Math. 401, Sec. 501 Fall, 2003

Advanced Engineering Mathematics

Prerequisite: ordinary differential equations (Math. 308). **This prerequisite is real!**

Classes: MWF 10:20–11:10, ZACH 119B

Web page: `http://calclab.math.tamu.edu/~fulling/m401/s03/`

Instructor: S. A. Fulling
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`http://www.math.tamu.edu/~fulling/`

If I am not in my office, you can leave a note in my mailbox (in the room opposite the math department office, 6th floor of Blocker) or in the plastic pouch beside my office door.

Tentative office hours: M 9:00–10:00, W 2:00–3:00, R 2:00–3:00
Permanent office hours will be announced later.

Textbooks:

1. J. G. Simmonds and J. E. Mann, *A First Look at Perturbation Theory*, 2nd ed. (Dover, 1998, 0-486-67551-3)
2. C. Constanda, *Solution Techniques for Elementary Partial Differential Equations* (Chapman & Hall/CRC, 2002 1-58488-257-3)

Course Outline:

I. Perturbation theory and asymptotic approximations — *6 weeks*
   - A. Perturbation theory for algebraic equations
   - B. Regular perturbation theory (power series) and its shortcomings
   - C. Asymptotics and uniformity
   - D. Stretched-time and two-time methods
   - E. WKB (phase-integral, Liouville–Green) approximation
   - F. Boundary-layer problems

II. Partial differential equations and Fourier methods — *8 weeks*
   - A. Introduction to PDEs and boundary-value problems: The heat equation
   - B. Basic PDE concepts; linearity and homogeneity
   - C. Separation of variables and Fourier series
   - D. Fourier transforms
   - E. Sturm–Liouville problems and special functions — a quick survey
   - F. The linear wave equation
   - G. Types of PDEs (parabolic, hyperbolic, elliptic); well-posed problems

Grading system:

Hour tests:	$100 \times 3 = 300$
Final exam:	200
Homework:	≥ 150
Class participation:	$\leq \underline{50}$
Total	700

The "curve" will be at least as generous as the "standard" scale [i.e., 90% (= 630 pts) will guarantee an **A**, etc.].

Dates of hour tests: Friday Oct. 3, Friday Oct. 31, Monday Dec. 1
Final exam on Tuesday, Dec. 16, 8:00–10:00 a.m.

Class participation: We will sometimes discuss homework problems and other examples at the blackboard (or projector) in class. Sometimes I'll assign problems for you to work on in class in groups. At other times volunteers and random draftees will simply be called on. (You may also be called to the board to help me introduce a new concept or technique "Socratically". In such cases a good participation score is attained merely by being alert and cooperative.)

Make-up tests: Make-up tests are very hard to grade fairly, and they absorb a large amount of my time which would be better spent for the benefit of the whole class. Please cooperate in making these incidents as rare as possible. If you miss (or foresee that you will miss) a test, it is *your* responsibility to contact me as soon as possible to request, justify, and schedule a make-up test. (If you can't reach me directly, you can leave a message at the Math Department office, (979) 845–3261.) If the absence is not clearly excused under the Attendance section of *Student Rules*, the request may be denied.

Joint work: On a homework assignment (*not* a take-home test!) discussion with other students is permitted, even encouraged. However, the grader will not give homework credit for "work" that is parasitical (and your test scores will suffer, too!). To forestall problems, please follow these policies: (1) When two or more students work together on an assignment, they should all indicate so on their papers. (2) If the cooperation is of the divide-and-conquer variety, you are certifying that you *have studied and understand* every problem solution on your paper. Mindless copying is dishonest and academically worthless.

Plagiarism: Finding information in books or on the Internet is praiseworthy; *lying* (even by silence) about where it came from is academic dishonesty. Whenever you copy from, or "find the answer" in, some other source, *give a footnote or reference.* Otherwise, you are certifying that it is your own work.

Calculators in exams: Calculators are to be used only to perform *elementary operations* such as addition, multiplication, and evaluation of simple functions such as square roots. Advanced facilities are prohibited, especially *storing formulas in memory* or executing programs to carry out algorithms that are part of the subject matter of the course. (Again, when in doubt, give a "footnote" describing what you did.) Violations of this rule may lead to total prohibition of calculators in exams (probably at the insistence of other students).

Students with disabilities can get assistance from the Office of Services for Students with Disabilities (845-1637).