



Tuesdays and Thursday's, 1:00 to 2:30 PM in 100 Powell-Booth. The goal of this one term class is to introduce biology and chemistry graduate students to MatLab and its applications in biology and biochemistry.

Instructors:

Mary B. Kennedy

Davis Professor of Biology

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Ciro Donalek (Ph.D. in Applied Math and Computational Sciences)

Postdoctoral Fellow in Astronomy

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Alexandre Cunha (Ph.D. in Computational Science and Engineering)

Staff of Moore Cell Center (CACR)

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Sean Upchurch (B.S. in Chemistry, M.S. in Biological Sciences)

Staff, Wold lab, bioinformatics and scientific programming

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Santiago Lombeyda (M.S. in Computer Science)

Staff of CACR (Specialist in Data Visualization)

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T.A. Timothy Miles, Graduate student in Biology

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Required Text:

Getting Started with MatLab: A quick introduction for scientists and engineers (2010, updated for version 7.8 release 2009a) by Rudra Pratap, Oxford University Press.

The book will be available through the Caltech web bookstore.

Required Software:

Caltech has a large number of site licenses for MatLab. These licenses work only when you are connected to a Caltech URL. Before the first class, please visit the Caltech Online Software Center: <http://elms05.e-academy.com/caltech/> to download a copy of the latest release of MatLab onto your laptop computer. The software uses a network based licensing method that permits its use on campus. **BRING YOUR LAPTOPS TO EACH CLASS.**

General Plan:

About 30-60 minutes of each class will be devoted to lecture/demonstrations. The remaining time will be used by the students to work through problem sets and exercises on their own. There will be two or three instructors available during the entire class to answer questions and help.

Over the first 3 weeks, Dr. Kennedy will lead the students through several of the introductory tutorials in the required Textbook. Then, Dr. Donalek will provide more in-depth training on several of the

central aspects of MatLab that were introduced in the tutorials. Dr. Cunha will introduce the Image Analysis Toolbox and its applications in biological research. Mr. Upchurch will cover best practices for scientific programming. Finally, Mr. Lombeyda will introduce programs and methods for visualization of biological and biochemical data that can be used in conjunction with MatLab.

Approximate Schedule (We will be flexible with the schedule.):

Week 1	Jan 4, 2010	<i>Kennedy</i> : Introduction, Check Installations, Lesson 1 (Getting Started) and associated problems (page 17) TA: <i>Miles</i>
	Jan 6, 2010	<i>Kennedy</i> : Lesson 2 (Arrays and Vectors) and associated problems (page 21) TAs: <i>Cunha</i> and <i>Miles</i>
Week 2	Jan 11, 2010	<i>Kennedy</i> : Lesson 3 (Making and printing simple plots), and associated problems (page 25) TAs: <i>Miles</i>
	Jan 13, 2010	<i>Kennedy</i> : Lesson 4 (Intro to Script files, page 29), and Lesson 11 (Publishing Reports, page 58) and associated problems TAs: <i>Cunha</i> and <i>Miles</i>
Week 3	Jan 18, 2010	<i>Kennedy</i> : Lesson 5 (Function files), and associated problems (page 33) TAs: <i>Miles</i>
	Jan 20, 2010	<i>Kennedy</i> : Tutorial 6 (Working with Matrices, page 39), and Tutorial 9 (importing and exporting data, page 51) and associated problems TAs: <i>Cunha</i> and <i>Miles</i>
Week 4	Jan 25, 2010	<i>Donalek</i> : Data Structures, matrices and variables, and associated exercises. TAs: <i>Kennedy</i> and <i>Miles</i>
	Jan 27, 2010	<i>Donalek</i> : Functions and associated exercises TAs: <i>Kennedy</i> and <i>Miles</i>
Week 5	Feb 1, 2010	<i>Donalek</i> : Plotting data, adding simple statistics TAs: <i>Miles</i>
	Feb 3, 2010	<i>Donalek</i> : Scripting - loops and conditionals TAs: <i>Kennedy</i> and <i>Miles</i>
Week 6	Feb 8, 2010	<i>Donalek</i> : Matrix Arrays, Cell Arrays TAs: <i>Kennedy</i> and <i>Miles</i>
	Feb 10, 2010	<i>Donalek</i> : Build your own GUI interface TAs: <i>Kennedy</i> and <i>Miles</i>
Week 7	Feb 15, 2010	<i>Cunha</i> : Image Processing, Formats and Intensity Transformations TAs: <i>Kennedy</i> and <i>Miles</i>
	Feb 17, 2010	<i>Cunha</i> : Image Processing: Filtering and Restoration TAs: <i>Kennedy</i> and <i>Miles</i>
Week 8	Feb 22, 2010	<i>Cunha</i> : Image Processing: Mathematical Morphology TAs: <i>Kennedy</i> and <i>Miles</i>
	Feb 24, 2010	<i>Cunha</i> : Image Segmentation TAs: <i>Kennedy</i> and <i>Miles</i>
Week 9	Mar 1, 2010	<i>Upchurch</i> : Best Practices for Scientific Programming TAs: <i>Kennedy</i> and <i>Miles</i>
	Mar 3, 2010	<i>Lombeyda</i> : Advanced Data Visualization Programs TAs: <i>Kennedy</i> and <i>Miles</i>
Week 10	Mar 8, 2010	<i>Lombeyda</i> : Advanced Data Visualization Techniques TAs: <i>Kennedy</i> and <i>Miles</i>
	Mar 10, 2010	Projects TAs: <i>All</i>