



WISCONSIN
UNIVERSITY OF WISCONSIN-MADISON

Introduction to MATLAB for Medical Physics

A. Instructor(s):

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Note, there are no office hours, but feel free to email or call to set up a time to talk if needed.

B. Frequency and time of offering:

Two 4 hour sessions during the department Orientation

8 am – 12 pm 08/28/2018

8 am – 12 pm 08/30/2018

Prior to the course:

- **Please install MATLAB 2018a on your laptop to bring to the sessions. If you are unable to bring your own computer please email the instructor who can help find a computer for you to use.**
- The university has a license for MATLAB that permits installation on personal computers. The MATLAB installer and license information is available here:
<https://software.wisc.edu/cgi-bin/ssl/csl.cgi>

C. Texts and other materials used:

- Course materials available here:
<https://uwmadison.box.com/s/r8somquvm3qxvm474z4uhforhzaxofa3>
- Additional materials:
 - MathWorks® blogs:
 - Loren on the Art of MATLAB (<http://blogs.mathworks.com/loren/>)
 - Doug's Pick of the Week (<http://blogs.mathworks.com/pick/>)
 - Steve on Image Processing (<http://blogs.mathworks.com/steve/>)
 - Inside the MATLAB Desktop (<http://blogs.mathworks.com/desktop/>)
 - MATLAB File Exchange
 - <http://www.mathworks.com/matlabcentral/fileexchange>
 - Undocumented MATLAB (Advanced functionality, *unofficial*)
 - <http://undocumentedmatlab.com>

- Free MATLAB text
 - <http://www.physics.byu.edu/Courses/Computational/phys330/matlab.pdf>

D. Course outline:

- Day 1: The Basics
 - Help resources
 - MATLAB integrated development environment
 - Creating variables (naming rules, special variables, etc.)
 - Creating vectors (square brackets and colon operator)
 - Creating N dimensional arrays (null filling, singleton dimensions)
 - Array sub-indexing
 - Suppressing command prompt output
 - Numeric operators (+, -, /, *, and element-wise operations using ‘.’)
 - Using built-in functions
 - Logic data types
 - Logic operators (<, <=, >, >=, ==, ~=, |, ||, &, &&, etc.)
 - Built-in data types and type casting
 - Control structures (if, while, for, switch)
 - Logical indexing
 - Function handles
 - Creating scripts and functions
 - Program design
 - File input/output (binary I/O and high level functions)
 - String manipulation
- Day 2: Practical Applications
 - Data display: Plotting, image display, and videos
 - Least squares fitting (linear, polynomial, and non-linear)
 - Parallel computation (parfor)
 - Common statistics test – ttest, ANOVA, Kolmogorov-Smirnov
 - Parallel computing and GPU computing in MATLAB
 - Scripting in MATLAB
 - ImageJ (Fiji) and other useful tools

Please bring a few questions with you! This is intended to be an interactive session with lots of hands on practice and back and forth.

Some questions to think about:

What is most important for you to take away from this class (basic functionality/programming in MATLAB, image manipulation, high-performance computing, etc.)?

What are some research tasks you might need to do that you aren't yet sure how to tackle?