FLORIDA POLYTECHNIC UNIVERSITY

EML 4225 Syllabus – Spring 2026

Course Information

- **Course Number and Title**: EML 4225 Introduction to Vibrations and Controls
- **Credit Hours:** 3 (3 lecture)
- **Current Academic Term**: Spring 2026

Instructor Information

- **Instructor**: Dr. Musa Norouzian
- **Office**: BARC-1183
- **Office Hours**: MTF 3:15 - 4:15 PM, *or by Appointment*
- **Contact**: mnorouzian@floridapoly.edu

Course Details

- **Class Schedule and Location:** MWF, 9:00 AM - 9:50 AM, IST-1017
- **Official Catalog Course Description**: Free and forced vibration of multi degree of freedom systems, material modes, open vs. closed loop control, time and frequency domain design of control systems.
    - **Course Prerequisites:** EGN 3321 - Dynamics, MAP 2302 - Differential Equations, EEL 3110 - Principles of Electrical Engineering, **Co-Requisite:** none
- **Required Texts (2 textbooks)**:
    - Mechanical Vibrations, 6th Edition, Singiresu Rao, ISBN: 9780134361307
    - Control Systems Engineering, Norman S. Nise, 8th Edition, ISBN: 9781119721406
- **Equipment and Materials**: Canvas, computer or tablet, Microsoft Teams, scientific or engineering calculator, FL Poly e-mail

  Note: Only use of the following calculator models as used on the Fundamentals of Engineering (FE) Exam will be allowed:
    - **Casio:** All fx-115 and fx-991 models (Any Casio calculator must have "fx-115" or "fx-991" in its model name.)
    - **Hewlett Packard:** The HP 33s and HP 35s models, but no others
    - **Texas Instruments:** All TI-30X and TI-36X models (Any Texas Instruments calculator must have "TI-30X" or "TI-36X" in its model name.)
- **Course Objectives**:

  The objective of this course is twofold. First, to understand vibrations (free and forced, for simple or multi degree of freedom) from the mathematical point of view and the applications in engineering practice. Second, to understand controls (open vs. closed loop control, time vs. frequency domain) from its mathematical point of view and its engineering applications.

  Highlights are as follows:
    - Mathematical modeling of vibrational systems
    - Modeling of single and two degree-of-freedom systems
    - Free and damped vibrations

- Modeling of mechanical
- Laplace transform
- Transfer function analysis
- Block diagram analysis
- Feedback system modeling

- **Alignment with Program Outcomes**:

SLO Table

Course Learning Outcome	Learning Level (Bloom's / ABET Assessment Example)	Program Learning Outcome (ABET, GenEd, Other)
a. An ability to apply knowledge of mathematics, science, and engineering	**Knowledge**- Ability to recall previously learned material **Application**- Ability to use learned material in new situations **ABET Assessment** – Exams	ABET 1 – an ability to identify formulate, and solve complex engineering problems by applying principles of engineering, science, and math.
e. An ability to identify, formulate, and solve engineering problems	**Analysis**- Ability to separate material into component parts and show relationships between parts **ABET Assessment** – Exams, Project	ABET 1 – an ability to identify formulate, and solve complex engineering problems by applying principles of engineering, science, and math. ABET 2 - An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
k. An ability to use the techniques, skills, and modern tools necessary for engineering practice	**Knowledge**- Ability to recall previously learned material **ABET Assessment-** project report	ABET 1, 2, 3 ABET 1 – an ability to identify formulate, and solve complex engineering problems by applying principles of engineering, science, and math. ABET 2 - An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors ABET 3- an ability to communicate effectively with a range of audiences

Academic Support Resources

- **Library**: Students can access the Florida Polytechnic University Library through the University website and Canvas, on and off campus. Students may direct questions to library@floridapoly.edu.
- **Tutoring and Learning Center**: The Tutoring and Learning Center (The TLC) provides tutoring to all Florida Poly students who may need additional academic support. The TLC is staffed by students who have excelled in the courses they tutor. They offer support by reviewing concepts and materials from class, clarifying points of confusion and providing assistance with learning strategies. While the focus of TLC is to provide support to students in freshman-level courses,

upper-level courses are also tutored at the Center. The TLC is located in the IST Commons (second floor).

  - **Knack Tutoring**: Students looking for additional assistance outside of the classroom are advised to consider working with a peer tutor through Knack. Florida Polytechnic University has partnered with Knack to provide students with access to verified peer tutors who have previously aced this course. To view available tutors, visit floridapoly.joinknack.com and sign in with your student account.

- **Academic Success Coaches**: All students at Florida Poly are assigned an Academic Success Coach. Your Academic Success Coach can assist you with academic success strategies. Please visit the Student Success Center on the second floor of the IST building to meet with an Academic Success Coach.
- **Writing Center**: Located on the second floor of the IST (2059/2061), the Writing Center helps students to develop their writing and presentation skills. Consultations are available in person and virtually. For more detail, visit floridapoly.edu/writing center.

Course Policies

Attendance:

- Students in face-to-face (this includes labs and C-courses) courses are expected "to attend all of their scheduled University classes and to satisfy all academic objectives as defined by the instructor" (University Policy, FPU-5.0010AP).
- Exceptions to any attendance requirements may be made on a case-by-case basis.

Late Work/Make-up

Make-up opportunities will be granted exclusively for exams in exceptional circumstances and at the discretion of the professor. Please note that NO make-up options will be provided for quizzes. Students are expected to reach out to the instructor well in advance of an exam or provide a valid justification if doing so ahead of time is not possible. Students are granted a 2-day grace period following the homework due date to submit their work; beyond this period, no submissions will be accepted.

Grading Policy

- Only neatly written problems will be graded.
- A correct answer without a correct outline of the work will not receive credit.
- All incorrect work should be distinctly crossed out on the page.
- When multiple solutions are presented, the solution with the most errors will be graded.

Grading Scale and Breakdown

Grading Scale (%)	
93-100	A
90-92	A-
86-89	B+
83-85	B
80-82	B-
76-79	C+
70-75	C
60-69	D
0-59	F

Grade Breakdown	
Homework	10%
Attendance and Class Participation	5%
Quiz	10%
Project	10%
Exam 1	15%
Exam 2	15%
Exam 3	15%
Final	20%
Total	100%

Note: *Percentages that fall between grades will be rounded up. Grades for each assignment will be posted to Canvas for reference only and students should make sure they are recorded correctly. However, there is no guarantee that the percentages or projected grades provided there are correct. The instructor will calculate final percentages and will determine final grades regardless of Canvas calculations.*

Homework (10%)

- Are assigned on a weekly basis and are due in approximately one week.
- Should be submitted electronically in a single PDF file via CANVAS.
- Submissions beyond the 2-day grace period will not be accepted.
- You are encouraged to collaborate on the homework to learn better.

Attendance and Class Participation (5%)

- **ATTENDANCE**: All class meetings are mandatory. Attendance is recorded at the start of class.
    - **LATE:** If you arrive late, check in with the instructor at the end of class to be marked late instead of absent. Extenuating circumstances will be considered individually.
    - **ABSENCE:** Notify the instructor via Canvas before your absence, except in extreme cases. Documentation may be required. Failure to notify results in an absence.

Quiz (10%)

- Only FE approved calculators and scratch papers will be allowed.
- No make-up will be offered.

Exams (45%)

- FE approved calculators and scratch papers will be allowed for use during the examination. However, the use of books and notes is not permitted.
- An equation sheet will be posted on Canvas in advance for students' review, and a copy will also be attached to the exam paper for reference.

Final (20%)

- The final will be a comprehensive assessment.
- FE approved calculators and scratch papers will be allowed for use during the examination. However, the use of books and notes is not permitted.
- An equation sheet will be posted on Canvas in advance for students' review, and a copy will also be attached to the exam paper for reference.

Project (10%)

- A project showcasing the semester content will be required.
- Presentations (10 minutes): Apr 24,27
- Final report due: April 28

NOTE: Changes in syllabus and assignment sheets may be modified as deemed appropriate. All changes will be announced in class.

University Policies

Reasonable Accommodations

The University is committed to ensuring equal access to all educational opportunities. The Office of Disability Services (ODS), facilitates reasonable accommodations for students with disabilities and documented eligibility. It is the student's responsibility to self-identify as a student with disabilities and register with ODS to request accommodations. If you have already registered with ODS, please ensure that you have requested an accommodation letter for this course through the ODS student portal, and communicate with your instructor about your approved accommodations as soon as possible. Arrangements for testing accommodations must be made in advance. Accommodations are not retroactive. If you are not registered with ODS but believe you have a temporary health condition or permanent disability requiring an accommodation, please contact ODS as soon as possible: DisabilityServices@floridapoly.edu; (863) 874-8770; www.floridapoly.edy/disability.

Accommodations for Religious Observances, Practices and Beliefs

The University will reasonably accommodate the religious observances, practices, and beliefs of individuals in regard to admissions, class attendance, and the scheduling of examinations and work assignments. (See University Policy.)

Title IX

Florida Polytechnic University is committed to ensuring a safe, productive learning environment on our campus that prohibits sex discrimination and sexual misconduct, including sexual harassment, sexual assault, dating violence, domestic violence and stalking. Resources are available if you or someone you know needs assistance. Any faculty or staff member you speak to is required to report the incident to the Title IX Coordinator. Please know, however, that your information will be kept private to the greatest extent possible. You will not be required to share your experience. If you want to speak to someone who is permitted to keep your disclosure confidential, please seek assistance from the Florida Polytechnic University Ombuds Office, BayCare's Student Assistance Program, 1-800-878-5470 and locally within the community at Peace River Center, 863-413-2707 (24-hour hotline) or 863-413-2708 to schedule an appointment. The Title IX Coordinator is available for any questions to discuss resources and options available.

Academic Integrity

Violations of academic integrity regulation include actions such as cheating, plagiarism, use of unauthorized resources (including but not limited to use of Artificial Intelligence tools), illegal use of intellectual property, and inappropriately aiding other students. Such actions undermine the central mission of the university and negatively impact the value of your Florida Poly degree. Suspected violations will be fully investigated, possibly resulting in sanctions up to and including expulsion from the university.

Recording Lectures

Students may, without prior notice, record video or audio of a class lecture for a class in which the student is enrolled for their own personal educational use. Recordings may not be used as a substitute for class participation or class attendance. Recordings may not be published or shared in any way, either intentionally or accidentally, without the written consent of the faculty member. Failure to adhere to these requirements is a violation of state law (subject to civil penalty) and the student code of conduct (subject to disciplinary action). *Recording class activities including, but not limited to, lab sessions, student presentations (whether individually or part of a group), class discussion (except when incidental to and incorporated within a class lecture), and invited guest speakers is* ***prohibited****.*

Course Schedule
Tentative Schedule (*Subject to change per course policies.*)

Week	Date	Topic	Assignments
1	**Jan 12/14/16**	Introduction to Vibrations and Control Review of Dynamics Basic Concepts and Classification of Vibrations	
2	**Jan ~~19~~/21/23**	**Jan 19:** MLK Jr. Holiday - **No Classes** Free Vibration of Undamped SDOF systems	Homework 1
3	**Jan 26/28/30**	Free Vibration of damped SDOF systems	Homework 2
4	**Feb 2/4/6**	Free Vibration of damped SDOF systems	Homework 3
5	**Feb 9/11/13**	Harmonic Excitation of SDOF Systems	Exam I
6	**Feb 16/18/20**	Harmonic Excitation of SDOF Systems	Homework 4
7	**Feb 23/25/27**	Transient Vibrations of SDOF Systems Two Degree-of-Freedom Systems	Homework 5
8	**Mar 2/4/6**	Two Degree-of-Freedom Systems	Homework 6
9	**Mar 9/11/13**	Introduction to Controls Modeling in the Frequency Domain	Exam II
10	**Mar 16/18/20**	****** Spring Break ******	
11	**Mar 23/25/27**	Modeling in the Time Domain and State-Space Representation	Homework 7
12	**Mar 30, Apr 1/3**	Time Response Poles, Zeros, and System Response	Homework 8
13	**Apr 6/8/10**	First Order and Second-Order Systems	Homework 9
14	**Apr 13/15/17**	Stability and Frequency Response	Exam III
15	**Apr 20/22/24**	Root Locus Techniques Project Presentations	Homework 10
16	**Apr 27**	Project Presentations Final Review	