MATH 567 – Numerical Methods for Partial Differential Equations

Summer 2018 (July 2 – August 4)

http://www.siue.edu/~juliu/teaching/2018Summer/MATH567Summer2018.html

Class Time and Location: MTWR 1:00pm-3:25pm, Engineering Building 1160
MTWR 3:30pm-4:00pm, Science East 2234 (make-up sessions)
Instructor: Dr. Jun Liu, **Office Location**: Science East 2310,
Office Phone: 618-650-2220, **E-mail**: juliu@siue.edu
Office Hours: MTWR 12:30pm-1:00pm, or by appointment.

Course Description: This course will explore finite difference methods for solving standard linear partial differential equations (PDEs). PDEs are used to model a great variety of physical phenomenon, from fluid flow to wave propagation in acoustics, electromagnetics, and elastodynamics. We will focus on practical implementation, analysis of stability, accuracy, convergence of these numerical methods. We will also discuss fast iterative solvers in solving linear systems arising from discretizations of such PDEs. Advanced topics may include nonlinear PDEs as well as standard finite element methods for general domains. Through projects, students will gain programming experience in implementing the studied algorithms using MATLAB/Octave.

Learning Outcomes:
- Understand typical linear (elliptic, parabolic and hyperbolic) PDEs.
- Code finite difference schemes for elliptic, parabolic and hyperbolic PDEs.
- Analyze these methods for their properties, including the concepts of consistency, accuracy, stability, and convergence.
- Understand the concepts of dissipation, and dispersion and how these relate to accuracy of finite difference methods.
- Write solid codes in MATLAB/Octave to simulate numerical methods for PDEs, and understand basic computational aspects behind the algorithms.

Prerequisite: MATH 152 (Calculus II) or MATH 462/464. Some programming experience (preferably with MATLAB) is required. Basic knowledge of differential equations and matrices is desired. Students who are not sure about prerequisites are encouraged to talk to the instructor.

Textbook: *Finite Difference Methods for Ordinary and Partial Differential Equations: Steady-State and Time-Dependent Problems*, Randall J. LeVeque, ISBN:978-0898716290. Link

Grade Distribution:
The final grade is based on the following **standard grading scale** (There will be **NO** curves):

100-90% A, 89-80% B, 79-70% C, 69-60% D, 59-0% F
based on 5 taken-home Projects and one comprehensive in-class Final Exam as follows:

Item	Percentage
5 Weekly Projects (14% each)	**70%**
Final Exam (August 2*)	**30%**
Total	**100%**

Important Notes:
1. **Late submission of Projects will not be accepted. Please write down all detail steps.**
2. **All work on Projects and Exams must be your own.** The university has a straightforward policy on academic integrity. **Any form of cheating/coping will not be tolerated and will result in a failing grade for the assignment or for the course.**
3. Make-up tests will be only given for exams missed due to **unavoidable circumstances and compelling situations which are documented**. **None** of the tests will be dropped.
4. **Attendance is mandatory:** Students are expected to arrive on time and attend each class for the entire class period. If you must be late, enter the class quietly, taking the nearest available seat. If you must leave early, notify the instructor before the class begins; sit by the door and exit quietly. Except for emergencies, students should not leave and reenter the classroom while class is in session. **Attendance will be taken randomly.**
5. **If you miss a class, you are responsible for the missed materials.** It is the discretion of the instructor to drop any student who misses many classes without justifiable reasons.
6. Incomplete(**I**) will **not** be given as an alternative to a withdrawal. It can be given only if the student has a legitimate excuse with written documentation provided that the student was passing the course at the time of the emergency.
7. The course plan may be slightly modified during the semester. All changes will be announced in class in advance. It is your responsibility to be informed of such changes.
8. *Students needing accommodations because of medical diagnosis or major life impairment will need to register with Disability Support Services (DSS) and complete an intake process before accommodations will be given. The DSS office is located in the Student Success Center, Room 1270. You can also reach the office by e-mail at disabilitysupport@siue.edu or by calling 618.650.3726. For more information on policies, procedures, or necessary forms, please visit the DSS website at www.siue.edu/dss.*
9. Any changes to the syllabus will be announced in the class. **Blackboard via emails will be used for posting announcements, assignments, lecture notes, and current grades.**

Guidelines on Student Behavior in the Classroom:
- You are expected to **arrive on time**. If you have to be late, enter the classroom quietly, possibly from the back, without disrupting the class. Do not walk between the instructor and the blackboard or between the instructor and the class.
- **Do not leave the class until it is over**. If you have to leave early, notify the instructor before the class begins, sit by the door and exit quietly.
- Except the emergencies, students should **not leave** and **reenter** the classroom when the class is in session.
- During the lecture time, **any electronic hand-held devices** should be silent or turned off.
- **Do not talk** to other students during the lecture. If you have a question about the material, address the instructor by raising your hands.
- **No eating** in the classroom. Walk quietly through the hallways since classes in other rooms may still be in session.
- Any other behavior that your classmates may find disruptive should be rectified. **Keep in mind that your behavior affects the learning environment of all**.
- The instructor has the right to impose additional rules if necessary.

Important Dates:
https://www.siue.edu/registrar/schedules/Summer_2018_Registration_Schedule.shtml