

MTH443/MTH543 - Fundamentals of Applied Mathematics I (Fall 2009)

(Tentative class handout)

When: Tuesday and Thursday 11:00AM - 12:20PM

Where: MATH 150

Instructor: Avner Peleg

Office: Math Building, room 325

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Office hours (tentative): Monday 3:00PM-4:30PM, Friday 11:30AM-12:30PM.

Textbook: Introduction to the Foundations of Applied Mathematics, by Mark H. Holmes, Springer (2009).

Prerequisites: MTH241, MTH306 and MTH309, all with grade of C or higher.

Tentative syllabus: Chapters 1-5 in the textbook.

Course description:

- (1) Dimensional analysis: theoretical foundation, similarity variables, nondimensionalization and scaling, examples.
- (2) Perturbation methods: regular expansions, singular perturbations, introduction to boundary layers, multiple scales and two-timing.
- (3) Kinetic equations: examples, conservation laws, steady states, stability analysis, phase plane analysis, perturbation analysis.
- (4) Diffusion: random walks and Brownian motion, continuous limit – the diffusion equation, solving the diffusion equation, balance considerations and Fick's law, Langevin equation.
- (5) Traffic flow: density and flux, velocity and the continuity equation, velocity-density relations and different types of dynamic behavior, cellular automata modeling, particle kinetics modeling.

Homework: Homework will be assigned each week. Selected homework problems on each assignment will be graded. Homework is an important component of the course and is worth 25% of the final grade.

Notice that: (1) Late homework will not be accepted. (2) It is your responsibility to show your work and to present it in readable form. Unreadable answers or answers without justification will not receive credit.

Bonus homework problems: During the semester a few bonus homework problems will be assigned. These problems will involve analytic and/or numerical calculations. The bonus problems are optional and their total weight in the final grade is 5%.

Exams: There will be one midterm exam and a final exam. The midterm exam is scheduled for Thursday, October 22. It will take place in the classroom during regular class time. The time, date, and location of the final exam will be announced when they become available. The weight of the midterm exam is 30%, and the weight of the final is 45%.

Grades:

Homework (regular)	25%
Midterm	30%
Final	45%
Bonus homework	5%

The final number grade will be translated to a letter grade, and the translation will not be worse than:

85-100	A
70-84	B
60-69	C
50-59	D
0-49	F

The boundaries for plus/minus grades (A-, B+, B-, etc.) will be determined only after the final exam.

Computational (numerical) problems: some of the assigned homework problems will involve numerical calculations. You may use any computer software to solve these problems. When you submit the solution you should include a description of the software and a list of commands that you used.

MTH543 students: in accordance with the graduate school policy, graduate students will have additional coursework, consisting of additional homework and/or exam problems.

Course web site: <http://www.math.buffalo.edu/~apeleg/mth543.html>

This web site will be updated with announcements, homework assignments and other useful resources. It is highly recommended that you visit the web site on a regular basis.

Attendance: Students are expected to attend every scheduled class. All students attending the class must be registered for the class.

Academic integrity: Students are expected to behave in accordance with the university policy on academic integrity. The guiding principle of academic integrity is that a student's submitted work must be the student's own. Cheating and plagiarism will result in formal charges.

Incomplete: A grade of incomplete (I) will be assigned only under extraordinary circumstances, which are beyond the student's control (like a non-elective surgery during the last week of class).

Students with disabilities: If you have a diagnosed disability (physical, learning or psychological), which will make it difficult for you to carry out the coursework as outlined, or requires accommodations such as recruiting note takers, readers, or extended time on exams and/or assignments, please advise me during the first two weeks of the course, so that we may review possible arrangements.

Studying strategy: Below are some tips on how to do well in the course.

- (1) Review background material at the beginning of the semester.
- (2) Study regularly throughout the semester.
- (3) Read each topic in the book before class.
- (4) Review the theory afterwards using your notes and the book.
- (5) Do the homework regularly.
- (6) Seek help from me when you don't understand something.

Some important dates:

Fri Sep 11: (a) Last day to add/drop the course (no record will appear on your transcript if you drop the course). (b) Last day to file "Petition to make up an Incomplete" with the Math Department.

Fri Nov 13: Last day to resign from the course (an "R" will appear on your transcript).

Wed Nov 25 through Sun Nov 29: no class (Fall Recess).

Thu Dec 10: Last MTH443/MTH543 class.

Fri Dec 11: Semester ends.