

Robotic Manipulation

15-384 Fall 2009

Meeting Times: Tuesdays and Thursdays, 9:00am – 10:20am, GHC 4307

Course Website: www.cs.cmu.edu/~roboticmanipulation

Overview: This class is mainly about the kinematics, dynamics, and programming of robotic mechanisms. We also spend some time on control, sensor and effector design, and automatic planning methods. The fundamental techniques apply to arms, mobile robots, active sensor platforms, and all other computer-controlled kinematic linkages. Arms are the primary application, and we will do some lab exercises to program our Denso robot arms to do something interesting.

Instructor: Howie Choset
Office: NSH 3211
Office Hours: TBA
Phone: Office x8-2495
Email: choset [at] ri [dot] cmu [dot] edu

TAs: Matthew Tesch
Office Hours: TBA
Email: mtesch [at] cmu.edu

Siyuan Feng
Lab Hours: TBA
Email: sfeng [at] andrew [dot] cmu [dot] edu

Gaurav Jalan
Office Hours: TBA
Email: gauravj123 [at] gmail [dot] com

Ian Lenz
Office Hours: TBA
Email: ilenz [at] Andrew [dot] cmu [dot] edu

Textbook: Robot Modeling and Control, Mark W. Spong, Seth Hutchinson and M. Vidyasagar, John Wiley & Sons

Prerequisites: informally, a year of calculus, a year of programming, and familiarity with matrix algebra:

Calculus: 21-121 and 21-122 (Calc I and II), or 21-115 through 21-118
Programming: 15-127 (Intro to Programming and Computer Science)

Matrix algebra, satisfied by any one of

- 18-200 (Mathematical Foundations of EE),
- 21-241 (Matrix Algebra),
- 21-341 (Linear Algebra), OR
- permission of instructor.

Also helpful, but not required, is a course on classical mechanics.

Grading:

Problem sets	30%
Lab assignments	30%
Midterm exam	10%
Final exam	30%

Above 90 is an A, from 80 to 90 is a B, etc. We may lower the thresholds slightly but we will not raise them.

Problem sets are due **at class** of the posted due date. Problem sets up to 48 hours late will receive half credit. Problem sets more than 48 hours will not be accepted.

Exams There will be an in-class midterm and one final exam where you can use an 8.5 x 11" sheet of paper, both sides, as a cheat sheet so as long as everything is written in your own hand. Other than the cheat sheet, everything else is closed book. Missing an exam will result in a zero, unless there is a dire medical or family emergency; in such cases, you must discuss with the instructor prior to the exam. Job interviews, special courses, and other enhancing experiences, although wonderful, are not reasons to miss an exam. These tests are arranged in advance so that you can plan your schedules accordingly.

Lab assignments will be done in teams of two or three. The lab assignments typically consist of programming an arm to perform some manipulation task, demonstrated during evening demo sessions. It is necessary that all team members be present for the demo. Time on the robot arms should be reserved in advance. Please be reasonable and refrain from signing up huge blocks of prime time.

Labs are due at the designated demo times with no extensions. Other than dire health and family issues, no excuses for failing to complete a lab will be accepted. We encourage you to meet with your group as soon as possible after a lab is assigned to avoid any problems. Group problems are not an excuse for failing to complete the lab. We understand that sometimes group problems may form, and it is the responsibility of the group members to resolve such problems, but feel free to call upon the Instructor or TA's for help.

The robot arms are Denso VS-E manipulators in the Robotic Education Lab, NSH 3206 (adjoining the atrium). You will have full access to the Robotic Education Lab, and must adhere to the rules. As soon as we can make arrangements your student ID card will open the door to the REL and the corridor leading to it.

The arms are dangerous! Do not start with them until Lab 1 is handed out and Howie has delivered his safety rant.