

Math 365-001
Introduction to Computational Mathematics
Spring 2012 (TuTh 3:40-4:55pm, ERB 1100)

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Office Hours: Tues: 12:30pm-2:00pm, Wed: 3:00pm-4:30pm, or by appointment

Required Text: C. Moler, *Numerical Computing with Matlab*, SIAM 2004

(The book is also distributed freely from <http://www.mathworks.com/moler/>)

Supplementary text: T. A. Driscoll, *Learning MATLAB*, SIAM 2009 (Cost is \$28)

Course webpage: <http://math.boisestate.edu/~wright/courses/m365/>

Prerequisites: Math 175 (Calculus II), and programming experience.

Course description:

We discuss basic techniques of computational mathematics. The material is presented from a problem-oriented perspective with examples from the applied sciences. Topics to be covered include: matrix computations, data fitting techniques (interpolation and least squares), image and signal processing, optimization, quadrature, dynamical systems, stochastic processes, computational efficiency, and visualization. Emphasis will be on critical thinking and problem solving using the Matlab software package.

Instruction: Lectures will take place in the computer lab and will involve instruction on the board and the computer.

Course work:

Your grade for the course will be based on seven homework assignments and one final project. The homework sets will be assigned every two weeks and will be posted on the course webpage. Your grade for each homework will not only be determined by how well you solved the problems, but also on how well you communicate your solution. Your submitted homework should show all necessary work you used to solve the problems; mathematical statements should be complete (or nearly complete) sentences; and the reasoning and logic underlying all arguments should be clearly spelled out. Numerical results should be presented in a readable format (e.g., in a table with headings or in a plot with labels). For problems that involve programming, you will turn in your code and it will be graded according to the following criteria: 1) whether it solves the problem at hand; 2) whether it is sufficiently efficient; 3) whether it is logically structured; 4) whether it is documented. **Failure to adhere to the above requirements may result in a loss of points.**

Late homework is accepted up to four days after the due date. However, 10% will be automatically subtracted from the assignment for every day that it is late. For example, if the homework is due at 4:30pm on Thursday and you hand it in the following Monday at 4:29pm then 40% of the total number of points possible will automatically be deducted.

The final project will be motivated by a problem from the physical or mathematical sciences and will require a typed or type set report containing the following information:

1. Introduction: describes the problem you are trying to solve.
2. Methods: describes the methods you are going to use to try and solve the problem.

3. Results: describes your results from applying the methods (graphs should be included here).
4. Discussion: describe how your results relate to the solution of the problem; describe if there are any errors with your results; describe how you might improve upon your results (graphs should be included here).
5. Code: include the Matlab or Maple code you used.

Each team of students (see below) will also be required to give a short presentation on their project at the end of the semester.

Teamwork: Teamwork is part of the real world and therefore required for all homework assignments and on the final project. **Keep in mind that the purpose of teamwork is to enhance the learning effect, not to decrease the workload.** It is up to each team member to prevent abuse. Please observe the following rules:

- **Each team can only consist of two students.**
- Hand in one homework solution set per team with the name of the team members clearly stated at the top.
- In general, you can consult literature and people, but **you have to acknowledge all help so obtained** (except for the textbook or myself).

Under no circumstances is one team allowed to use another team's work or computer code. Straight copying of another team's work is forbidden and will result in a zero on that assignment for all parties involved.

Programming: All numerical programming will be done using Matlab (or the “clone” Octave) and all symbolic programming will be done using Mathematica. No exceptions! Matlab is the most dominant commercial computing environment and is used extensively in industry for computing, analysis, and visualization. Mathematica is also used in industry, and is one of the two top software packages for symbolic manipulation.

Exams: there are no exams.

Grading policy: Each of the seven homework assignments is worth 10% of your final grade and the final project will be worth 30%. Final letter grades will be determined from the standard percentages.

- Failure to turn in one of the homework assignments will result in a maximum final grade of a B.
- Failure to turn in the final project will result in an F for the course.

Important dates:

- **Jan. 30** – Last day to register; add classes; change from credit to audit or audit to credit; and last day to drop classes without a W and receive a refund (less \$25 processing fee) for Regular session classes.
- **Feb. 20** – Presidents' Day Holiday
- **Feb. 27** – Last day to drop or completely withdraw.
- **Mar. 26 – Mar. 30** – Spring break
- **May 4** – Classes end
- Tuesday, May 8 3:30-5:30pm – Final project presentations

Academic honesty: All students are expected to be familiar with and adhere to the policies and standards given in the BSU Student Code of Conduct (<http://www2.boisestate.edu/studentconduct/Student%20Code%20of%20Conduct.htm>)

The purpose of computing is insight, not numbers! ~ Richard Hamming
Computers are useless. They can only give you answers. ~ Pablo Picasso

It would appear that we have reached the limits of what it is possible to achieve with computer technology, although one should be careful with such statements, as they tend to sound pretty silly in 5 years. ~ John Von Neumann (1949)

I think there is a world market for maybe five computers. ~ Thomas Watson, chairman of IBM, 1943.

The inside of a computer is as dumb as hell but it goes like mad! ~ Richard Feynman

If you were plowing a field, what would you rather use, two strong oxen or 1024 chickens? ~ Seymour Cray, Founder of Cray Research commenting on parallel architectures

Without precise calculations we could fly right through a star or bounce too close to a supernova and that'd end your trip real quick, wouldn't it? ~ Hans Solo