COMPUTER SCIENCE 31400
Spring 2013
January 8
COURSE INFORMATION

1. **Basic information:** Tu Th noon–1:15 pm, Haas G066

   **Instructor**
   Robert Skeel  
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   (765)494-9025

   **Teaching Assistant**
   Youhan Fang  
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   **Office hours:**
   Monday 4:00–5:00
   Tuesday 2:30–3:00 4:00–5:00
   Wednesday 2:30–3:00 4:00–6:00

   The class web page is http://www.cs.purdue.edu/homes/skeel/cs314.html. This is supplemented with Blackboard Learn.

2. **Course description:**

   *Numerical Methods*
   Iterative methods for solving nonlinear equations;  
   direct and iterative methods for solving linear systems;  
   approximations of functions, derivatives, and integrals; error analysis.

   Mathematics plays an essential role in very many endeavors. However, except in the simplest situations, usable results can be obtained only with the assistance of numerical computation on a digital computing device.

3. **Prerequisites:**

   Prerequisites: Math 265 and one of CS 159, CS 177, or CS 180.

   Math 265: Linear Algebra
   Systems of linear equations, matrix algebra, vector spaces, determinants, eigenvalues and eigenvectors, diagonalization of matrices, applications. Prerequisite: Math 162 or 166 or 173.

   Math 162 or 166 or 173: Plane Analytic Geometry and Calculus II
   Vectors in two and three dimensions, techniques of integration, infinite series, conic sections, parametric equations, polar coordinates, surfaces in three dimensions.

4. **Course goals and learning objectives**

   In general terms, goals are to

   * solidify knowledge of prerequisite material, and
• learn some principles for the design of numerical methods.

Learning objectives will be specified during the semester. One objective is to be able to implement the methods on a computer in a dynamic programming language (like MATLAB/Octave, Julia or Python). You will be expected not only to learn some algorithms but also to reason about them.

5. Examination schedule

Thursday, **January 31**, 1st exam,
Thursday, **February 14**, 2nd exam,
Thursday, **February 28**, 3rd exam,
Thursday, **March 21**, 4th exam,
Thursday, **April 4**, 5th exam,
Thursday, **April 18**, 6th exam,
**April 30–May 4** final exam, 2 hours.

6. Textbook:

Numerical Computing with MATLAB, Revised Reprint, by Cleve Moler, SIAM, published in 2004. Students enrolled in course can purchase textbook at 20% discount. Email the instructor if you were not been offered this opportunity by email December 29th.


7. Topics with textbook sections and approximate dates:

1 Octave/MATLAB (1.1–1.6) Jan 8–17
2 floating-point operations (1.7) Jan 22–24
3 linear systems of equations (2.1–2.11) Jan 29–Feb 14
4 interpolation (3.1–3.7) Feb 19–Feb 28
5 nonlinear equations (4.1–4.10) Mar 5–Mar 19
6 least squares approximation (5.1–5.6) Mar 21–Mar 28
7 numerical integration (6.1–6.6) Apr 2–Apr 4
8 eigenvalues (10.1–10.5, 10.10–10.12) Apr 9–Apr 18

8. Course policies:

a. *Copying* is the evident use of outside material in your solution (anything not present in lectures, textbook, and handouts). In the case of collaboration or use of outside written material, the score for an assignment may be discounted. For example, 3 students turning in identical correct answers each may receive as little as one third credit. The course staff reserve the right to determine the discount, if any. Use of your work by another will be assumed to be done with your consent unless there is evidence to the contrary.

b. *Cheating* is the evident use of outside material in your solution *without including a written acknowledgment of the source.* (Citing sources is simply good scholarship.) This does not preclude some discussion when starting an assignment. However, the onus is on you to either acknowledge the collaboration or ensure that it is sufficiently limited
so as not to be evident in your work. In practice this is enforced when the course staff believe that the collaboration goes beyond the sharing of ideas. but again the course staff reserve the right to make this judgment. *Cheating is penalized in accordance with university rules and the instructor’s policy is to impose substantial penalties.*

c. Excuses. Failure to attend an exam or failure to submit an assignment on time is recorded as a zero except when it is unavoidable because of some legitimate emergency (a medical excuse from a physician, or a death in the immediate family). In such a case it is desirable that the instructor be contacted before the exam or before the due date of the assignment.

The teaching assistant may grant you an extension for an assignment, but he has the prerogative to refuse you.

d. Requests for quiz regrades should be submitted to the instructor within four hours of it being returned to the student. Requests for assignment regrades should be submitted to the TA within one week of it being returned to the class. Requests for regrades should be submitted initially in writing. If you remain dissatisfied after the regrade, you may appeal to the instructor.

e. It is our policy to take every precaution to avoid losing submitted assignments. Nevertheless you are expected to keep course work and computer files until you see the score recorded for that work. Also, any loss should be reported within one week after the assignment was returned to the class. Also, there are no guarantees for assignments turned in at odd times.

f. No extra work will be provided for students wishing to improve their grade. Also, final grades will not be changed after they are posted (except if they were incorrectly computed).

9. **Assignments:**

Assignments are due at the beginning of class on the day due. Solutions will be made available 5 days after due date.

For computing and programming, you may use Octave, MATLAB, Julia, or Python.

10. **Grading:**

A percentage score is calculated as follows: assignments 30%, in-class exams 40%, final exam 30%. The lowest of the assignments and the lowest of the in-class exams will be dropped. Grades are based on your percentage score as follows:

0–40 E, 41–50 D, 51–65 C, 66–80 B, 81–100 A.

Each cutoff may be individually adjusted by as much as 5 percentage points at the discretion of the instructor in order to increase the gap between letter grades and/or to get closer to a typical grade distribution for a 300-level CS course.
11. **Using/installing interpreters** The NCM files are here.

- **MATLAB** can be executed from Software Remote (DACS). Documentation is here.
- **Octave** can be downloaded from [http://www.gnu.org/software/octave/download.html](http://www.gnu.org/software/octave/download.html). Documentation is here. If you are using OS X, you might try following these instructions for the MacPorts package management system, for which **octave-devel** (version 3.6.3) is probably a better choice than **octave** (version 3.2.4). Version 3.6.2 would be ideal.
- **Julia** is for the fearless. Its web page is at [http://julialang.org](http://julialang.org) and documentation is here. Download from [https://github.com/JuliaLang/julia/downloads](https://github.com/JuliaLang/julia/downloads). After downloading and uncompressing the file, you might move the directory to your home directory and put

```bash
export PATH="/julia-e154fda78a/bin:$PATH
```

into your `.profile` file in your home directory. Plotting will be inconvenient: You can do graphics at [http://julia.forio.com](http://julia.forio.com) or use one of the other scripting languages.

- **Python** requires the addition of two packages: NumPy and a plotting package such as Matplotlib.