MATH 815: Topics in Numerical Analysis:

Advanced Numerical Solvers for Elliptic Boundary Value Problems

Spring 2018

Department of Mathematical Sciences, UWM

Lecture Time and Place

5:00 PM - 6:15 PM, Monday and Wednesday, EMS Room E416

Instructor

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Office Hours: 10:30 AM - 11:30 AM, Monday and Wednesday.

Textbook

Class notes will be used in the course based on the following reference books and some recent related research articles:

- *Numerical solution of partial differential equations by the finite element method,* Claes Johnson, Cambridge, 1987.
- *The Mathematical Theory of Finite Elements*, by Susanne Brenner and Ridgway Scott, Springer, 2002.
- The FEniCS tutorial on the website https://fenicsproject.org/tutorial/.

Course Overview

This course focuses on the finite element method for solving partial differential equations. It introduces the basic finite element mathematical theory, advanced finite element numerical solvers (such as the multigrid method, the preconditioned conjugate

gradient method, and the domain decomposition method), and a finite element program library from the FEniCS project (*http://fenicsproject.org*). Python programs for solving elliptic boundary value problems will be taught based on FEniCS′s finite element program library.

Grading

The grade will be based on your class attendance (20 %) and four homework evaluations (each 20 %).

Attendance:

Attendance at the lectures is required. Three-points reduction will be taken for each class missing. The maximum of class missing reduction points is 30. There is no provision for absences due to vacations, family outings and other social activities, other special plans and appointments, etc. Absences due to illness require a medical excuse on Physician's letterhead, signed by the physician.

Important Dates

- January 22: First day of classes.
- January 29: Last day to add a class in the Math Department.
- February 16: Last day to drop course without W on record.
- April 8: Last day to drop or withdraw.
- March 18 to 25: Spring Recess.
- May 10**:** Last day of classes.

Statement of Academic Misconduct

The university has a responsibility to promote academic honesty and integrity and to develop procedures to deal effectively with instances of academic dishonestly. Students are responsible for the honest completion and representation of their work, for the appropriate citation of sources, and for respect of others' academic endeavors. Further information can be found at http://www.uwm.edu/Dept/Acad_Aff/policy/academicmisconduct.html.

Other important university policies

They can be found here: http://uwm.edu/secu/wp-content/uploads/sites/122/2016/12/Syllabus-Links.pdf