

ME 482/582

Robotics: Kinematics, Dynamics, and Control

Fall 2011

Instructor. Dr. Gregory P. Starr—I consider myself to be a shadetree mechanic who learned a little math; I have always been fascinated with things that *move* (that’s why I’m not a civil engineer). My ME office is ME 423 (MTTC 242), phone 277-6298 (272-7156), email address starr@unm.edu (or Gmail at gpstarr@gmail.com), office hours generally walk-in or by appointment in ME 423. I also have an office in MTTC Suite 235, room 242; I’m usually there on TTh.

I was on leave from UNM during the Spring 2011 semester due to an acute respiratory illness. I’m pretty much recovered from that episode, but don’t have full endurance yet.

Goal of Course. Robotics is obviously an important area for mechanical engineers. This course is intended to expose you to the basics of robot kinematics, dynamics, and a little bit of control. Note that these areas are disciplines in themselves—hence this course is by nature almost a “survey” course. Nevertheless you will gain an understanding of some of the key analytical topics in robotics. This course is strictly a “blackboard” course—no “hands-on” content. However—as you may know—I am an experimentalist, so hopefully we’ll have a demo or two (location at our lab on the UNM south campus) to illustrate some topics.

Textbooks. John J. Craig, *Introduction to Robotics: Mechanics and Control*, 3rd ed. This is a “beginner-intermediate” level book and is quite readable; John Craig wrote the first edition of this book while a Ph.D. student at Stanford back in 1986. The 3rd edition was released a few years ago, and it looks to be very similar to the previous edition (not a bad thing!). We will cover chapter 1–7, 9–11, and maybe a little more.

Exams/Projects. We will have a midterm exam and a final exam, as well as a midterm project and a final project. Both exams will be 50 minutes in length, and both projects will involve some computer work. If possible, at least one of the projects may be demonstrated on an actual robot manipulator.

Homework. Selected homework problems will be assigned. I will provide homework solutions for most homework assignments (see “Website” below)—I strongly feel that I shouldn’t ask you to do anything I wouldn’t do. I will usually have homework “hints and answers” documents available on my website for you to download. This has proven to be quite helpful.

Programming Exercises. You’ve perhaps heard that the best test of whether you understand something is if you can explain it to someone else. Well, the *next* best test of whether you understand something is if you can write a computer program to do it. Each chapter of the text has “Programming Exercises” and we will do them all (well, almost). In doing these you will build up a library of functions which will support a three-link planar robot. All programming will be done in MATLAB. You will email me your program files.

Symbolic Computation. Robot kinematics involves multiplication of symbolic matrices. The use of a “symbolic math” package can free you from tedious hand calculation. I use the “Maple” package from Maplesoft.com.

Website. My website, www.me.unm.edu/~starr has a link on the front page to ‘ME 482/582 Robot Engineering’. I will put all homework solutions and programs on this site as soon as you have submitted them to me. I will also have homework “hints” you can download *before* the homework is due.

Grading. The following table shows the weighting used to evaluate your performance in this course:

Homework	20%
Programs	20%
Midterm Exam	15%
Midterm Project	15%
Final Exam	15%
Final Project	15%
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TOTAL	100%

Mailing List (listserv). Finally, there is a “mailing list” associated with this class, ME582-L, to which you should all sign up. I will be mailing information regarding the class, and it is important that you receive it.

Use the standard procedure to join the list:

HOW TO SUBSCRIBE TO THE LIST

Individuals can subscribe to the list by sending a message to:

`listserv@list.unm.edu`

Leave the Subject field blank.

In the body of message type (with no other text):

`subscribe ME582-L Firstname Lastname`

Once the subscribe request is approved, a notification will be emailed to the person.