Math 314, Introduction to Applied Mathematics Spring 2019

MW 12-1:15pm, Peterson Hall 1105

Instructor: Evelyn Sander (Exploratory Hall 4408, esander@gmu.edu)
Office Hours: MW 1:20-2:15 and by appointment.

Course Text: *Theory and Numerics of Partial Differential Equations*, by Evelyn Sander and Thomas Wanner, unpublished, available on Blackboard.
Other recommended reference: *Advanced Engineering Mathematics*, Erwin Kreyszig.

Prerequisites: Grade of C or better in Math 214, Math 216, or an equivalent course in ordinary differential equations.

Course Goals: The goal of this course is to study Fourier analysis, series solutions of differential equations, Bessel and Legendre equations, Sturm-Liouville problems, and partial differential equations.

Exams: Exam dates are as follows:
Midterm Exam: Monday March 4
Final exam: Monday May 13, 10:30-1:15

Homework: Problem sets will be assigned regularly. No late homework. The lowest homework score will be dropped.

Matlab and Blackboard: Some homework will require Matlab. All course materials will be on Blackboard.

Grading Policy:
Homework = 27%
Midterm exam = 30%
Attendance and participation= 10%
Final Exam = 33%

Grade scale: In general, 90%-100% = A, 80%-89% = B, 70%-79% = C, 60%-69% = D, below 60% = F. Plus and minus grades will be approximately 2 or 3 percentage points above or below these boundaries (e.g. 88% would correspond to a B+). I reserve the right to lower the curve, but will not raise the curve.

No makeup exams: In the event that one exam is missed and (1) a valid, documented excuse is given in writing to the instructor at the time of the absence and (2) the student provides sufficient evidence to the instructor that he/she is keeping up with the topics in the course, the final exam score will count in place of the missed exam. The instructor will determine whether an excuse is valid (for example, a medical emergency would constitute a valid excuse but leaving early for vacation is not a valid excuse). Without a valid documented excuse given at the time of the exam, a missed exam will count as a zero. If more than one midterm exam is missed, that situation will be dealt with on an individual basis.

Final Exam: The final exam will be an in-class exam and must be taken at the scheduled time. Exceptions are allowed only with a Dean's permission, by University rules.

Calculator policy: No calculators or other electronic devices will be allowed for use on exams.

Honor System: It is expected that all students will conduct themselves within the guidelines of the Honor Code. All academic work should be done with the level of honesty and integrity that this University demands. Here are guidelines specific to this class.

- **Discussion versus copying:** You may discuss homework problems with others in the class. However, you may not consult others' assignment writeups or show others your writeup.
- **Citing your sources:** You may use sources other than the textbook to help you with your assignment, but then you must cite these sources.

Topics Covered
The course will cover the following sections.

- Ch. 1 Introduction to Differential Equations
  - 1.1 Ordinary and Partial Differential Equations
  - 1.2 Four Classical Partial Differential Equations
  - 1.3 Classification of Partial Differential Equations
- Ch. 2 Separation of Variables

    - 2.1 Generalized Fourier Series Expansions
    - 2.2 Sturm-Liouville Boundary Value Problems
    - 2.3 A First Taste of Separation of Variables
    - 2.4 Eigenvalue Problems via Separation of Variables
    - 2.5 Nonhomogeneous Equations and Boundary Conditions
    - 2.6 Separation of Variables in Different Coordinate Systems
- Ch. 3 Basic Numerical Techniques
    - 3.1 Numerical Approximation of Derivatives
    - 3.4 Spectral Interpolation and Differentiation
- Ch. 4 Linear Elliptic Equations *(Tentative - Time permitting!)*
    - 4.1 Introduction to Linear Elliptic Problems
    - 4.2 Finite Difference Method
    - 4.3 Spectral Methods
