

Instructor: Changho Kim

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Lectures: Tuesdays and Thursdays, noon – 1:15 pm, GLCR140

Discussions: Wednesdays, 1:30 pm – 2:20 pm, GLCR 150

Office Hours:

- TBA
 - TBA
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Learning Objectives and Overview. The overall goal of this course is to enable students to develop, analyze, and implement efficient numerical methods for solving problems of practical interest. We will cover the following topics:

- Topic 1. Iterative methods for solving linear systems
- Topic 2. Foundations of approximation theory
- Topic 3. Numerical integration and differentiation
- Topic 4. Numerical solutions of ordinary differential equations
- Topic 5. Numerical solutions of systems of nonlinear equations

Learning Outcomes. Successful completion of the course assumes that a student is able to:

1. Assess and articulate what type of numerical methods are appropriate for a given problem;
2. Construct a numerical algorithm for solving a given problem and analyze its convergence and efficiency;
3. Implement, test, and validate codes to numerically solve a given problem;
4. Interpret and articulate the results of numerical simulations.

It is highly recommended that students go over the material presented in lectures and homework assignments while asking themselves how they can properly learn these topics to achieve the outcomes above. Students are *strongly encouraged to seek help from the instructor* if they do not understand how they can achieve any of the outcomes in the context of a particular topic or concept studied in class.

Course Materials. There is no textbook for the course. Lecture notes will be uploaded to CatCourses after the lecture on the same day. There are reference books which are freely downloadable through UC Merced VPN (see below).

Computer Software. MATLAB will be used in class and for homework assignments. It can be freely downloaded from the website of the Office of Information Technology (<https://it.ucmerced.edu/software-list>) to be installed on your machine.

Course Website. The CatCourses system (<http://catcourses.ucmerced.edu>) manages the MATH 231 website. Most class materials, including lecture notes and homework assignments, will be uploaded to CatCourses.

Grade Determination. Your final grade in the course will be based on the following break-down:

- Homework assignments (30%);
- Midterm exam 1 (10%)
- Midterm exam 2 (15%);
- Final exam (30%);
- Presentation (10%);
- Attendance (5%).

Attendance. Please ensure that you submit the feedback survey after each class since *attendance will be checked by collecting feedback* in the form of a short survey. If you are not able to attend class due to a scheduled event (e.g. attending a conference), please let me know ahead of time. In case of an emergency (e.g. illness), please let me know as soon as you can.

Homework Assignments. A total of 9 or 10 homework assignments will be given. Homework assignments will consist of both analytical and computational problems (i.e. pen-and-paper and MATLAB problems). The lowest homework score will be omitted from the final grade calculation. Up to three homework assignments can be resubmitted (even after the solutions are posted). However, resubmissions are subject to a deduction of $\frac{1}{3}$ of the score. Late submissions will be treated as resubmissions.

Exams. There will be two *in-class* midterm exams and a *take-home* final exam. The dates for the exams are

- **Midterm Exam 1:** TBA
- **Midterm Exam 2:** TBA
- **Final Exam:** TBA

There will be no make-up exams or early exams! If you are sick during a unit exam, please bring a note from your doctor verifying your illness. Your course grade will then be determined by the rest of your course work. All electronic devices (e.g., laptops, cell phones, iPods, etc.) must be turned off and put away during a unit exam. Calculators are not allowed in exams.

Presentation. Students will form groups of two and each group will perform a case study of a numerical problem (e.g. comparison of two numerical methods) and give a short presentation.

Reference books.

1. W. Ford, *Numerical Linear Algebra with Applications: Using MATLAB*, Elsevier, 2014. <https://www.sciencedirect.com/book/9780123944351/numerical-linear-algebra-with-applications>
 2. Randall J. LeVeque, *Finite Difference Methods for Ordinary and Partial Differential Equations: Steady-State and Time-Dependent Problems*, SIAM, 2007. <https://doi.org/10.1137/1.9780898717839>
 3. Desmond J. Higham and Nicholas J. Higham, *Matlab Guide*, 3rd edition, SIAM, 2016. <https://doi.org/10.1137/1.9781611974669>
 4. Tobin A. Driscoll, *Learning MATLAB*, SIAM, 2009. <https://doi.org/10.1137/1.9780898717662>
 5. Brian Sutton, *Numerical Analysis: Theory and Experiments*, SIAM, 2019. <https://doi.org/10.1137/1.9781611975703>
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Additional Course Information

Dropping the Course. Last day to add/drop courses is Wednesday, September 15. Dropping the course after this time requires the signed approval of the instructor, and the confirmation of the Dean of the School of Natural Sciences. Please see the registrar website <https://registrar.ucmerced.edu/policies> for detailed policies.

Special Accommodations. UC Merced is committed to creating learning environments that are accessible to all. If you anticipate or experience physical or academic barriers based on a disability, please feel welcome to contact the instructor privately so that possible options can be discussed. In addition, please contact Student Accessibility Services (SAS) at (209) 228-6996 or <https://access.ucmerced.edu> as soon as possible to explore reasonable accommodations. All accommodations must have prior approval from Student Accessibility Services on the basis of appropriate documentation.

If you anticipate or experience barriers due to pregnancy, temporary medical condition, or injury, please feel welcome to contact me so we can discuss options. You are encouraged to contact the Dean of Students for support and resources at (209) 228-3633 or <https://studentaffairs.ucmerced.edu/dean-students>

Academic Integrity. Academic integrity is the foundation of an academic community and without it none of the educational or research goals of the university can be achieved. Academic integrity applies to research as well as undergraduate and graduate coursework/exams. Existing policies forbid cheating on examinations, plagiarism, and other forms of academic dishonesty. UC Merced students are held to high standards of personal and professional conduct in compliance with the UC Merced Academic Honesty Policy and the UCM Code of Student Conduct. UCM Code of Student Conduct can be found at <http://studentconduct.ucmerced.edu>

Resources.

- With COVID19, campus has a one-stop site featuring student resources at <https://success.ucmerced.edu>
- Psychological counseling services are available (individual and group, scheduled and drop-in): <https://counseling.ucmerced.edu/services/counseling-services>

Good luck in the course!