passing it off as one's own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality via Turnitin or SafeAssign. Resources to help you understand this policy better are available at the ASU Writing Center[12].

12.7.3: Copyright Policy

Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.

13: Modifications to the Syllabus

This syllabus, including grade evaluation and course schedule, is subject to modification on potentially short notice based on developing circumstances.

14: Course Outline

The course outline is presented in the table next page. Detailed reading and homework assignments along with updates to this schedule will be provided via Bb. The following schedule may be modified as the semester progresses.

Table 3: Course Lesson Outline

week #	Lesson #	Date	Topic	Assignment
1	1	19-Jan	Course Introduction	
	2	21-Jan	Introduction to dynamic systems	
2	3	24-Jan	Laplace transform & complex numbers	
	4	26-Jan	Laplace transform & complex numbers	
	5	28-Jan	Laplace transform & complex numbers	
3	6	31-Jan	Inverse Laplace transform	
	7	2-Feb	Inverse Laplace transform	Homework #1
	8	4-Feb	Solving ODE with LT	
4	9	7-Feb	Transfer function	
	10	9-Feb	Transfer function & Dynamic systems structure	
	10	11-Feb	Transfer function & Dynamic systems structure	
5	11	14-Feb	Transfer function & Dynamic systems structure	Homework #2
	12	16-Feb	Dynamic systems modeling	
	13	18-Feb	Dynamic systems modeling	

week #	Lesson #	Date	Topic	Assignment
6	14	21-Feb	Dynamic systems modeling	Homework #3
	15	23-Feb	Transfer function & Block diagram	
	16	24-Feb	System Modeling & Frequency response	
7	16	28-Feb	Transfer function & Dynamic systems structure	
	17	2-Mar	Exam #1	Intro & Laplace Transform
	18	4-Mar	Frequency response of system	
8	19	7-Mar	Bode plots	Homework #4
	20	9-Mar	Stability	
	21	11-Mar	Stability	
	22	14-Mar	Spring break	
	23	16-Mar	Spring break	
	24	18-Mar	Spring break	
9	25	21-Mar	Stability	
	26	23-Mar	Stability	
	27	25-Mar	Feedback System	Homework #5
10	28	28-Mar	Feedback System	
	29	30-Mar	Feedback System	
	30	1-Apr	Feedback System	Homework #6
11	31	4-Apr	Feedback System	
	32	6-Apr	Exam 2	Laplace, transfer function, system modeling, frequency response, block diagrams, Bode plot & Stability (chapter 2 & 3 from book)
	33	8-Apr	Analysis of feedback systems	
12	34	11-Apr	Analysis of feedback systems	
	35	13-Apr	Analysis of feedback systems	
	36	15-Apr	Analysis of feedback systems	Homework #7
13	37	18-Apr	Pole analysis & root locus method	
	38	20-Apr	Pole analysis & root locus method	
	39	22-Apr	Pole analysis & root locus method	
14	40	25-Apr	Pole analysis & root locus method	Homework #8
	41	27-Apr	Pole analysis & root locus method	
	42	29-Apr	Pole analysis & root locus method	
15	43	2-May	Review problems	
	44	4-May	Review problems	
	45	6-May	Review problems	
	47	9-May	Final Exam	10:30 am-12:30 pm (checked on ASU final exams Schedule)

15: End Notes

[1] https://blackboard.angelo.edu/
[2] http://www.angelo.edu/student-handbook/
[3] http://www.angelo.edu/catalogs/
[4] http://www.angelo.edu/services/disability-services/
[5] https://www.angelo.edu/incident-form
[6] http://www.angelo.edu/title-ix
[7] http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of
[8] https://www.angelo.edu/content/files/14197-op-1011-grading-procedures
[9] https://www.angelo.edu/covid-19/
[10] https://www.angelo.edu/live/files/27603-student-handbook-2020-21#page=97
[11] http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php
[12] http://www.angelo.edu/dept/writing_center/academic_honesty.php