ACM 11: Introduction to Matlab and Mathematica
Fall 2008/2009, Caltech

Instructors: Stephen Becker and Alex Gittens

TAs: Alex Gittens, Stephen Becker (and perhaps one additional TA)

The course will be split into two equal sections. The first section covers Matlab and will be taught by Stephen Becker; the second section covers Mathematica and will be taught by Alex Gittens.

Contact info:

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Office hours:
Every week, the instructor will hold one hour of office hours, and each TA will hold two hours. The exact hours are to-be-determined, and will be posted on the course website.

Course website: `http://www.acm.caltech.edu/~acm11/2008/FALL/`
The course website will contain this syllabus, a more detailed course schedule, homeworks and solutions, notes, links, and notices. It is important to check it regularly.

Grading:
Both the Matlab and Mathematica sections will each have 4 to 5 homeworks and one project each; there are no exams. The two sections will have equal weight. The homeworks will also be weighted equally, with the projects carrying twice the weight of a homework. Students will be allowed to drop one homework for the entire class (*not* one for each section); the projects are not eligible to be dropped. Electing to drop a homework will also prevent the student from receiving an "A+" grade. Letter grades may be based on a curve.

Extension policy:
In order to be fair to all students, there is a no-extension policy. However, as mentioned above, students are allowed to drop one homework per term (we will do this automatically).

Email policy:
The instructors and TAs are happy to answer students' questions; this is why we hold office hours. However, we strongly discourage questions via email. Email responses take much longer and are less effective than personal interaction – it is also harder to give the appropriate amount of assistance without giving away the solution. We will answer such emails at our discretion.

Collaboration policy:
Students are allowed to discuss problems; however, particular homework problems should be discussed away from the computer. It is *not* OK for students to "split" a homework, and each solve half the problems. It is completely unacceptable to copy code.

Homework submission:

Some assignments, or parts of assignments, may require electronic submission of files. Instructions on submitting code will be at the website. For regular problems, a hardcopy is required, in color if requested, with annotated code. Uncommented code may not receive full credit, at the grader's discretion. Email submissions will not be accepted, unless for a legitimate reason (a broken printer is not a valid reason) and arranged ahead-of-time; in such a case, only PDFs will be accepted.

Textbooks:

There are no required textbooks for this class. During the Matlab section, we may refer to Cleve Moler's online textbook "Numerical Computing with MATLAB", available free-of-charge at `http://www.mathworks.com/moler/index_ncm.html` (Moler is the creator of Matlab and a Caltech alumn). Supplemental textbooks and readings will be listed on the course website.

Course overview:

For both software packages, we will cover basic syntax and common commands. There will also be an emphasis on using the Help features, which are excellent for both packages; on good programming habits; and on choosing the appropriate language/software for the given task. Additionally, we will cover basic numerical linear algebra, at a lower level than that of ACM 106.

Prior programming experience is not required, but it is recommended. Students without such a background should expect to work harder. Students are also expected to be familiar with basic linear algebra; we will be solving systems of linear equations, finding eigenvalue decompositions, etc.

Basic Matlab topics will be: syntax and development environment; basic linear algebra; visualization and graphical output; control-flow; scripts and functions; file i/o; and arrays, structures and strings.

Numerical analysis topics covered in the Matlab section may include: curve fitting, interpolation, differentiation, integration, optimization, solving nonlinear equations, discrete Fourier Transforms and the FFT, eigenvalue and singular-value decompositions, and ODEs.

The Matlab section will also cover the Help menu, debugging techniques, vectorization of code, writing fast code, and, time-permitting, parallelization and object-oriented features.

The Mathematica section will cover basic syntax and the notebook interface; calculus and linear algebra operations; numerical and symbolic solution of algebraic and differential equations; manipulation of lists and expressions; Mathematica programming (rule-based, functional, and procedural); and debugging, plotting and visualization.