MATH 616-010 Introduction to Applied Mathematics I
MWF 10:10-11, EWG 204 Fall 2006
Web Page: http://www.math.udel.edu/~edwards/download/m616/f06home.html

Instructor: Prof. D. A. Edwards Office Hours: T 3–4, F 11–12 or by appointment
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Introduction

Welcome to MATH 616! In this course you will be learning not only the mathematical techniques of 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*, 3rd ed. New York: Wiley, 2006.
- 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.) The homework will ideally cover material up through the Friday after it is distributed. **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 from an answer key) or use someone else's ideas as your own, I encourage you to discuss the homework problems with your classmates. (All students are expected to be familiar with and follow the guidelines on academic dishonesty at `http://www.math.udel.edu/~stuguide/06-07/code.html`.)

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 course Web page 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 616—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.)

August 30–September 1: modeling, dimensional analysis
  August 30: Homework 1 distributed
September 4: Labor Day (no lecture)
September 6–8: dimensional analysis, scaling, the diffusion equation
week of September 11: the diffusion equation, separation of variables, Fourier series
  September 13: Homework 1 due; Homework 2 distributed
week of September 18: Fourier series, the heat equation

September 20: Homework 2 due; Homework 3 distributed
week of September 25: the heat equation, regular Sturm-Liouville problems
September 27: Homework 3 due; Homework 4 distributed
September 27: Topic for writing assignment due
week of October 2: regular Sturm-Liouville problems, Green's functions
October 4: Homework 4 due; Homework 5 distributed
week of October 9: Green's functions, Fredholm alternative, Fourier transforms
October 11: Homework 5 due; Homework 6 distributed
week of October 16: sine, cosine, and Laplace transforms, the heat equation, population dynamics
October 16: Midterm exam distributed
week of October 23: population dynamics and the phase plane
October 25: Homework 6 due; Homework 7 distributed
October 27: Outline of writing assignment due
week of October 30: bifurcations, action-angle coordinates, predator-prey models
November 1: Homework 7 due; Homework 8 distributed
week of November 6: predator-prey models, perturbation expansions
November 8: Homework 8 due; Homework 9 distributed
week of November 13: singular perturbations, asymptotic expansions of integrals
November 15: Homework 9 due; Homework 10 distributed
week of November 20: Laplace's method, stationary phase
November 22: Homework 10 due; Homework 11 distributed
November 24: Thanksgiving recess (no lecture)
week of November 27: stationary phase, integral equations
November 29: Writing assignment due
December 4: Fredholm equations
December 6: review
December 6: Homework 11 due; supplemental study material distributed