

MEAM 520

Introduction to Robotics

Katherine J. Kuchenbecker, Ph.D.

Mechanical Engineering and Applied Mechanics Department
SEAS, University of Pennsylvania

GRASP
LABORATORY

Lecture 1: August 28, 2013



Who?

What?

How?

Why?

Who am I?



Katherine J. Kuchenbecker, Ph.D.

Associate Professor
Mechanical Engineering and Applied Mechanics
Secondary Appointment in Computer and Information Science
Graduate Group in Bioengineering

Part of the General Robotics, Automation, Sensing, and Perception (GRASP) Laboratory and the Institute for Research on Cognitive Science (IRCS)

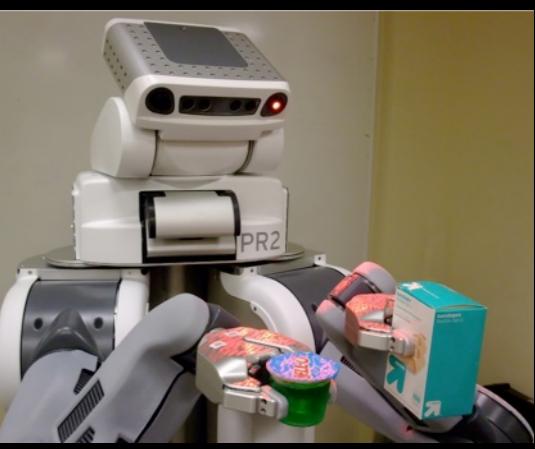
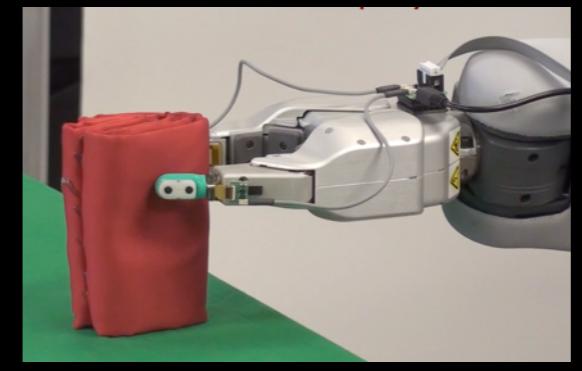
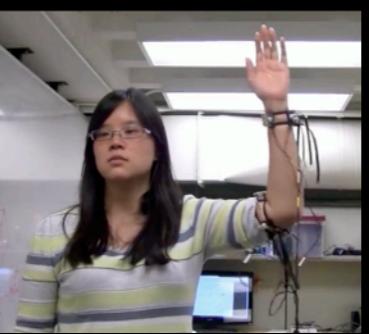
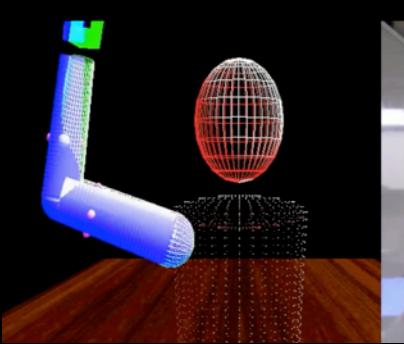
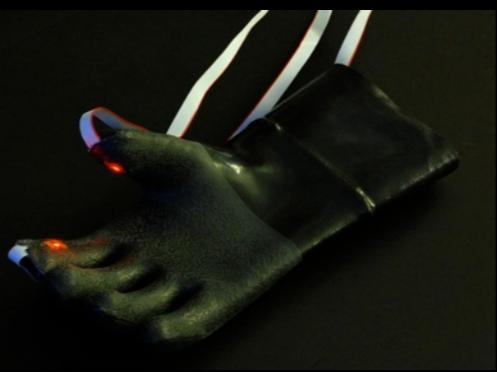
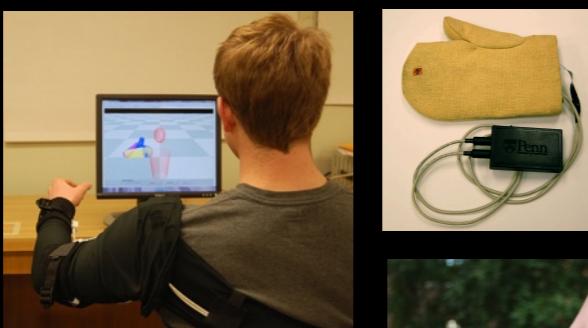
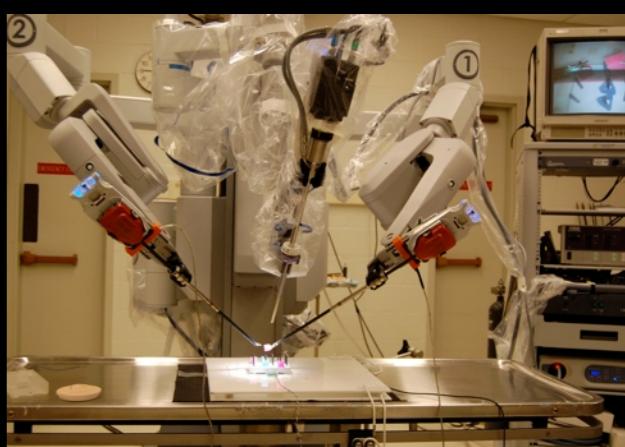
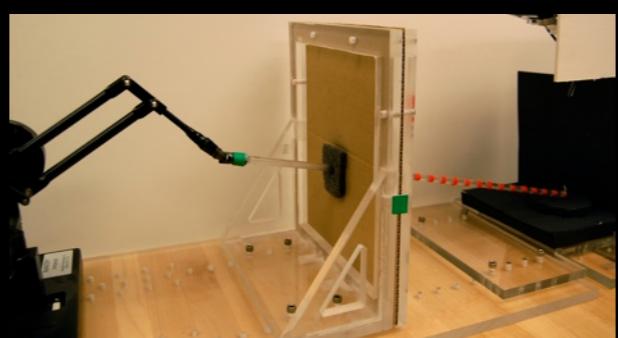
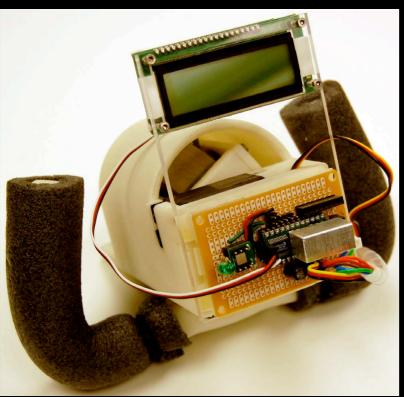
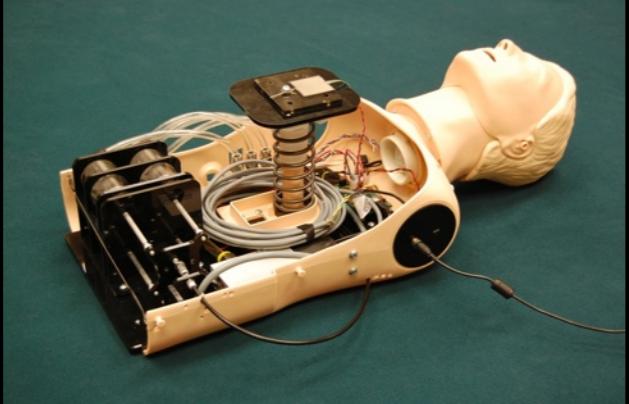
Who am I?

- Kuchenbecker is best pronounced *Kook-en-beck-er*
- Kuchenbecker means “Cake Baker” in German
- You can address me as any of the following.
Pick the one with which you are most comfortable.
 - Professor
 - Professor Kuchenbecker
 - Dr. Kuchenbecker
 - Dr. K
 - Katherine
- I often refer to myself with my initials (KJK)

Who am I?



- I joined the Penn faculty in July 2007; this is my seventh year here.
- From 2006 to 2007 I was a postdoctoral scholar with Allison Okamura at Johns Hopkins University.
- I earned my doctorate in June 2006 at Stanford University, where I worked with Günter Niemeyer.
- My primary research interests are:
 - Creating highly realistic haptic interfaces for virtual environments and teleoperation.
 - Making autonomous robots that can capably accomplish physical tasks and understand the world around them.
 - Understanding and aiding human motor learning.
 - Developing medical devices and medical robotic systems.



How do you contact me?

Mainly: in class and via Piazza

Email: kuchenbe@seas.upenn.edu

Office: 224 Towne Building

Office Phone: (215) 573-2786

Office Hours: Tuesdays 1:30-2:30 p.m.
Thursdays 3:00-4:00 p.m.

Where is my office?



What's inside my office?



Who are you?

Undergraduate?
Submatriculant?
Masters?
Ph.D.?

Mechanical Engineering?
Robotics?
Embedded Systems?
Computer Science?
Other?

New to Penn?
Second year?
Third or later years?

U.S.A.?
North America?
Central America
and Caribbean?
South America?
Asia?
Middle East?
Europe?
Africa?
Australia?
Antarctica?

Who else will be teaching us?



Naomi Fitter
Teaching Assistant



Tyler Barkin
Lab Assistant



Samarth Brahmbhatt
Lab Assistant



Chaitanya Bhargava **Ed (Yunkai) Cui** **Annie Mroz** **Others To Be
Lab Assistant & Grader** **Grader** **Grader** **Determined**

What is this class about?

Robots, particularly robot arms and some mobile robots

Tentative list of topics:

- Translation and Rotation in 2D and 3D
- Forward Kinematics of Serial Manipulators
- Trajectory Planning
- Inverse Kinematics
- Velocity Kinematics
- Independent Joint Dynamics and Control
- Manipulator Dynamics and Control
- Haptic Interfaces
- Teleoperation
- Simple Computer Vision
- Mobile Robots



What is this class about?

There is a **lab** component!

Simulating robots in Matlab

Hands-on experience with an industrial manipulator

Hands-on experience with a haptic interface

Hands-on experience with a vision-guided mobile robot

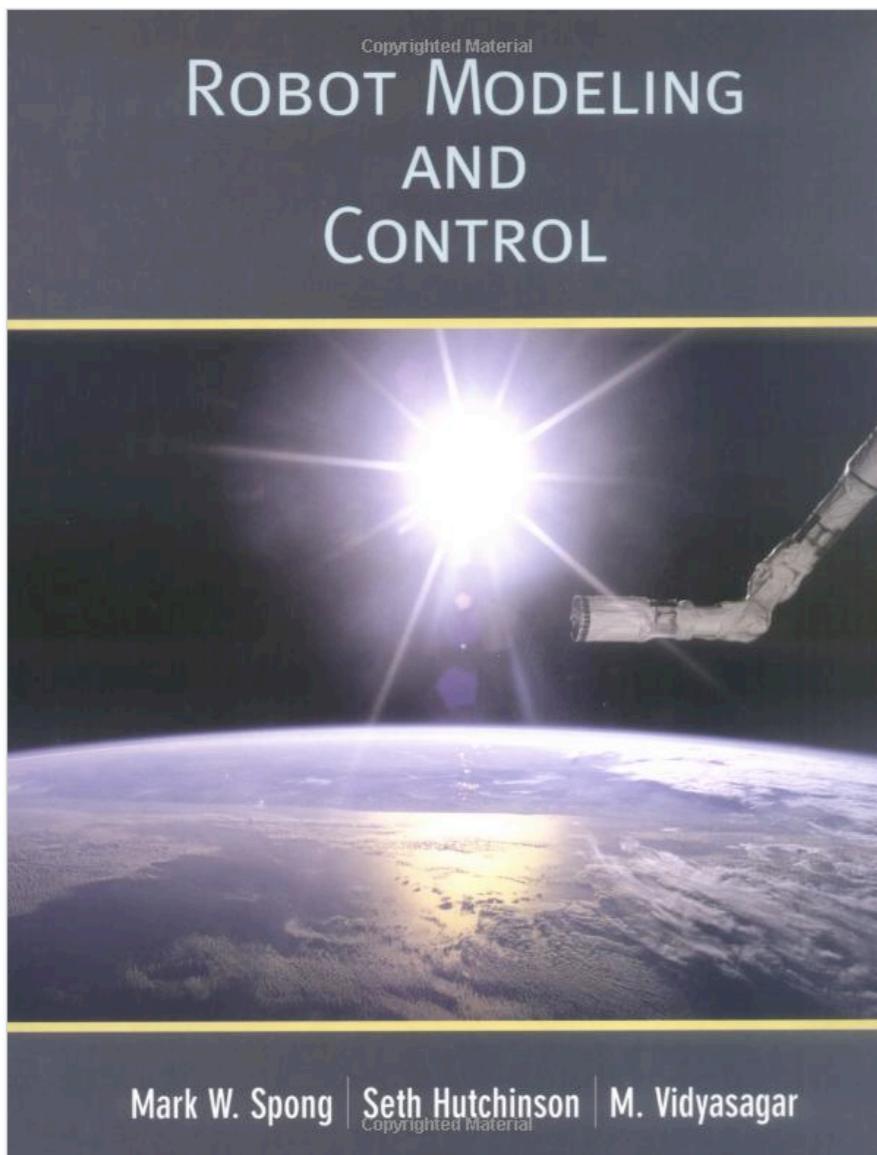


Textbook



- “Robot Modeling and Control” by Spong, Hutchinson, and Vidyasagar, published in 2006.
- You should get a copy.
- Two copies of the book are on reserve at the Engineering Library (Towne 2nd floor)
- Other robotics textbooks also on reserve in the library.

Reading Assignment



- Chapter I: “Introduction,”
- Read pages I to 19 in the textbook.
- Find the error in Figure 1.17.
- Skim from page 19 to 33 (“Outline of the Text”).
- Do this before lecture on Tuesday.

Class Components

- Written assignments ~12.5%
- Programming assignments in simulation ~12.5%
- Programming assignments on real robots (projects) ~25%
- Midterm ~20%
- Final exam ~30%

Course Logistics

- You should be a junior undergraduate, senior undergraduate, or graduate student in STEM (science, technology, engineering, or math).
- I listed MEAM 211 as a prerequisite, but it is not strictly required. Previous experience in kinematics will be useful, but you can make this up if you lack it.
- This class is worth one credit unit.
- We meet two days a week.
- Tuesday and Thursday classes are from noon to 1:20 p.m. in Claudia Cohen Hall G17.
- No scheduled recitations; we can hold review sessions when needed.

Attendance

- I want to see you in class every day.
- You are expected to participate actively in lectures, homework assignments, and projects.
- If you have to miss class, you should make up the lecture by getting notes from a classmate and watching the **lecture recording** online.
 - Links are automatically posted on Canvas.
 - Recording includes slides and audio, but no video.
- Late arrivals and unexcused absences will get in the way of understanding and enjoying the material.

Participate Actively!

Learning Method	Retention	Class Activity
What one reads	10%	Readings
What one hears	26%	Lectures, discussions
What one sees	30%	Figures, drawings, slides
What one sees and hears	50%	Lectures with visuals
What one says	70%	Asking questions, discussing class topics
What one says while doing something	90%	Hands-on assignments, project demonstration

My Philosophy About Slides

- I use slides to support my presentation and ensure there is something interesting to look at in the lecture recording.
- After each lecture, I will post a pdf of my slides on Piazza under Course Page/Resources/Lecture Slides.
- The slides are **not** lecture notes or a transcript of class. It is boring to watch someone read slides.
- I will write on the board, bring demonstrations, and say things that are not written in the slides. You should take notes!
- The slides are **not** a substitute for the book.

Course Website: Piazza

<https://piazza.com/class#fall2013/meam520>

MEAM 520

https://piazza.com/class/hf935b0sz1m5r3?cid=7

Katherine J. Kuchenbecker

hw1 hw2 hw3 hw4 lecture1 logistics other

Unread Updated Unresolved Following

New Post Search or add a post...

PINNED

■ Private Search for Teammates! 4/7/13

TODAY

■ Instr First Lecture and My Office ... 11:33PM
Hello all, Welcome to MEAM 520! Our first lecture is this Thursday, August 29, from 12:00 noon to 1:20 p.m. The lectu

THIS WEEK

■ Instr Welcome to Piazza! Mon
Dear students, Welcome to Piazza! We'll be conducting all class-related discussion here this term. The quicker you be

WEEK 4/7 - 4/13

■ Private Introduce Piazza to your stu... 4/7/13

■ Private Get familiar with Piazza 4/7/13

■ Private Tips & Tricks for a successfu... 4/7/13

Welcome to Piazza!
Piazza is a Q&A platform designed to get you great answers from classmates and instructors fast. We've put together thi

Note History:

note ★ stop following 2 views Actions

First Lecture and My Office Hours

Hello all,

Welcome to MEAM 520! Our first lecture is this Thursday, August 29, from 12:00 noon to 1:20 p.m.

The lecture will take place in Claudia Cohen Hall G17, also known as the Class of 1969 Lecture Room. It's a nice large auditorium with 275 seats and everything we will need this semester, including lecture recording capabilities.

This building is located two blocks west of the School of Engineering near College Hall and Houston Hall. The official address is 249 South 36th Street, between Spruce Street and Locust Walk.

I'm attaching a Google Maps view of the building so you know what you're looking for. You should enter the building from the east. G17 is on the first floor on the right immediately after you enter.



Average Response Time: N/A Special Mentions: There are no special mentions at this time. Online Now | This Week: 2 | 43

Copyright © 2013 Piazza Technologies, Inc. All Rights Reserved. Privacy Policy Copyright Policy Terms of Use Blog Report Bug!

Piazza Access

- Earlier this week, I invited all enrolled students to the Piazza site.
- 15 people still need to activate their accounts.
- You can also join this class on your own:
piazza.com/upenn/fall2013/meam520
- I ❤️ Piazza.
- You will ❤️ Piazza.

MEAM 520

https://piazza.com/class/h6fcx0mgghdjx?cid=236

Katherine J. Kuchenbecker

homework1 homework2 homework3 homework4 homework5 lecture4 lecture16 lecture17 lecture20 other

Unread Updated Unresolved Following

New Post Search or add a post...

FAVORITES

MEAM 520 final score distribution 11/15/12
How much will homework and projects count toward the final grade of MEAM 520? #Grade

WEEK 3/24 - 3/30
Instr Interesting Robotics Seminar... 3/26/13
If you're interested in robotics, I encourage you to attend this Friday's GRASP seminar. It will be at 11am in Wu and Ch

WEEK 12/16 - 12/22
Instr Jacobians and Forces 12/19/12
In the textbook, there is some difference from the lecture about the Jacobian. The book's force vector contains nx, ny, za

puma vs phantom 12/18/12
Can you go through the key differences between the phantom and the puma?

Can we have a sample solution to Proj... 12/18/12
I am confused about the standard surface rendering in 3D in lecture 17. What is $\$\$r_{\{p\}}\$$? Is there any relationship

Questions in Lecture 18 Slides 12/18/12
Would it be possible to make sure that the answers (below) to the questions in Lecture 18 slides are correct? Especially

Instr Notes from the Review Session 12/18/12
Sorry this is a tad bit late and they may be a little messy, but here is a link to Denise's and my notes we used during

Instr Encoder counts versus pulses? 12/18/12
I still have a little question with encoder. The counts on datasheet is actually pulse we say in our class. However ther

- An instructor thinks this is a good question

This class has been made inactive. No posts will be allowed until an instructor reactivates the class.

question

stop following 69 views

puma vs phantom

Can you go through the key differences between the phantom and the puma?

edit good question 0 8 months ago by Anonymous

the instructors' answer, where instructors collectively construct a single answer

Easily the biggest and most important difference is that the Phantom has significantly less mechanical impedance than the puma does. It's super light weight, low friction, and easily backdrivable. This allows a user to move the Phantom around with ease and allows the Phantom to provide nice clean force feedback to the user with little complication from inertia. The Phantom is meant to be a haptic device though, right? Thus it's not meant to provide a lot of force or carry a lot of weight. The Puma, being an industrial manipulator, is meant to provide the force necessary to perform manufacturing and other industrial tasks. It doesn't make a very good haptic device at all because the joints are not made to back drive very easily.

edit good answer 0 8 months ago by Ryan Scott Wilson

followup discussions for lingering questions and comments

Start a new followup discussion

Compose a new followup discussion

Average Response Time: 48 min Special Mentions: Ryan Scott Wilson answered Jacobians and Forces in...

Online Now | This Week: 1 | 3

Copyright © 2013 Piazza Technologies, Inc. All Rights Reserved. Privacy Policy Copyright Policy Terms of Use Blog Report Bug!

Piazza Use

- We will post all announcements, course materials, and assignments via Piazza.
- You should use Piazza for all questions and comments on this class.
- You can post anonymously (hidden name) if you don't want other students to identify you.
- You can post privately (only to the instructors) if you think your question may disclose important information about an assignment.
- Use email only for sensitive personal topics.

Course Gradebook: Canvas

<http://upenn.instructure.com/>



MEAM 520

2013C

Home

Announcements

Modules

Piazza

Grades

Assignments

Discussions

Pages

Files

Outcomes

Syllabus

People

Quizzes

Conferences

Collaborations

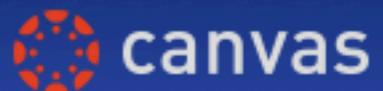
Settings

Courses

Assignments

Grades

Calendar

[Home](#) > [MEAM 520](#) > Modules

Introduction to Robotics

[Change Home Page Layout](#) | [See Course Stream](#)

Course Modules

[View Progress](#)[Create a Module](#)

Lecture Recordings

[View Lecture Recordings](#)

Coming Up

[View Calendar](#)

Nothing for now



MEAM 520

2013C

Home

Announcements

Modules

Piazza

Grades

Assignments

Discussions

Pages

Files

Outcomes

Syllabus

People

Quizzes

Conferences

Collaborations

Settings

Courses

Assignments

Grades

Calendar



canvas

[Home](#) > MEAM 520 > Announcements

Search title, body, or author

Unread



Make an announcement



Using Piazza

KATHERINE

12:20am

This course will use Piazza for almost all web functions. You can join and view the MEAM 520 ...



Add External





MEAM 520

2013C

Home

Announcements

Modules

Piazza

Grades

Assignments

Discussions

Pages

Files

Outcomes

Syllabus

People

Quizzes

Conferences

Collaborations

Settings

Courses

Assignments

Grades

Calendar

KATHERINE | Inbox | Settings |

[Home](#) > [MEAM 520](#) > [Announcements](#) > [Using Piazza](#)

Search entries or author

Unread



Edit



Using Piazza

Aug 29 at 12:20am

KATHERINE

This course will use Piazza for almost all web functions. You can join and view the MEAM 520 Piazza site at:

<http://piazza.com/upenn/fall2013/meam520>

The only two parts of Canvas we will use are the gradebook and the posting of lecture recordings.

 [Reply](#)

Piazza

https://upenn.instructure.com/courses/1162420/external_tools/24846

KATHERINE | Inbox | Settings | Logout | Help

 Penn UNIVERSITY of PENNSYLVANIA

Courses Assignments Grades Calendar  canvas

MEAM 520
2013C

Home Announcements Modules Piazza Grades Assignments Discussions Pages Files Outcomes Syllabus People Quizzes Conferences Collaborations Settings

MEAM 520 > Piazza

PIAZZA MEAM 520 Q & A Course Page Manage Class

hw1 hw2 hw3 hw4 lecture1 logistics other

Unread Updated Unresolved Following

New Post Search or add a post...

PINNED

■ Private **Search for Teammates!** 4/7/13

YESTERDAY

■ Instr **First Lecture and My Office ...** 11:33PM
Hello all, Welcome to MEAM 520! Our first lecture is this Thursday, August 29, from 12:00 noon to 1:20 p.m. The lectu

THIS WEEK

■ Instr **Welcome to Piazza!** Mon
Dear students, Welcome to Piazza! We'll be conducting all class-related discussion here this term. The quicker you be

WEEK 4/7 - 4/13

■ Private **Introduce Piazza to your stu...** 4/7/13

■ Private **Get familiar with Piazza** 4/7/13

■ Private **Tips & Tricks for a successfu...** 4/7/13

Note History: Katherine J. Kuchenbecker

note 

First Lecture and My Office Hours

Hello all,

Welcome to MEAM 520! Our first lecture is this Thursday, August 29, from 12:00 noon to 1:20 p.m. The lecture will take place in Claudia Cohen Hall G17, also known as the Lecture Room. It's a nice large auditorium with 275 seats and everything semester, including lecture recording capabilities.

The lecture is located two blocks west of the School of Engineering near Houston Hall. The official address is 249 South 36th Street, between Spruce and Locust Walk.

I'm attaching a Google Maps view of the building so you know what you should enter the building from the east. G17 is on the first floor on the right you enter.

Average Response Time: N/A Special Mentions: There are no special mentions at this time.

Copyright © 2013 Piazza Technologies, Inc. All Rights Reserved. Privacy Policy Copyright

MATLAB

Fwd: [ircslocalfaculty] MATLAB tutorials in late August and early September — Sent

From: Katherine Kuchenbecker
Subject: Fwd: [ircslocalfaculty] MATLAB tutorials in late August and early September
Date: August 26, 2013 6:31:44 PM EDT
To: meam520-001-13C@lists.upenn.edu



Dear students,

I'm the professor for MEAM 520: Introduction to Robotics. You're receiving this email because you're currently enrolled to take my course this fall. I sent another email like this in early August, but many more people have enrolled since then, so I wanted to send it again.

We are going to be using the programming language MATLAB quite a bit in MEAM 520. If you're not already comfortable in MATLAB, I recommend you sign up for one of the introductory or intermediate workshops described in the forwarded message below. The first one is this Thursday from 6 to 8pm.

Another way to build or brush up your MATLAB skills is to do the interactive online tutorial provided by the MathWorks. The tutorial is presented via Adobe Flash Player and can be completed via any modern web browser. There is an audio narration, so you may want to use headphones. Doing the entire tutorial takes approximately three hours, and I recommend you break it up into smaller chunks. You will need to create a free MathWorks account to access this, and you may need to use your seas.upenn.edu email address:
http://www.mathworks.com/academia/student_center/tutorials/mltutorial_launchpad.html

I also received confirmation that SEAS is going to pay for licenses so all engineering students in courses that require MATLAB (like this class) can install the program and about 40 toolboxes on their personally owned computer. It will be a one-year license; I'll share the installation instructions as soon as I have them. MATLAB is also available on all computers in the school of engineering so you can use it even if you don't have your own computer.

I look forward to seeing you at the first day of class - this Thursday at noon in Claudia Cohen Hall G17! I will give an overview of the course, we'll do an activity to get you thinking about robots, and I'll answer questions. If you have a particular concern or question about whether you should take this class, please see me after lecture or during my 3-4pm office hours on Thursday.

Best wishes,
KJK

Begin forwarded message:

From: Jessica Marcus <jmarcus@seas.upenn.edu>
Date: August 26, 2013 2:34:05 PM EDT
To: ircslocalfaculty@lists.seas.upenn.edu
Subject: [ircslocalfaculty] MATLAB tutorials in late August and early September

Hello to all. IRCS is sponsoring MATLAB tutorials to be held this week and next for students enrolled in courses for which some knowledge of MATLAB would be helpful. Since this may apply to students in courses you're teaching this semester, we wanted to make sure you have information to share with your students about when and where the sessions will be held, and how to sign up for them.

We are offering two sessions -- a beginner session and a more



MATLAB

Fwd: [ircslocalfaculty] MATLAB tutorials in late August and early September — Sent

Delete Junk Reply Reply All Forward Print To Do

Begin forwarded message:

From: Jessica Marcus <jmarcus@seas.upenn.edu>
Date: August 26, 2013 2:34:05 PM EDT
To: ircslocalfaculty@lists.seas.upenn.edu
Subject: [ircslocalfaculty] MATLAB tutorials in late August and early September

Hello to all. IRCS is sponsoring MATLAB tutorials to be held this week and next for students enrolled in courses for which some knowledge of MATLAB would be helpful. Since this may apply to students in courses you're teaching this semester, we wanted to make sure you have information to share with your students about when and where the sessions will be held, and how to sign up for them.

We are offering two sessions -- a beginner session and a more advanced session -- with each session being offered twice so students will have a choice of times to attend. The first two sessions, the introductory sessions, will be held during the week that Fall semester classes begin. We've reserved a computer lab in DRL that can accommodate 20 students at a time.

The session times are as follows:

Session 1 - Introduction to MATLAB: Thursday, 8/29: 6-8pm

Session 1 - Introduction to MATLAB: Saturday, 8/31: 1-3pm

Session 2 - Intermediate MATLAB: Thursday, 9/5: 6-8pm

Session 2 - Intermediate MATLAB: Sunday 9/8: 1-3pm

These classes are free, but registration is required due to space limitations. Please have interested students sign up by emailing me: jmarcus@seas.upenn.edu. I will send an email confirmation to each registered student.

The instructors for these sessions are Manuel Spitschan, a Psychology graduate student, and Alexander Burka, an Electrical and Systems Engineering graduate student.

Best regards,

Jessica.



MATLAB®

MATLAB

Introduction: Thursday, 8/29: 6-8pm

Introduction: Saturday, 8/31: 1-3pm

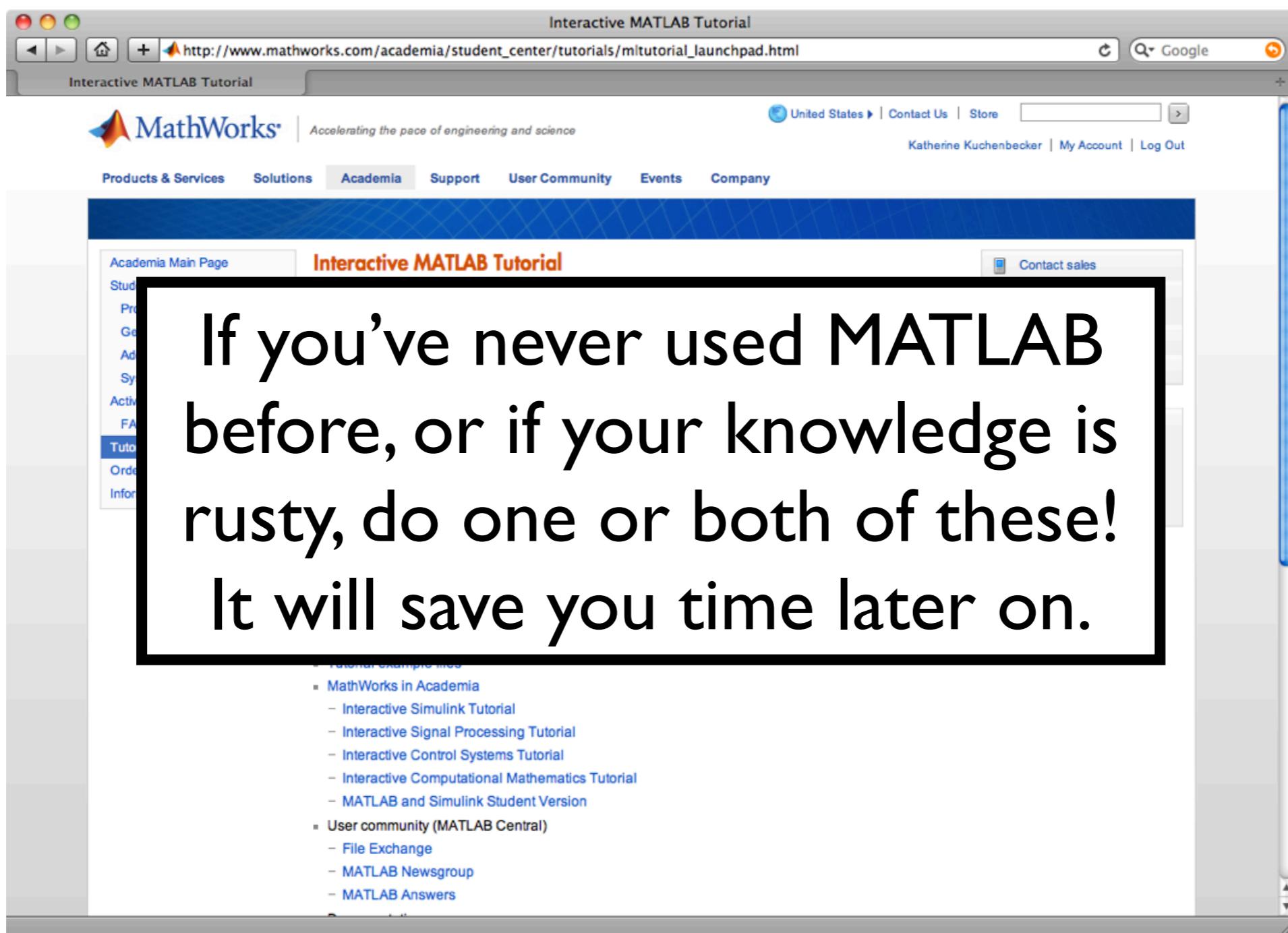
Intermediate: Thursday, 9/5: 6-8pm

Intermediate Sunday, 9/8: 1-3pm

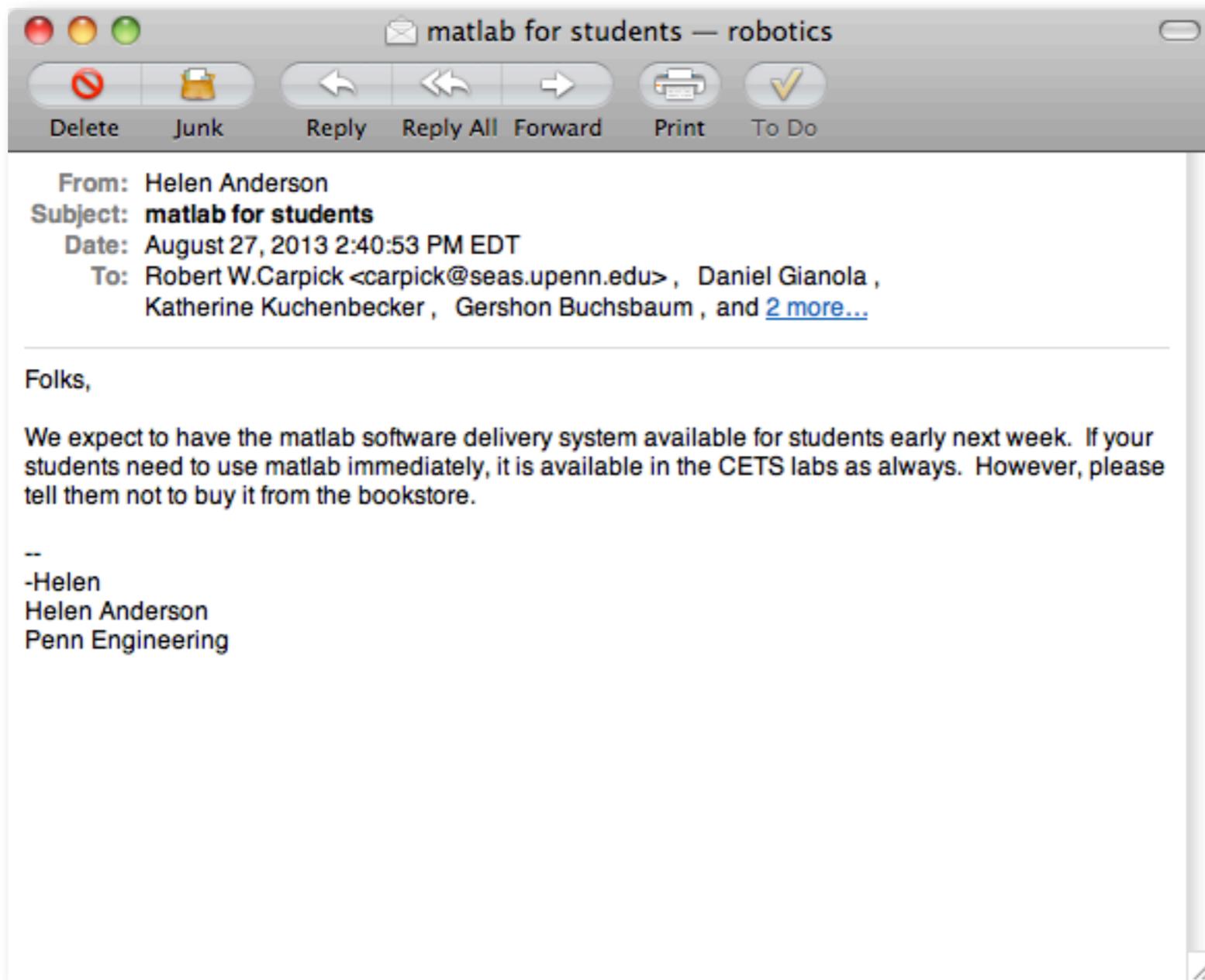
email jmarcus@seas.upenn.edu to sign up

MATLAB

Free online tutorial: [http://www.mathworks.com/academia/
student_center/tutorials/mltutorial_launchpad.html](http://www.mathworks.com/academia/student_center/tutorials/mltutorial_launchpad.html)



MATLAB Licenses



Mechatronics vs. Robotics

Which should you take?

MEAM 410/510 or MEAM 520

low level

how to build robots
and other smart products

higher level

how to understand and
control robot motion



PennCourseReview



Search for a class or a professor, e.g., Siegel, ECON001, Intro to Philosophy

Welcome!

Welcome to the new Penn Course Review!

The student-run Penn Course Review has served as a valuable guide for course selection since the 1960s. Now, we have completely redesigned the experience, making it even easier to look for your classes and professors. We hope you will enjoy it!

Interested in building something on the Penn Course Review API? Go here to [request API access](#).

Questions?

If you have any questions, take a look at our [FAQs](#) section.

Developed by



PennCourseReview



Courses

MEAM 510

DSGN OF MECHATRONIC SYS

Welcome!

Welcome to the new Penn Course Review!

The student-run Penn Course Review has served as a valuable guide for course selection since the 1960s. Now, we have completely redesigned the experience, making it even easier to look for your classes and professors. We hope you will enjoy it!

Interested in building something on the Penn Course Review API? Go here to [request API access](#).

Questions?

If you have any questions, take a look at our [FAQs](#) section.

Developed by



PennCourseReview

[Home](#) | [About](#) | [FAQs](#) | [Feedback](#) | [Logout](#)


MEAM 510

(Also: [MEAM-410](#))

Dsgn Of Mechatronic Sys

In many modern systems, mechanical elements are tightly coupled with electronic components and embedded computers. Mechatronics is the study of how these domains are interconnected, and this hands-on, project-based course provides an integrated introduction to the fundamental components within each of the three domains, including: mechanical elements (prototyping, materials, actuators and sensors, transmissions, and fundamental kinematics), electronics(basic circuits, filters, op amps, discrete logic, and interfacing with mechanical elements), and computing (interfacing with the analog world, microprocessor technology, basic control theory, and programming).

 Average
11 Sections

3.4

Course

3.4

Instructor

3.4

Difficulty

 Most
Recent
Fall 2012

3.8

Course

3.6

Instructor

3.7

Difficulty

 View: [Average](#) [Most Recent](#)
[Choose Columns](#)


+ Instructor	Name	Course Quality	Instructor Quality	Difficulty		
JONATHAN FIENE	Dsgn Of Mechatronic Sys	3.62	3.61	3.52		
Semester	Name	Section	Responses	Course Quality	Instructor Quality	Difficulty
Fall 2012	DSGN OF MECHATRONIC SYS	401	50/59	3.78	3.57	3.66
Fall 2011	DSGN OF MECHATRONIC SYS	401	72/82	3.41	3.40	3.63
Fall 2010	DSGN OF MECHATRONIC SYS	401	64/67	3.58	3.53	3.53
Fall 2009	DSGN OF MECHATRONIC SYS	401	39/45	3.63	3.68	3.35
Fall 2008	DSGN OF MECHATRONIC SYS	401	25/25	3.68	3.72	3.52
Fall 2007	DSGN OF MECHATRONIC SYS	401	29/32	3.66	3.76	3.41

[Feedback](#)

mechanical elements (prototyping, materials, actuators and sensors, transmissions, and fundamental kinematics), electronics(basic circuits, filters, op amps, discrete logic, and interfacing with mechanical elements), and computing (interfacing with the analog world, microprocessor technology, basic control theory, and programming).

View: Average Most Recent

Choose Columns

?

Instructor	Name	Course Quality	Instructor Quality	Difficulty	Amount Learned	Amount of Work	Value of Readings	Instructor Communication	Instructor Accessibility	Ability to Stimulate Interest	TA Quality	Re	
Semester	Name	Section	Responses	Course Quality	Instructor Quality	Difficulty	Amount Learned	Amount of Work	Value of Readings	Instructor Communication	Instructor Accessibility	Ability to Stimulate Interest	TA Quality
JONATHAN FIENE	Dsgn Of Mechatronic Sys	3.62	3.61	3.52	3.77	3.97	2.66	3.45	3.46	3.73	3.17	3.7	
Fall 2012	DSGN OF MECHATRONIC SYS	401	50/59	3.78	3.57	3.66	3.89	3.91	2.98	3.49	3.38	3.85	3.17
Fall 2011	DSGN OF MECHATRONIC SYS	401	72/82	3.41	3.40	3.63	3.67	4.00	2.34	3.17	3.03	3.64	3
Fall 2010	DSGN OF MECHATRONIC SYS	401	64/67	3.58	3.53	3.53	3.82	3.98	2.28	3.32	3.19	3.74	3
Fall 2009	DSGN OF MECHATRONIC SYS	401	39/45	3.63	3.68	3.35	3.69	3.95	2.81	3.30	3.50	3.73	3
Fall 2008	DSGN OF MECHATRONIC SYS	401	25/25	3.68	3.72	3.52	3.76	4.00	2.79	3.67	3.80	3.72	3
Fall 2007	DSGN OF MECHATRONIC SYS	401	29/32	3.66	3.76	3.41	3.79	4.00	2.74	3.76	3.83	3.6	Feedback

PennCourseReview

[Home](#) | [About](#) | [FAQs](#) | [Feedback](#) | [Logout](#)


MEAM 520

(Recent Example) Intro To Robotics

The rapidly evolving field of robotics includes systems designed to replace, assist, or even entertain humans in a wide variety of tasks. Recent examples include planetary rovers, robotic pets, medical surgical-assistive devices, and semi-autonomous search-and-rescue vehicles. This introductory-level course presents the fundamental kinematic, dynamic, and computational principles underlying most modern robotic systems. The main topics of the course include: coordinate transformations, manipulator kinematics, mobile-robot kinematics, actuation and sensing, feedback control, vision, and motion planning. The material is reinforced with hands-on lab exercises including robot-arm control and the programming of vision-guided mobile robots.

Average
3 Sections

2.8

Course

3.2

Instructor

2.6

Difficulty

Most
Recent
Fall 2012

2.7

Course

3.4

Instructor

2.3

Difficulty

View: [Average](#) [Most Recent](#)

[Choose Columns](#)



+ Instructor	Name	Course Quality	Instructor Quality	Difficulty	Amount Learned	Amount of Work	Value of Readings	Instructor Communication	Instructor Accessibility	Ability to Stimulate Interest	TA Quality	Re for
+ JONATHAN FIENE	Various	2.86	3.04	2.73	2.87	2.99	2.46	2.81	2.95	3.35	3.29	2.0
- KATHERINE J. KUCHENBECKER	Intro To Robotics	2.71	3.39	2.31	2.72	2.37	2.71	3.46	3.46	3.56	3.44	3.1

Semester Name

Section Responses

Course

Instructor

Difficulty

Amount

Amount

Value of

Instructor

Instructor

Abili
Stim

Feedback

(Recent Example) Intro To Robotics

The rapidly evolving field of robotics includes systems designed to replace, assist, or even entertain humans in a wide variety of tasks. Recent examples include planetary rovers, robotic pets, medical surgical-assistive devices, and semi-autonomous search-and-rescue vehicles. This introductory-level course presents the fundamental kinematic, dynamic, and computational principles underlying most modern robotic systems. The main topics of the course include: coordinate transformations, manipulator kinematics, mobile-robot kinematics, actuation and sensing, feedback control, vision, and motion planning. The material is reinforced with hands-on lab exercises including robot-arm control and the programming of vision-guided mobile robots.

Most
Recent
Fall 2012

2.7
Course

3.4
Instructor

2.3
Difficulty

View: Average Most Recent

Choose Columns ?

Instructor	Name	Course Quality	Instructor Quality	Difficulty	Amount Learned	Amount of Work	Value of Readings	Instructor Communication	Instructor Accessibility	Ability to Stimulate Interest	TA Quality	Re		
JONATHAN FIENE	Various	2.86	3.04	2.73	2.87	2.99	2.46	2.81	2.95	3.35	3.29	2.0		
KATHERINE J. KUCHENBECKER	Intro To Robotics	2.71	3.39	2.31	2.72	2.37	2.71	3.46	3.46	3.56	3.44	3.1		
Semester	Name	Section	Responses	Course Quality	Instructor Quality	Difficulty	Amount Learned	Amount of Work	Value of Readings	Instructor Communication	Instructor Accessibility	Ability to Stimulate Interest	TA Quality	Re
Fall 2012	INTRO TO ROBOTICS	001	81/103	2.71	3.39	2.31	2.72	2.37	2.71	3.46	3.46	3.56	3.44	3

My Plans

I intend to teach more material and do more labs
that we did last fall.

These changes will make this class more thorough
and challenging than it was last time.

It will be less work than Mechatronics.

Questions ?

Activity

1. Find a partner. Sit together.
2. Obtain a blindfold, a cup, and some candy.
3. Devise a general non-linguistic auditory communication scheme that enables a sighted partner to **direct a blindfolded partner to pick up a piece of candy and put it in the cup** without knocking over the cup or touching anything else.
4. Test your scheme, using different cup and candy locations and switching roles.

Activity

5. Blindfold one partner. No peeking.
6. Use the same communication scheme to direct your partner to do a different secret task:

What schemes did you use?

What are their main distinguishing features?

motion commands vs. *exploration with feedback*

absolute position vs. *incremental position* vs. *velocity*

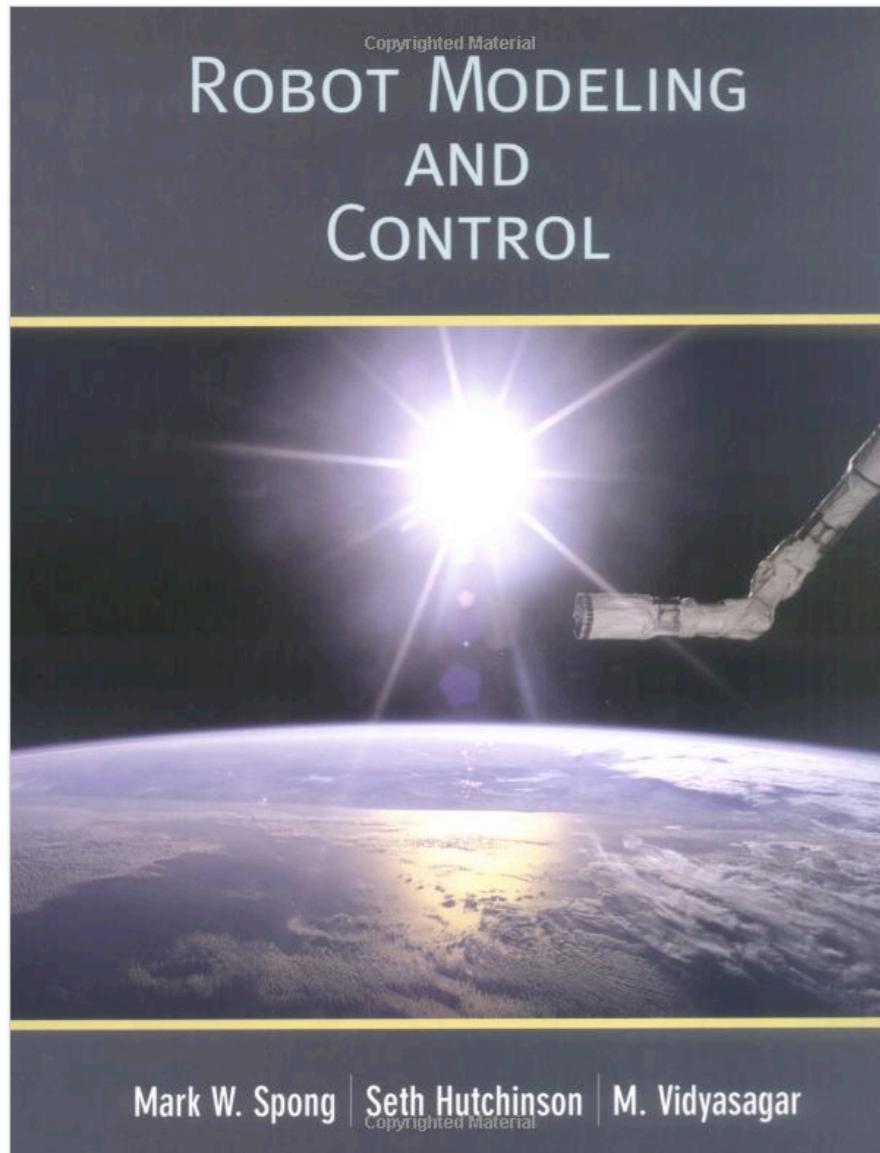
Cartesian space vs. *joint space*

communication code and *error handling*

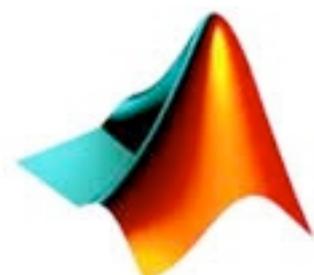
How well did you do on the first vs. second task?

What problems would we have to solve to get a robot to do these same tasks?

Assignment



- Chapter I: “Introduction,”
- Read pages I to 19 in the textbook.
- Find the error in Figure I.17.
- Skim from page 19 to 33 (“Outline of the Text”).
- Do this before lecture on Tuesday.



MATLAB®

Also brush up on MATLAB if needed!