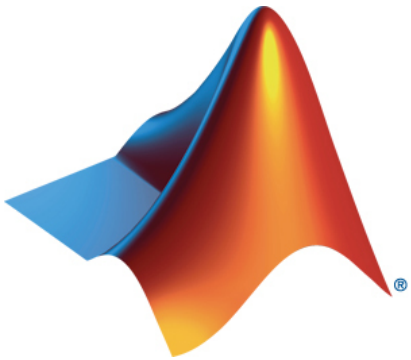
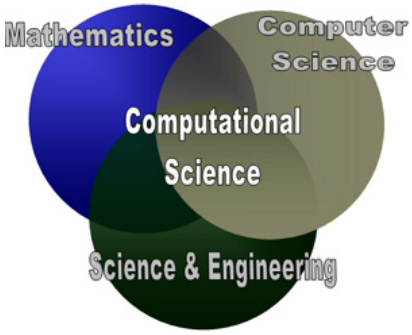
CME 292: Advanced MATLAB for Scientific Computing

Schedule: Autumn 2014, TuTh 3:15p - 4:45p, 60-120 **Units:** 1





Course Description

Short course running first four weeks of the quarter (8 lectures) with interactive lectures and application-based assignments. Students will be introduced to advanced MATLAB features, syntaxes, and toolboxes not traditionally found in introductory courses. Material will be reinforced with in-class examples, demos, and homework assignments involving topics from scientific computing. MATLAB topics will be drawn from: advanced graphics (2D/3D plotting, graphics handles, publication quality graphics, animation), MATLAB tools (debugger, profiler), code optimization (vectorization, memory management), object-oriented programming, compiled MATLAB (MEX files and MATLAB Coder), interfacing with external programs, and toolboxes (optimization, parallel computing, symbolic math, PDEs). Scientific computing topics will include: numerical linear algebra, numerical optimization, ODEs, and PDEs. Prerequisites: basic knowledge of MATLAB (CME 192 or equivalent), basic linear algebra (CME 104 or equivalent).

Students will have the opportunity to design an optional 9th lecture on MATLAB-related topics that were not covered in the first 8 lectures. Students should expect to gain: ◆ exposure to the tools available in the MATLAB software ◆ knowledge of and experience with advanced MATLAB features ◆ independence as a MATLAB user. Successful completion of the course requires satisfactory submission of four homework assignments.

Course Outline

◆ **Advanced graphics** – advanced plotting (vector/surface/slice plots), graphics handles/objects, publication-quality plots, animation ◆ **MATLAB tools** – debugger, profiler ◆ **code optimization** – vectorization, memory management ◆ **advanced data structures** – object-oriented programming ◆ **compiled MATLAB** – MEX interface to C/C++/Fortran, MATLAB Coder to generate stand-alone C/C++ code from MATLAB code ◆ **interfacing with external programs and files** – system calls, file manipulation, communication with spreadsheets ◆ **open-source MATLAB programs** – MATLAB File Exchange ◆ **MATLAB toolboxes** – Optimization, Parallel Computing, Symbolic Math, Partial Differential Equations

Prerequisites

- (required) Basic programming skills in MATLAB (CME 192 or equivalent)
- (recommended) Basic knowledge of numerical analysis and numerical linear algebra

Instructor

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