AMSC/CMSC 663-664: Advanced Scientific Computing I-II
Fall 2017 – Spring 2018
Syllabus

Class: 2017 Fall: TuTh, 9:30am – 10:45am, CSIC 4122
2018 Spring: TBD

Instructors and Contact Information:
• Maria Cameron: cameron@math.umd.edu, Math 4105, x55068
• Howard Elman: elman@cs.umd.edu, AV Williams 3125, x52694

Office Hours: by appointment


Course objectives:
AMSC/CMSC 663-664 is a two-semester project course in which each student will identify and carry out his or her own scientific computing project with focus on:
• Understanding of scientific computing algorithms related to the project
• Code Development, including
  o Modularity, portability, memory management
  o Post-processing, restarting, and writing to databases
  o Interactivity
  o Scientific visualization
  o Documentation and version management tools
  o Debugging and profiling tools
  o Validation
• Verification using test problems
• Time permitting, additional considerations may be given, for example implementation of parallel algorithms: OpenMP, MPI, GPU programming; Masking communication costs, load balancing, granularity; parallel numerical linear algebra

Milestones and Time Line:
• Project formulation [2017 September]
  o Each student must:
    ▪ Find a project advisor
    ▪ Identify a suitable project that includes a deliverable suite of software designed to carry out a scientific computing task
    ▪ Propose appropriate algorithms, languages, and platforms for the development of this software
  o Each student should meet with both instructors and project advisor to agree on the project formulation.
• Project proposal: Oral presentation and written documentation
Proposal materials should serve as the foundation for future reports

- Oral presentation: [2017 late September to mid October]
  - Plan on 30min including questions and discussion
  - The project advisor must be present
- Written document: [shortly after oral presentations]
  - At least 5 pages and longer as needed

- Weekly report, throughout the duration of AMSC/CMSC 663-664
  - Due Thursday 11:59pm
- Mid-year progress report: Oral presentation and written document
  - Update on the project status
    - Report on how the software has been developed and tested so far, against the proposed milestone and timeline
    - Current vision of the complete product
    - Details of how that vision has evolved over the course of the project
  - Oral presentation: [2017 late November to early December]
    - Plan on 30min including questions and discussion
    - The project advisor must be present
  - Written document: [shortly after oral presentation]
- Status report: Oral presentation only
  - Update on the project status: [2018 February]
    - Target towards the completion of the project at the end of the semester
    - Plan on 30min including questions and discussion
    - The project advisor is welcome, but not required, to attend
- Final project report: Oral presentation and written document
  - Complete report on the project
    - Report on how the software has been developed and tested, against the proposed (initial) milestone and timeline
    - Discussion of the results obtained by the project
    - Summary of the project and future directions if appropriate
    - Discussion of deliverables
  - Oral presentation: [2018 late April to early May]
    - Plan on 30min including questions and discussion
    - The project advisor must be present
  - Written document: [shortly after oral presentations]
  - Deliverables: [with the written document]

**Class Attendance by Project Advisor:**
During AMSC/CMSC 663-664, the individual project advisor is required to attend a total of three oral presentations, in addition to a three-way meeting for project formulation

- Project proposal: mid October
- Mid-year progress: late November to early December
- Final: late April to early May
**Student Responsibility and Grading Policy:**

- Students are responsible for achieving the project goals that were listed in the proposal.
- If any difficulty arises with the project, it is the student’s responsibility to communicate with the instructors and seek for a resolution in a timely manner.
- It is the individual student’s responsibility to secure the attendance of the project advisor.
- Grading takes into account all aspects of the project execution, including student’s understanding of mathematics and algorithms involved in the project, its implementation including validation and verification, timing of the weekly reports, oral presentation quality, written document quality, overall understanding and discussion of the final results, deliverables, execution according to the proposed milestone, as well as the class attendance and communication with the project advisor.

**Guidance for Proposal and Reports:**

- Proposal and reports consist of:
  0. Cover page material: Project Title; Name; Advisor Name with Unit; Date of Submission; Abstract
  followed by sections that describe, define, explain, and discuss:
  1. Brief introduction and background
  2. Project goal
  3. Outline of overall approach to the project
  4. Scientific computing algorithms
  5. Implementation, including
     - Language
     - Computational facilities to be used
     - Databases to be used
  6. Validation methods
  7. Test problems for verification
  8. Expected results (later on discussion)
  9. Milestone
  10. Deliverables
  11. Reference
- In both oral presentations and written documents,
  o Proper credit must be given to any references, including online materials
  o DO NOT cut-and-paste; plagiarism is a very serious offense at UMD and in any academic/scientific/engineering community.
- Submit presentation and documentation files
  o In .pdf, to avoid conversion issues among platforms;
  o Three days in advance in draft form; the instructors may request an early submission if needed.