

MATH 233: Scientific Computing

Fall 2020

Instructor: Maxime Theillard

Office: zoom

Office Hours: W 1:30pm-2:30pm

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Lectures: M/W, 12:00pm-1:15pm, (zoom link to be posted 5minutes before the class)

Discussion: M, 1:30pm-2:20pm,

Email: If you email me about anything related to this course, please put [MATH233] in the email's subject line.

Website: All important course materials will be posted under resources on the [CatCourses](#) course management system.

Course Description: This is the third part of the graduate Numerical Analysis course. In this course we will cover advanced numerical methods (e.g. semi-lagrangian, level-set, shock capturing methods, Finite Volumes) and their high performance implementation in C++. **Prerequisites:** MATH 231 and MATH 232, or instructor approval

Learning Objectives: The goal of this class is to prepare the students to be computational scientists. At the end of the class, for any given computational modeling problem, the students should be able to compare different strategies and when possible identify the most appropriate one. In addition, they should not only know how to implement them and validate but also visualize and present their results

Learning Outcomes: By the end of this course, the students should be able to:

1. Understand the key ideas, concepts, definitions, and theorems covered in class
2. Use your expertise to choose the best numerical method to apply to solve a given problem.
3. Implement a given algorithm in C++, using parallel resources as much as possible.
4. Visualize, verify, validate and analyze your results.
5. Set up and use a version control repository

Suggested Materials:

- **Textbook** Ronald Kriemann, *C++ for Scientific Computing*
- **Suggested** Conservation laws and level-set method
 - Randall J. Leveque, *Numerical Methods for Conservation Laws*
 - Stanley Osher, Ronald Fedkiw, *Level Set Methods and Dynamic Implicit Surfaces*
- **Suggested** Git tutorial
 - (GitHub) <https://guides.github.com/activities/hello-world/>

– (BitBucket) <https://www.atlassian.com/git/tutorials/setting-up-a-repository>

Grading Policy:

Homework
30%

Final project
70%

- For the final project, students will have to work alone that they will have to define. Ideally this project will be related to their research. This work will have to be original, personal and involve some C++ implementation.

Special Accommodations:

The University of California, Merced is committed to ensuring equal academic opportunities and inclusion for students with disabilities based on the principles of independent living, accessible universal design and diversity. I am available to discuss appropriate academic accommodations that may be required for student with disabilities. Requests for academic accommodations are to be made during the first three weeks of the semester, except for unusual circumstances. Students are encouraged to register with the Disability Services Center at UC Merced to verify their eligibility for appropriate accommodations.

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. All members of the university community are responsible for its academic integrity. Existing policies forbid cheating on examinations, plagiarism and other forms of academic dishonesty. Further information on the academic conduct policy can be found at UC Merced [Office of Student Conduct](#).

Diversity statement:

"We affirm that a diverse campus furthers our mission to create, interpret, and disseminate knowledge and values. The manifold diversity of our community encourages each of us to reflect on intellectual and cultural orthodoxies, and thus stimulates the creativity at the heart of our academic mission as a research university. We take pride in serving a large population of first-generation college students, including the broad representation of background on our campus as a Hispanic (HSI), Minority (MSI) and Asian American and Native American Pacific Islander (AANAPISI) serving institution. As a common goal, we will work together to ensure all members of our academic community reflect the multiplicity of identities in our region." [UC Merced official statement](#).

Additional resources:

[Student services](#).