

Spring 2018, CMPSC/MATH 451
NUMERICAL COMPUTATIONS

<http://www.cse.psu.edu/~kxm85/teaching/CMPSC451>

Section 1: MWF 2:30–3:20 PM, 273 Willard

Section 2: MWF 1:25–2:15 PM, 102 Leonhard

Instructor. Kamesh Madduri, W312 Westgate. Office hours: MWF 3:30–4:30 PM.

Teaching Assistant. Hongyuan Zhan, W343 Westgate. Office hours: TR 11:30 AM–1:00 PM.

Please send email to the instructor and the TA via the Canvas messaging system.

Class Overview and Objectives. This class introduces students to key ideas behind numerical computation, with emphasis on the implementation of common numerical methods. CMPSC/MATH 455 is a related course that covers a subset of the topics we will study in this class. Students may obtain credit for either this class or CMPSC/MATH 455, but not both.

Topics. Floating Point Arithmetic, Approximations in Scientific Computing, Nonlinear equations in one variable, Linear Systems: Direct Methods, Polynomial Interpolation, Piecewise Polynomial Interpolation, Numerical Differentiation, Numerical Integration, Initial Value Problems for ODEs.

Prerequisites. MATH 230 or MATH 231. Three credits of programming.

Textbook. Uri M. Ascher and Chen Greif, *A First Course in Numerical Methods*, SIAM, 2011.

Class Material. All class material (lecture notes, code, homework) will be posted on Canvas.

Evaluation and Grading. The final grade will be based on six homework assignments, two evening exams (Feb 23 and Apr 9, 6:00–7:15 PM, 112 Kern), and a final exam (May 2, 6:50–8:40 PM, 010 Sparks). Exam 1: 10%, Exam 2: 15%, Final exam: 25%, Homework assignments: 50%

Homework Assignments. You will be submitting all homework via Canvas. Each homework assignment will be worth 10 points, and the best five out of six will be chosen for the homework grade. Most of the homework assignments will include problems that require MATLAB/Octave programming, and the code must be submitted electronically. Late homework submissions will not be accepted. Please contact the TA at least 72 hours prior to the submission deadline in case you won't be able to meet a deadline, and we can schedule a make-up assignment.

Attendance Policy. You are strongly encouraged to attend all the lectures. Please let the instructor know if you will be missing multiple classes for legitimate, unavoidable reasons.

Schedule. Here is a tentative schedule of topics to be covered (last updated Feb 14th):

- **Jan 8–Jan 29.** Introduction, Error Analysis, Octave/MATLAB, Floating-point arithmetic
- **Jan 29–Feb 14.** Nonlinear equations in one variable
- **Feb 14–Mar 16.** Linear systems
- **Feb 23.** Exam 1
- **Mar 19–Mar 28.** Interpolation

- **Mar 30–Apr 16.** Numerical Integration and Differentiation
- **Apr 9.** Exam 2
- **Apr 18–Apr 23.** ODEs

Academic Integrity Statement. The University defines academic integrity as the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts (refer to Senate Policy 49-20). Dishonesty of any kind will not be tolerated in this course. Dishonesty includes, but is not limited to, cheating, plagiarizing, fabricating information or citations, facilitating acts of academic dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Students who are found to be dishonest will receive academic sanctions and will be reported to the University's Office of Student Conduct for possible further disciplinary sanctions (refer to Senate Policy G-9).

The CSE Department has its own statement on Academic Integrity. Academic sanctions for each violation includes a reduction in score for the submission and optionally a reduction of the final letter grade in the course.

Accessibility Statement. Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Student Disability Resources Web site provides contact information for every Penn State campus. For further information, please visit the Student Disability Resources Web site.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation. If the documentation supports your request for reasonable accommodations, your campus's disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.

Counseling & Psychological Services (CAPS) Statement. Students who experience personal issues that interfere with their academic performance, social development or satisfaction at Penn State are encouraged to seek confidential assistance from Counseling and Psychological Services (CAPS) Center (<http://studentaffairs.psu.edu/counseling/>). They can be reached at (814) 863-0395. Some of the more common concerns they can help with include anxiety, depression, difficulties in relationships (friends, roommates, or family); sexual identity; lack of motivation or difficulty relaxing, concentrating or studying; eating disorders; sexual assault and sexual abuse recovery; and uncertainties about personal values and beliefs. Crisis intervention is available from Centre County CAN HELP (<http://centrecountypa.gov/index.aspx?NID=593>) at 1-800-643-5432, 24 hours a day, seven days a week.

Education Equity Reporting Statement. Students who experience themselves or observe any act of intolerance or bias may file a report through Penn State's Educational Equity Office: <http://equity.psu.edu/reportbias>.