

MATH 521 – Boundary Value Problems and Partial Differential Equations

Instructor Professor Doug Meade
Office Hours: MW 1:30PM – 2:30PM,
T 2:30PM – 3:30PM,
and by *prior* appointment
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Course Website <http://www.math.sc.edu/~meade/math521-S15/>

Meeting Times Lecture: TR 1:15PM– 2:30PM, LC 121

Text O'Neill, *Beginning Partial Differential Equations*, Wiley, 3rd ed., 2014.

Prerequisite Completion of MATH 242 or 520 with a grade of C or better.

Learning Outcomes Successful students in Boundary Value Problems and Differential Equations will be knowledgeable about and will be able to analyze solutions to two-point boundary value problems, boundary value problems for partial differential equations, eigenfunction expansions and separation of variables, transform methods for solving PDEs, Green's functions for PDEs, and the method of characteristics.

Course Content Differential equations is the language of science. Many basic scientific laws express the change in one quantity in terms of the values of other quantities. You were exposed to these ideas, first, for ordinary differential equations — that is, for functions of one variable.

Many more physical problems involve quantities that depend on more than one variable — for example, $u(t, x, y, z)$ could be the temperature at any location (x, y, z) in a three-dimensional object at any instant in time t .

We will focus on some of the classical methods to find explicit solutions to partial differential equations: separation of variables, integral transforms, and the method of characteristics. In each case the basic idea is the same — do something to convert the PDE into something “simpler”. Often the simpler problem will be an ordinary differential equation or an algebraic equation.

Almost all of the PDEs that we consider will be linear. Nonlinear PDEs are, in general, much more difficult. One of the first ways to analyze nonlinear PDEs is to approximate it with a linear PDE.

Study Hints Reading the textbook **in advance** of the lecture is strongly encouraged. Benefits of this preparation include obtaining a familiarity with the terminology and concepts that will be encountered (so you can distinguish major points from side issues), being able to formulate questions about the parts of the presentation that you do not understand, and having a chance to review the skills and techniques that will be needed to apply the new concepts.

Grading Your grade in this course will be based on your performance on homework, two (2) mid-term exams, and a final exam. The weights assigned to each of these components will be:

Homework	25%(drop lowest 10% of HW scores)
Mid-term exams (2)	50%
Final exam	25%

Course grades will be determined according to the following scale:

A	90 – 100
B	80 – 89
C	70 – 79
D	60 – 69
F	0 – 59

The deadline to drop this course with a grade of W is Thursday, March 5, 2015.

Exams *Tentative* dates and material for the three mid-term exams are:

Thursday, Feb 19	Chapters 1–4
Thursday, April 9	Chapters 4–6

Make-up exams will be given only for documented reasons of illness, family emergency or participation in a University sponsored event. Excuses such as oversleeping, forgetting the time or location of the exam, and lack of studying are explicitly noted as unacceptable grounds for a make-up exam.

A comprehensive final will be given at 12:30P.M. on Thursday, April 30, 2015.

Homework Problems will be assigned for each section. Most problems can be completed online, using WileyPlus. Selected problems will need to be written up and turned in as announced in class (and on the course website).

Your homework grade will be determined from all homework scores, with the lowest 10% of your scores dropped.

Graduate Credit Graduate students enrolled in this course will be expected to work additional problems assigned throughout the semester.

Attendance Attendance at every class meeting is important – and expected. Students missing more than 10% of the class meetings (3 days) can have their grade lowered.

Academic Honesty Cheating and plagiarism will not be tolerated. You may discuss homework problems with others, but do not copy work from another student or from a book. Violations of this policy will be dealt with in accordance with the USC Honor Code and other University guidelines.