MTH443/MTH543 - Fundamentals of Applied Mathematics I (Fall 2013)

When: Tuesday and Thursday 9:30AM-10:50AM
Where: MATH 250

Instructor: Avner Peleg
Office: Math Building, room 325
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Office hours (tentative): Monday 4:00PM-5:00PM, Tuesday 3:00PM-4:00PM.

Textbook: Introduction to the Foundations of Applied Mathematics, 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) <u>Dimensional analysis</u>: theoretical foundation, similarity variables, nondimensionalization and scaling, examples.
(2) <u>Perturbation methods</u>: regular expansions, singular perturbations, introduction to boundary layers, multiple boundary layers.
(3) <u>Kinetic equations</u>: examples, description in terms of chemical reactions, the law of mass action, conservation laws, steady states, stability analysis, phase plane analysis, perturbation analysis.
(4) <u>Diffusion</u>: random walks and Brownian motion, continuous limit – the diffusion equation, solving the diffusion equation, Fourier transform, balance considerations and Fick's law, Langevin equation.
(5) <u>Traffic flow</u>: density and flux, velocity and the continuity equation, velocity-density relations and different types of dynamic behavior, method of characteristics, shock waves, 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 30% 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.

Exams: There will be one midterm exam and a final exam. The midterm exam is scheduled for Thursday, October 17 between 9:30AM-10:50AM in Math 250. 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) 30%
      Midterm   30%
      Final   45%

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

      85-105 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 might 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 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.

Make-up exams: There will be no make-up exams (for the midterm). If due to severe circumstances beyond your control (car accident, illness, etc.), you will not be able to take the midterm exam, please call me immediately (before the exam) and let me know your situation. If you have a good reason and can present convincing documentation as to why you are not able to take the midterm exam, your final grade will be calculated without taking into account the midterm exam.

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.

Some important dates:
Tue Sep 3: Last day to drop/add the course (no record will appear on your transcript if you drop the course).
Thu Sep 5: no MTH443/MTH543 class (Rosh Hashanah).
Fri Nov 8: Last day to resign from the course (an "R" will appear on your transcript).
Wed Nov 27 through Sun Dec 1: no class (Fall Recess).
Thu Dec 5: Last MTH443/MTH543 class.
Fri Dec 6: Semester ends.