MATH 616-010   Introduction to Applied Mathematics I
MW 4:00–5:15, PRN 324B   Fall 1999
    Web Page: `http://www.math.udel.edu/~edwards/download/m616/f99home.html`

Instructor: Prof. D. A. Edwards   Office Hours: M9–10, T2:30–3:30 or by appointment
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Introduction

Welcome to MATH 616! 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:
    Logan, J. David. *Applied Mathematics*, 2nd ed. New York: Wiley, 1996.
    Weinberger, Hans F. *A First Course in Partial Differential Equations With Complex Variables and Transform Methods*. New York: Dover, 1995.

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

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 assignments, 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 each examination 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. In it, you will choose a phenomenon which interests you, create a simple model to describe it, and then solve the equations governing the model using the techniques you have learned in this class. The focus of the assignment will be the clarity of the expression contained therein, rather than the mathematical sophistication of the arguments. Further details will follow.

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 the following Wednesday. (The first homework assignment is attached to this sheet.) **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 placed on reserve in Morris Library 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:"

<div align="center">

Name
MATH 616—Edwards
Assignment Number
Date

</div>

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.)

September 1: modeling, dimensional analysis
     September 1: Homework 1 distributed
September 6: Labor Day (no lecture)
September 8: dimensional analysis, scaling, the diffusion equation
week of September 13: the diffusion equation, separation of variables, Fourier series
     September 15: Homework 1 due; Homework 2 distributed
week of September 20: Fourier series, the heat equation, maximum principles
     September 22: Homework 2 due; Homework 3 distributed
week of September 27: regular Sturm-Liouville problems, Green's functions
     September 29: Homework 3 due; Homework 4 distributed
     September 29: Topic for writing assignment due
week of October 4: Green's functions, the Fredholm alternative
     October 6: Homework 4 due; Homework 5 distributed
week of October 11: Fredholm alternative, Fourier transforms
     October 13: Midterm Exam
week of October 18: Fourier transforms and inversion properties
     October 20: Homework 5 due; Homework 6 distributed
week of October 25: Fourier inversion and applications
     October 27: Homework 6 due; Homework 7 distributed
     October 27: Outline of writing assignment due
week of November 1: asymptotics of transforms, Laplace's method
     November 3: Homework 7 due; Homework 8 distributed
week of November 8: Laplace's method, stationary phase
     November 10: Homework 8 due; Homework 9 distributed
week of November 15: stationary phase, initial value problems
     November 17: Homework 9 due; Homework 10 distributed
week of November 22: phase plane analysis
     November 24: Homework 10 due; Homework 11 distributed
week of November 29: phase plane analysis
     December 1: Writing assignment due
week of December 6: summary and review
     December 8: Homework 11 due