Spring Semester 2015
MATH 6363: Partial Differential Equations

Instructor: Dr. Vu Kim Tuan
Time & Location: TR, 5:30 PM - 6:50 PM, Boyd 307
Office: Boyd 325
Office Hours: TR, 4:30 PM-5:30 PM, 6:50 PM-7:20 PM, or by appointment. Please contact me only through campus MyUWG e-mail or in person.
Phone: 678-839-4135
E-mail: vu@westga.edu
Hours Credit: 3 hours
Prerequisites: MATH 2654 Calculus III and MATH 2853 Elementary Linear Algebra

Textbook: R.C. McOwen, *Partial Differential Equations: Methods and Applications*, 2nd edition, Pearson Education, New Jersey, 2003. ISBN 0-13-009335-1

Course Description: This course offers classical methods used in partial differential equations. Topics include data propagating along characteristics, classifications of equations of the second order, the method of transforms and separation of variables, and typical applications of the wave and heat equations.

Topics:

1- First-Order Equations: The Cauchy problem for quasilinear equations. The method of characteristics. Weak solutions for quasilinear equations. Consevation Laws and jump conditions. General nonlinear equations. Complete integrals and general solutions.
2- Higher-Order Equations: The Cauchy-Kovalevski theorem. Second-order equations. Classification and canonical forms. Linear equations. Adjoints and weak solutions. Distributions, convolutions and fundamental solutions.
3- The Wave Equation: Weak solutions. Huygen's principle. Conservation of energy. Dispersion and dissipation. The domain of dependence. Applications to light and sound.
4- The Laplace Equation: Separation of variables. Green's function and Poisson's kernel. Existence and uniqueness. The maximum principle. Harmonic and subharmonic functions. Perron's method. Eigenvalues and eigenfunction expansions. Applications to vector fields.
5- The Heat Equation: Existence by eigenfunction expansion. The maximum principle and uniqueness. Fourier transform. The fundamental solution. Regularity and similarity. Application to fluid dynamics.

Learning Outcomes: It is expected that the student who completes this course will:

1- Be able to classify partial differential equations of first and second order.
2- Be able to prove the existence and uniqueness of solution of classical PDEs.
3- Be able to solve practical PDEs by separation of variables and transform method.

Tests: There will be three take-home tests and one in-class bonus test worth 100 points each. Take-home tests are supposed to be completed *individually*. You can request to

drop one take-home test (say Test X). In that case your individual Bonus Test will cover topics of Test X, and your new Test X score = max{old Test X score, Bonus Test score}. No make-up exam for missing a test.

Final Exam: No comprehensive final examination.

Important Dates: 2/5 : Test 1, Due 2/10 at 5:30 PM
3/5 : Test 2, Due 3/10 at 5:30 PM
4/9 : Test 3, Due 4/14 at 5:30 PM
4/21: Bonus Test, 5:00 PM – 7:30 PM

Grading: The final letter grade will be determined by the following scale:
A = 270-300, B = 240-<270, C = 210-<240, F = below 210

Homework: This is an important part of the course. At the end of most classes you will be given a list of problems – these are the minimum that you should work on. These problems will not be graded. Practice is important. An important part of each homework assignment is to read the corresponding material in the text. I encourage you to use my office hours if you have any questions. You should make sure to set aside some time every class day to work problems.

Disabilities: Students with documented disabilities (through West Georgia's Disability Services) will be given all reasonable accommodations. Students must take the responsibility to make their disability known and request academic adjustments or auxiliary aids. Adjustments needed in relation to test-taking must be brought to the instructor's attention well in advance of the test (at least one week prior).

Attendance Policy: You are expected to attend every class. Although absences are not penalized, if a class is missed, you are responsible for all material and assignments.

Academic Honesty: You are expected to achieve and maintain the highest standards of academic honesty and excellence as described in the Graduate Catalog. In short, be responsible and do your own work.