AMSC664/CMSC664: Advanced Scientific Computing II - Spring 2021

Course description

AMSC/CMSC 663-664 is a two-semester project course in which each student will identify and carry out a scientific computing project with a focus on:

- Understanding of scientific computing algorithms related to the project.
- Code development, which could include

  - Modularity, portability, memory management
  - Post-processing, restarting, and writing to databases
  - Interactivity and effective scientific visualization
  - Proper documentation, version management tools, and accessibility
  - Debugging and profiling tools
  - Validation, verification, and unit testing.

Each project must be focused on computing and involve the development of high-quality computer code implementing contemporary or original numerical techniques.

Each project is for academic use only. Data used in each project must be publicly available.

AMSC 664/CMSC 664 is the continuation of AMSC 663/CMSC 663.

Logistics

Classes: Tue-Th 12:30--1:45, online via Zoom:

Instructors:

Radu Balan, email: rvbalan@cscamm.umd.edu

Maria Cameron, email: mariakc@umd.edu

Course web site:

umd.instructure.com mirrored at

https://www.math.umd.edu/~mariakc/advanced-scientific-computi.html (Links to an external site.)

and also:

Prerequisites

AMSC/CMSC 663

Course requirements

- **Each student must have a faculty advisor (who is not an instructor of this course)**
- Deliverables:

  - Written documents and oral presentations (see Section Presentations and proposal documents below)

    - Project Update presentation (30 min oral presentation)
    - End-of-Year presentation (30 min oral presentation)
    - End-of-Year report (updated Mid-year report with additional results, due May 13)

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  - Code posted on GitHub (Links to an external site.) (if appropriate) and accompanied with documentation (see Section Code requirements) (due May 13).
  - Data and results included as appropriate.
- Weakly update email should be sent by each student to the instructors.

Grading

- Projects will be graded on the quality of

  - code and documentation for it;
  - written documents: end-of-year report;
  - oral presentations: mid-semester update and end-of-year presentation.

- Oral presentations and written documents should reflect:

    - critical thinking,
    - ability to formulate and achieve research goals,
    - ability to identify and overcome difficulties,
    - newly acquired technical skills.

- Note that a solid effort without significant technical advances will **not** result at a good grade.

Code requirements

- Code should be well-organized, clean, loosely coupled, and extensible
- Code should be tested and validated.
- Code should be documented, well-commented, and accompanied with a user-friendly guide.
- Code should be distributable via [GitHub (Links to an external site.)](#) if appropriate.

Oral and written presentation requirements

- Project reports should include the following components.

  - Background on the problem being addressed.
  - Why is this problem important?
  - What are state-of-art methods for solving it? Provide refs.
  - Project goals: what are you hoping to achieve?
  - Approach. How will you achieve these goals? What components will need to be implemented to get there?

    - Describe specific algorithms and how they will be implemented.
    - Describe hardware/software platform you target. What programming languages will be used.

  - Validation methods: how you plan to test your code.
  - Deliverables: specific components of the code you plan to develop.
  - Milestones and a rough timeline.

- End-of-year presentation and report should include the following items.

  - Shorter versions of the first five bullet points above.
  - Detailed description of what has been accomplished.
  - Description of what has not been accomplished and why.
  - A link to the completed code and documentation for it.
  - Itemized list of deliverables such as code, data, code documentation.

Course calendar

January 26: Kick-off Meeting

Jan. 28 -- Feb. 11: Individual meetings during regular class time.

Feb. 25, March 4, 9, 11: Mid-semester update presentations

March 14-21: Spring Break

March 23, 30, April 1: Second individual meetings during regular class time.

April 20, 22, 27, 29: Final round of individual meetings regular class time; On April 29 we will have both a final presentation and then a final individual meeting.

April 29, May 4,6,11: End-Of-Year oral presentations. Please invite your advisor!

May 13: *End-Of-Year Report due. Code and results are also due.*

Academic integrity

- Sources such as text and figures must be properly cited.
- You can import and use third-party libraries in your code if it is rational. In this case, provide a full and due credit to the third party.
- Link to the UMD Code of Academic Integrity: https://www.studentconduct.umd.edu/academic-dishonesty