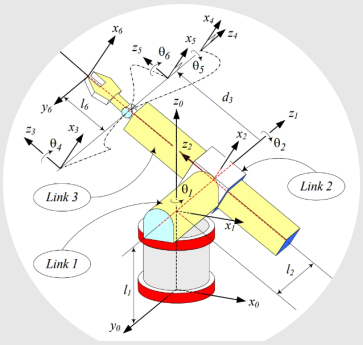

Intro to Robotics

MECG 548 - Spring 2021

3 Credits

Instructor Info

Masoud Masoumi

Office Hrs: Mondays 4-6pm

Office (during office hrs):
https://us02web.zoom.us/j/87401094090?pwd=L0QzcWFuSHhzbklJSTRlUFJkQjNsUT09

Office Number: 718-862-6403

mmasoumi01@manhattan.edu

Course Info

Mondays & Thursdays

9:20-10:35am

Classroom:
https://us02web.zoom.us/j/89103523522?pwd=WVRqRTZnVEd0ZWlGUG54R3pqZjVKdz09

Overview

The geometry and mathematical representation of rigid body motion, forward and inverse robot kinematics, robot dynamics, trajectory generation, position sensing and actuation, and the control of manipulators.

Learning Objectives

- Homogeneous transformation of rigid bodies
- Direct and inverse kinematics analysis of robot manipulators
- Design trajectories and paths
- Model and analyze robot arms using computer software.

Material

Recommended Texts

Theory of Applied Robotics: : Kinematics, Dynamics, and Control by Reza N. Jazar, 2^{nd} Edition, Springer (2010)

Introduction to Robotics: Mechanics and Control by John J. Craig, 4^{th} Edition, Pearson (2017)

Robotics, Vision and Control: Fundamental Algorithms in MATLAB by Peter Corke, 2^{nd} Edition, Springer (2017)

Other

Any handouts, required journal articles and additional book chapters will be provided.

Grading Scheme

25%	Exam I
35%	Project I
30%	Project II
10%	Online forum activity

A	Grade $\geq$ 93%
A^-	90% $\leq$ Grade $<$ 93%
B^+	87% $\leq$ Grade $<$ 90%
B	83% $\leq$ Grade $<$ 87%
B^-	80% $\leq$ Grade $<$ 83%
C^+	77% $\leq$ Grade $<$ 80%
C	73% $\leq$ Grade $<$ 77%
C^-	70% $\leq$ Grade $<$ 73%
D^+	65% $\leq$ Grade $<$ 70%
D	60% $\leq$ Grade $<$ 65%
F	Grade $<$ 60%

Online Forum Activity

The course page on Moodle has online forums to discuss various topics, including homework assignments, reading assignments, and covered topics in the course. Every student is highly encouraged to use these forums and participate in the discussions. It can also be used to introduce useful resources related to the topics covered in the course or interesting sources related to engineering statics in general. It is mandatory that everyone participate in either posting or answering others' questions at least five times during the semester. You are NOT allowed to share any solution to the assignments on the forum.

FAQs

What if my schedule does not allow me to attend office hours?

You are more than welcome to make an appointment whenever you have a question or concern by contacting me via email.

What is the topic for the projects?

The details for the projects will be announced during the semester. As a general guideline, you will have to analytically model a robot arm and simulate its behavior using computer software.

Is there any online resource that you suggest for this course?

There are many references and materials available for the topics in robotics. However, a recommended resource is https://robotacademy.net.au/.

Class Policy & Attendance

Due to the nature of the materials covered in this course, regular attendance is highly recommended. Students are required to fulfill all course requirements as detailed in the course syllabi for their registered courses. Implicit in these requirements is completion of all course assignments and attendance in all classes. Also, if I believe that a student's failure to attend class is substantially affecting his/her course grade, I am obligated to report the situation to the dean of the school in which the student is matriculated. The dean will address the situation with the student. In case you miss a class, it is your responsibility to keep up with the class work and be informed of all announcements in class such as homework assignments, quizzes, etc. Cell phones and all other forms of electronic communication devices, if carried into the classroom, must be turned off. The use of computers and other electronic devices during class is restricted to classroom activities and course applications.

Academic Integrity

The college Community Standards & Student Code of Conduct is central to the ideals of this course. Students are expected to be independently familiar with the code and to recognize that their work in the course is to be their own original work that truthfully represents the time and effort applied. Violations of the Academic Policies of the Community Standards & Student Code of Conduct are most serious and will be handled in a manner that fully represents the extent of the Code and that befits the seriousness of its violation. See the code here https://inside.manhattan.edu/student-life/dean-of-students/code-conduct.php#academicintegrity for more information.

Diversity and Inclusivity

I consider this classroom to be a place where you will be treated with respect, and I welcome individuals of all ages, backgrounds, beliefs, ethnicities, gender identities, national origins, religious affiliations, sexual orientations, ability, and other visible and non-visible differences. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.

Accommodations for Students with Special Needs

If you are a student with learning needs that require special accommodation, contact the Accommodation Administrator in Specialized Resource Center (SRC) located in Thomas Hall, Room 3.15 as soon as possible to make an appointment to discuss your special needs. Once your Academic Adjustment/ Auxiliary Form is approved, please meet with me during my office hours and bring the form. You can find more information about SRC and the procedure on their website https://inside.manhattan.edu/academic-resources/specialized-resource-center/index.php.

Academic Assistance

The Center for Academic Success (CAS) has two locations - the Learning Commons & the Leo Learning Center. These offices, conveniently spread across campus, will provide students with a quiet space to study with a peer tutor, or engage in small group study sessions. The services offered include individual peer tutoring in most 100-200 level and select 300-600 level courses. All services are free of charge. Appointments are preferred but drop-ins are also welcome. To make an appointment contact the CAS at (718) 862-7414, email success@manhattan.edu or visit Thomas Hall, 3^{rd} floor. For more information please visit their website at https://inside.manhattan.edu/academic-resources/center-for-academic-success/index.php

Class Schedule

The course will tentatively follow this schedule :

Week	Topic	Textbook Chapter
Week 1	Introduction	1
Week 2	Rotation Kinematics	2.1-2.3
Week 3	General Motion Kinematics	4.1
	Homogeneous Transformation	4.2
Week 4	Compound Homogeneous Transformation	4.4
Week 5	Review for Exam I	
	Exam I	
Week 6	Denavit-Hartenberg Method	5.1
Week 7	Transformation Between Two Adjacent Coordinate Frames	5.2
	Forward Position Kinematics	5.3
Week 8	Spherical Wrist	5.4
	Assembling Kinematics	5.5
Week 9	Inverse Kinematics	6.1-6.2
Week 10	Inverse Kinematics	6.1-6.2
	Project I Assignment	
Week 11	Path Planning	13.1
Week 12	Path Planning	13.2
Week 13	Manipulator Motion using Joint Path	13.4
	Project I Deadline & Project II Assignment	
Week 14	Manipulator Motion using End-Effector Path	13.7
Week 15	Sensors & Actuators	
Week 16	Project II Deadline	