

EML 4806 Modeling and Control of Robots

EML 5808 Robot Control

Spring 2020

A. LOGISTICS

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Office Hours :	Room: EC 2108; TMTTh 4:00 – 5:00 PM
Class Schedule:	TTh 11:00 – 12:15 EC1115
Textbook (Required):	“ Introduction to Robotics: Mechanics and Controls ,” John Craig, 4 th Edition, Pearson
Textbook (Recommended):	“ Kinematics, Dynamics and Design of Machinery ,” Kenneth Waldron, Gary Kinzel, 3rd Edition, John Wiley & Sons
Textbook (Recommended):	“ Robotics, Vision and Control ,” Peter Corke, 2 nd Edition, Springer
Textbook (Recommended):	“ Robotics Toolbox for MATLAB , Release 10,” Peter Corke
TA:	TBD

B. CATALOG COURSE DESCRIPTION

Robot models in terms of geometric parameters. Kinematic and dynamic modeling of robots. Static and dynamic force equilibrium. Robot programming, control algorithms, simulations.

C. COURSE OBJECTIVES

To introduce the fundamentals of robotic systems which includes analysis of linkage mechanisms and the modeling and control of manipulators for engineering applications.

D. TOPICS COVERED

- 1) Introduction
- 2) Spatial Descriptions and Transformations
- 3) Manipulator Kinematics
- 4) Inverse Manipulator Kinematics
- 5) Jacobians: Velocities and Static Forces

- 6) Manipulator Dynamics
- 7) Manipulator Mechanism Design

E. ME PROGRAM OUTCOMES

- A. Ability to apply knowledge of mathematics including statistics, multivariable calculus and differential equations, science including physics, and engineering.
- C. Ability to design a system, component, or process to meet desired needs.
- E. Ability to identify, formulate, and solve engineering problems.
- F. Understanding of professional and ethical responsibility.
- G. Ability to communicate effectively.
- I. Recognition of the need for, and an ability to engage in life-long learning.
- K. Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

F. COURSE GRADING

Course-Work Evaluation

Quizzes	10%
Exam 1	25%
Exam 2	25%
Final Exam	25%
Projects	15%
TOTAL	100%

Grading Scale:

GRADE	SCORE RANGE	GRADE	SCORE RANGE
A	94 - 100	B-	77 - 79
A-	90 - 93	C+	73 - 76
B+	85 - 89	C	67 - 72
B	80 - 84	D	60 - 66

Grades below 60 are considered as an F

Course Policies:

Homework: Selected problems are assigned in class. It is recommended that student complete these problems by the next lecture period for which they are assigned. The instructor will not collect any of these problems for grading. Answers to selected homework problems are provided in the text, and detailed solutions for some problems related to the topic will be available on the website <http://web.eng.fiu.edu/mcdaniel>.

Exams: Two exams will be held in class and a final exam will be given during finals week. Dates for the exams will be provided in class. Excusable absence from the scheduled exams is accepted **only if** the student informs the professor before the event such as illness or after the event such as last-minute medical or other emergencies, within a reasonable time frame and with a **valid documentary proof** shown (e.g., medical memo from doctor, letter from employer, etc.).

Quizzes: three quizzes will be held in class during the semester. Dates for the quizzes will be provided in class. There will be no make ups for quizzes, however, students will be allowed to drop their lowest quiz grade.

Projects: Approximately 3 projects will be assigned during the course of the semester and will require each student to obtain access to MATLAB. You may run MATLAB on your computer through EIC by going to www.eic.fiu.edu and selecting the EIC Apps link for information on obtaining access to the software. You may also download the software directly at <https://www.mathworks.com/academia/tah-portal/florida-international-university-40640276.html>. Make sure to download the robotic toolbox, symbolic math toolbox and Simulink as well.

Class Attendance: It is recommended that every student attend all lectures, however, attendance will not be taken.

No 4-C Policy: No Cell-phone, Computer (unless taking notes), Chatting, or Cheating is allowed in this class.

Learning Strategy: Simply reading the solutions is absolutely the worst strategy for this course. **You need to practice as much as possible.**

Calculators allowed in test (by National Council of Examiners for Engineering and Surveying):

Casio: All fx-115 models. Any Casio calculator must contain fx-115 in its model name. Examples of acceptable Casio fx-115 models include (but are not limited to)

- fx-115 MS
- fx-115 MS Plus
- fx-115 MS SR
- fx-115 ES

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 contain either TI-30X or TI-36X in its model name. Examples of acceptable TI-30X and TI-36X models include (but are not limited to)

- TI-30Xa
- TI-30Xa SOLAR
- TI-30Xa SE
- TI-30XS Multiview
- TI-30X IIB
- TI-30X IIS
- TI-36X II
- TI-36X SOLAR

Academic Misconduct: Florida International University is a community dedicated to generating and imparting knowledge through excellent teaching and research, rigorous and respectful exchange of ideas, and community service. All students should respect the right of others to have an equitable opportunity to learn and honestly to demonstrate the quality of their learning. Therefore, all students are expected to adhere to a standard of academic conduct, which demonstrates respect for themselves, their fellow students, and the educational mission of the University. All students are deemed by the University to understand that if they are found responsible for academic misconduct, they will be subject to the Academic Misconduct procedures and sanctions, as outlined in the Student Handbook.

Other: Academic dishonesty is a serious offense and will be treated according to the University policy. The instructor will abide by the University's policy on religious holidays.