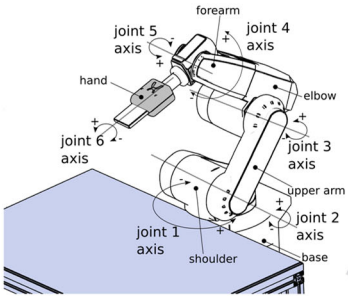
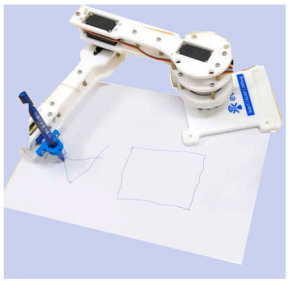
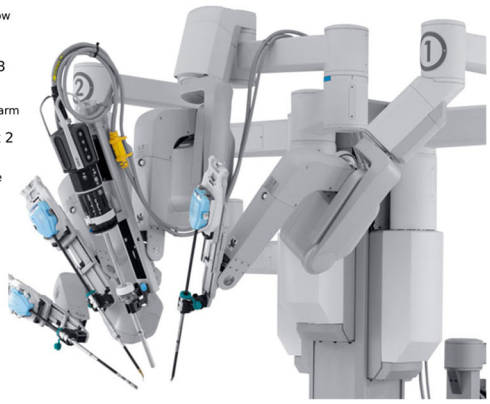
ECE PMP 543 - W2026







Mathematical models of arbitrary articulated robotic (or biological) arms and their application to realistic arms and tasks, including the homogeneous coordinate model of positioning tasks, the forward and inverse kinematic models, the Jacobian Matrix, and the recursive Newton-Euler dynamic model.

Instructional Team

Instructor:

Prof. Nivii Kalavakonda (nkalavak@uw.edu)

Office hours: Thursdays 5:00 - 6:00 PM in ECE M306 and on Zoom (Check canvas tab)

Additional office hours can be scheduled via email.

Teaching Assistant:

Ishika Kanakath

Office hours: Tuesdays 6:00 - 7:00 pm on Zoom (link in announcements)

Class time and location

Thursdays 6:30 PM - 9:50 PM (Mix of lecture and in-class participation exercises)

Location: ECE 045

Lab Location: ECE B011

Textbook

Models of Robot Manipulation, Copyright: Prof. Blake Hannaford

Lecture Slides:

Lecture slides will be uploaded to Canvas after lectures.

Grades

30% Homework

10% In-class practice (graded on effort)

10 % Quiz 1 (in class, close book, 1-page double-sided note allowed)

15% Quiz 2 (in class, close book, 1-page double-sided note allowed)

35% Final Project

Late policy for Homeworks: You are allowed to use 2 penalty-free late days for homework. 10% off each day after that. The grade will be 0 after 3 days, when the solution is posted. Extensions for medical or family emergencies will be made on a case-by-case basis.

Note: There are no late days for ICP or project submissions.

Tentative Lecture Schedule:

This is to help folks plan their quarter. The instructors may move some content around if it would benefit students.

Project Page: https://canvas.uw.edu/courses/1862377/pages/ee543-course-project-winter-2026

Week	Date (Every Thursday)	Topic	In-Lecture Activities/Exams	HW Schedule	Project Deadlines
1	8 January	Introduction and Basic Ideas			

2	15 January	Spatial Relations; Rotations	ICP 1 - Rotations		
				Rel HW 01 - 16 Jan (Friday)	
3	22 January	Rotations ; Positioning and Homogeneous Transforms ; Week2-3 Companion Slides Coordinate Transformation.pdf	ICP 2 - Hom Trans & Graphs		
				Rel HW 02 - 23 Jan (Friday) HW 01 Due 25 January (Sunday)	
4	29 January	Forward Kinematics	ICP 3 - Fwd Kinematics		
				Rel HW 03 - 30 Jan (Friday) HW 02 due - 01 February (Sunday)	
5	5 February	Workspace and Inverse Kinematics I	ICP 4 - Inverse Kin		Team formation -

					Feb 06 (Friday)
				Rel HW 04 - Feb 06 (Friday) HW 03 Due - 08 February (Sunday)	
6	12 February	Inverse Kinematics Week6_Feb12_Notes_IK.pdf	**Quiz 1** + ICP 5 - Inverse Kinematics		
7	19 February	Differentil Kinematics	ICP 6 - Jacobian Mat		
				HW 04 Due - 22 February (Sunday)	Project Proposal (Feb 20, Friday)
8	26 February	Differential Kinematics; Manipulator Dynamics	ICP 7 - Jacobian Mat + Gravity Comp		
				Rel HW 05 - Feb 27 (Friday)	

9	5 March	Manipulator Dynamics	Project time		
				HW 05 Due - 08 March (Sunday)	Intermediate Milestone (March 06, Friday)
10	12 March	Teleoperation; Trajectory Generation (Extra) Motion Planning	**Quiz 2 ;** Project time		
11	19 March	Project Presentations/Demo			19 March - Project Demo/Video Deadline
					Project Report + Video Deadline - 20 March

Acknowledgment:

This course stands on the shoulder of past instructors of the EE543 course at UW. We thank Prof. Blake Hannaford (UW ECE), Haonan Peng (UW ECE PhD candidate), and Prof. John Raiti (UW ECE; TECHIN instructor) for all their support in developing the course material and content.

Academic Integrity Expectations

We expect students to follow the relevant UW policies on Cheating (working collaboratively on quizzes/exams and homework submissions, sharing answers and previewing quizzes/exams) Plagiarism (representing the work of others as your own without giving appropriate credit to the original author(s)) Notice: The University has a license agreement with online educational tool that helps prevent or identify plagiarism from Internet resources, including work previously turned in to UW. The report is automatically generated by Canvas. The Report will indicate the

amount of original text in your work and whether all material that you quoted, paraphrased, summarized, or used from another source is appropriately referenced.

Academic Integrity Policies specific to ECE543

ICPs: work together with people, ask questions, help each other, share methods, create an open learning environment

Homework: turn in ONLY your own work, help each other with ideas and techniques but NOT answers.

Quiz/Exam: turn in ONLY your own work, NO peeking, NO talking, close book, one-page double-sided cheat sheet allowed

All suspected cheating will be reported immediately through the College of Engineering's academic misconduct procedure.

https://vannevar.ece.uw.edu/academics/undergrad/AcademicMisconduct.html

When academic misconduct is suspected:
https://www.engr.washington.edu/mycoe/academic/integrity

Land Acknowledgement

The University of Washington acknowledges the Coast Salish people of this land, the land which touches the shared waters of all tribes and bands within the Duwamish, Suquamish, Tulalip and Muckleshoot nations.

Diversity

Diverse backgrounds, embodiments and experiences are essential to the critical thinking endeavor at the heart of University education. In this course, students are expected:

- To respect individual differences, which may include, but are not limited to, age, cultural background, disability, ethnicity, family status, gender, immigration status, national origin, race, religion, sex, sexual orientation, socioeconomic status and veteran status.
- To engage respectfully in the discussion of diverse worldviews and ideologies embedded in course readings, presentations and artifacts, including those course materials that are at odds with personal beliefs and values.
- To encourage students with concerns about classroom climate to talk to their instructor, adviser, a member of the departmental or College of Engineering EDI Committee, the Assistant Dean for EDI, or the program's director.

Religious Accommodations

It is our sincere desire to create a comfortable, welcoming and safe environment for all enrolled students. This course will make accommodations to the religious observations of any student according to the UW Religious accommodation policy https://registrar.washington.edu/staffandfaculty/ religious-accommodations-policy/ Please request your religious accommodations within the first two weeks.