MATH 617-010 Introduction to Applied Mathematics II
MW 2:30–3:30, SMI 221 Spring 2000
Web Page: `http://www.math.udel.edu/~edwards/download/m617/s00home.html`

Instructor: Prof. D. A. Edwards Office Hours: M10–11, T3–4 or by appointment
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Introduction

Welcome to MATH 617! In this course you will be learning not only the mathematical techniques used in applied mathematics, but also how they are actually used in practice to analyze physical systems. The texts for this course are as follows:

Required:

Guenther, Ronald B., and Lee, John W. *Partial Differential Equations of Mathematical Physics and Integral Equations*. New York: Dover, 1996.

Logan, J. David. *Applied Mathematics*, 2nd ed. New York: Wiley, 1996.

Recommended:

Weinberger, Hans F. *A First Course in Partial Differential Equations With Complex Variables and Transform Methods*. New York: Dover, 1995.

In addition, upon request I will put other books on reserve in the Morris Library that may prove helpful for certain sections.

If you have a problem, question about the material, or interesting application you would like me to address in class, please feel free to contact me during my office hours or make an appointment.

Electronic Communication

The Web page for this course is listed above. There you will find copies of handouts available for downloading, as well as any important announcements (corrections to typographical errors, etc.). Also at the URL

`http://www.math.udel.edu/~edwards/download/suggest.html`

you will find an anonymous suggestion box.

Particularly important messages regarding this course may also be e-mailed to you directly. In addition, you may send me e-mail with questions regarding the course, homework assign-

ments, etc. For more information on how to use electronic resources, contact the Help Center (x6000).

Exams

There will be a midterm and final exam for the course; the dates are listed on the attached schedule. Attached to the midterm will be a course evaluation form so that I may receive

your suggestions for how the course could be improved. These forms will be seen only by me, so if you have comments that you wish the department to hear, please contact them directly.

Writing Assignment

As each of you proceeds in your career, you will encounter situations where you will have to communicate your ideas to others. Those in academia have to submit theses and research articles; those in industry must make presentations and write reports. In order to prepare you for this sometimes daunting task, I am assigning a **MANDATORY** writing assignment. This semester you will continue to refine your writing assignments from last term to hopefully use additional techniques you will learn this semester. Deadlines are listed in the course schedule below.

Homework

The most effective way to succeed in this course is to do all the homework assignments. I select the problems carefully to illustrate the most important topics in the course. Even if you are registered as a listener, I recommend doing the homework, and I will review it.

In most cases, homework will be distributed every Wednesday during lecture and it will be due at the beginning of class the following Wednesday. (The first homework assignment is attached to this sheet.) The homework will ideally cover material up through the Friday before it is due. **ABSOLUTELY NO LATE HOMEWORK WILL BE ACCEPTED!** If you must miss a due date because of University business, it is your responsibility to make sure the homework gets to me ***before*** the due date. Since mathematics is a subject where the material for one section builds on the section before, it is critical that you keep up to date on the homework: hence the stringent policy. However, to calculate your semester-long homework average, I will drop your two lowest homework scores. Therefore, low scores for assignments where you were pressed for time can be erased as long as you don't have too many of them.

Though you may not copy directly from another's paper or use someone else's ideas as your own, I encourage you to discuss the homework problems with your classmates. Any scientific endeavor is rarely done in a vacuum; therefore it is to your advantage to learn the benefits of collaborating. Model homework solutions will be posted on the Web after the assignment is due. Hopefully these will assist you in learning the material.

Homework assignments should be folded like a book with the following information on the "front cover:"

Name
MATH 617—Edwards
Assignment Number
Date

You will turn in your assignments this way so that I can put your grade on the inside, thus ensuring your privacy. I will make every effort to ensure that your graded homework is returned in a timely manner. The number of points assigned to each problem will be listed.

Assessment

Your grade for the course will be determined in two stages. First your *raw score* will be calculated using the *higher* of the two algorithms:

1) Each exam will count for 1/3 of your grade; the other 1/3 will be split between the homework and the writing assignment.
2) The writing assignment will count for 1/6 of your grade; the other 5/6 will be split evenly between the homework and exams.

Then each of the raw scores will be scaled to determine final grades, if necessary.

Tentative Schedule

Note: This is only a tentative schedule; you may expect deviations from it. (In particular, topics near the end of the schedule may be dropped if the other topics take more than the allotted time.)

week of February 7: linear first-order PDEs
February 7: Homework 1 distributed
week of February 14: quasilinear first-order PDEs
February 16: Homework 1 due; Homework 2 distributed
week of February 21: classification of second-order equations, the wave equation
February 23: Homework 2 due; Homework 3 distributed
week of February 28: the wave equation, Bessel's functions
March 1: Homework 3 due; Homework 4 distributed
week of March 6: Laplace's equation
March 8: Homework 4 due; Homework 5 distributed
week of March 13: spherical harmonics, the Stefan problem
March 15: Homework 5 due; Homework 6 distributed
week of March 20: generalized Green's functions, generalized eigenfunction expansions
March 20: Midterm Exam (take-home)
week of March 27: Spring Break (no class)
week of April 3: generalized eigenfunction expansions, bifurcation theory
April 3: Outline of writing assignment due
April 5: Homework 6 due; Homework 7 distributed
week of April 10: traveling waves, epidemics
April 12: Homework 7 due; Homework 8 distributed
week of April 17: variational principles
April 19: Homework 8 due; Homework 9 distributed
week of April 24: Rayleigh quotient, the Navier-Stokes equations
April 26: Homework 9 due; Homework 10 distributed

week of May 1: limiting cases of the Navier-Stokes equations

May 3: Homework 10 due; Homework 11 distributed

week of May 8: nonlinear diffusion

May 10: Writing assignment due

May 15: biochemical systems

May 17: formal review session

May 17: Homework 11 due