MATH 616-010 Modeling in Applied Mathematics
MWF 9:10–10:05, PRN 331 Fall 2023
Web Page: `http://sites.udel.edu/dedwards/m616f23`
(also referenced from QR code at end of document)

Instructor: Prof. D. A. Edwards Office Hours: T 1:30–2:30, F 11:15–12:15 or by appointment
EWG 511 (302) 831-1871, `dedwards@udel.edu`

Introduction (9/1 Version)

Welcome to MATH 616! In this course you will be learning not only the techniques used in applied mathematics, but also how they are actually used in practice to analyze physical systems. The text for this course is *Applied Mathematics*, 4th ed., by Logan.

If you have any questions, contact me during my office hours or make an appointment. **Extra copies of handouts are available at the Web page listed above or referenced at the QR code at the end of the document.**

If you have to miss class one day, just get the notes from someone. If you are in quarantine, let me know and I will stream the class over Zoom.

Exams

There will be a take-home midterm and an in-class final exam for the course. **You will need a small blue book for each exam**. Attached to each examination will be a course evaluation form so that I may receive your suggestions for how the course could be improved.

When the exams are returned, they will have a numerical score and a letter grade on them. The numerical score is your score for the exam; *the letter grade is your grade for the course* to that point, including all homework scores.

Writing Assignment

As each of you proceeds in your career, you will encounter situations where you will have to communicate your ideas to others. 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.

Homework

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 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. However, I will drop your two lowest homework scores.

Though you may not copy directly from another's paper or use someone else's ideas (including online aids) as your own[1], I encourage you to discuss the homework problems with your classmates. Model homework solutions will be posted online 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.

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[1] For more details regarding academic dishonesty, see the Student Handbook (`http://www.udel.edu/stuguide/`).

Electronic Communication

Important announcements (corrections to typographical errors, etc.) will be handled by e-mail. Also at the URL

`https://sites.udel.edu/dedwards/classes/suggest/`

you will find an anonymous suggestion box.

Tentative Schedule

week of August 28: modeling, scaling
August 30: Homework Set 1 distributed
week of September 4: scaling, dimensional analysis, population dynamics
September 4: Labor Day (no lecture)
week of September 11: population dynamics, bifurcation theory, phase planes
September 13: Homework Set 1 due; Homework Set 2 distributed
week of September 18: phase planes
September 20: Homework Set 2 due; Homework Set 3 distributed
week of September 25: phase planes, predator-prey and epidemic systems
September 25: Topic for writing assignment due
September 27: Homework Set 3 due; Homework Set 4 distributed
week of October 2: epidemics, the diffusion equation
October 4: Homework Set 4 due; Homework Set 5 distributed
week of October 9: diffusion and Fisher's equations, traveling waves and spatial epidemics, one-dimensional discrete models
October 11: Homework Set 5 due; Homework Set 6 distributed
week of October 16: one- and two-dimensional discrete models
October 18: Homework Set 6 due; Homework Set 7 distributed
week of October 23: Beddington model, Stefan problem, first-order PDEs
October 23: Outline of writing assignment due
October 25: Midterm exam distributed
week of October 30: first-order PDEs
November 1: Homework Set 7 due; Homework Set 8 distributed
week of November 6: shocks, the wave and Navier-Stokes equations
November 8: Homework Set 8 due; Homework Set 9 distributed
week of November 13: Navier-Stokes, unidirectional flows, Volterra equations
November 15: Homework Set 9 due; Homework Set 10 distributed
week of November 20: Thanksgiving break (no lecture)
week of November 27: integral equations, perturbation methods
November 27: Writing assignment due
week of December 4: order estimates, perturbed algebraic and differential equations
December 6: Homework Set 10 due; supplemental study material distributed
December 11: review