Syllabus

MATH663/AMSC663 Fall 2010
Advanced Scientific Computing I (ASC I)

Instructors: Radu Balan, Manuel Tiglio
Classes: Tuesday, Thursday, 5:15pm – 6:30pm (or as needed) in CSIC 4122
Office Hours: Wednesday, 1-2pm in CSCAMM; or by appointment otherwise
Contact Information:
Radu Balan: rvbalan@math.umd.edu, Math Building, Room 2308, x55492 / CSCAMM, Room 4131, x51217
Manuel Tiglio: tiglio@umd.edu, Physics Building, Room 4205E, x56193 / CSCAMM, Room 4123, x50667

• Project Proposal
  o By the end of the first month each student must find a faculty advisor and identify a suitable project that includes a deliverable suite of software that is designed to carry out a computational scientific task, propose appropriate algorithms, languages, and platforms for the development of this software, write a short project proposal that also includes a scientific justification, and present the proposal orally. The proposal must also include the description of the computational facilities to be used in the project.
  o Project description should also include outline of a test problem that will be used for verification.
  o Meeting with both instructors and scientific advisor at least one week before oral presentation.
  o Project proposal should be no more than 5 pages.
  o Oral presentations at the end of September. Plan on 30 minutes, including questions and discussion.
  o Encourage your scientific advisor to attend the oral presentation. Will require attendance of scientific advisor at end-of-semester presentations.

• Code Development
  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

• Implementation of Parallel Algorithms (time permitting)
  o OpenMP, MPI, GPU programming
  o masking communication costs, load balancing, granularity
  o parallel numerical linear algebra
  o basic parallel algorithms for PDE, e.g. simple domain decompositions

• Project Progress Report
  o Each student must give a written and oral mid-year report on the state of his or her project, explain how the software has been developed and tested, give his
or her current vision of the finished product, and detail how that vision has evolved over the course of the project.

Students will provide weekly statements of their project status. The statements are due before the beginning of the scheduled weekly class period.

Students are responsible for achieving the project goals that were listed in the proposal. Grading takes into account student’s understanding of the project, its implementation, timing of the weekly reports, presentation quality and the mid-year report quality.