

## Advanced Engineering Mathematics

**Prerequisite:** ordinary differential equations (Math. 308). **This prerequisite is real!** Chapter 1 of Constanda's book is a review.

**Classes:** MWF 12:40–1:30, BLOC 164

**Web page:** <http://calclab.math.tamu.edu/~fulling/m401/s09/>

**Instructor:** S. A. Fulling

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845-2237

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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 3:00–3:40, W 1:50–2:40, R 2:00–3:00

Permanent office hours will be announced later.

### Textbooks:

1. S. A. Fulling, Math. 401 lecture notes (see the class Web page)
2. J. G. Simmonds and J. E. Mann, *A First Look at Perturbation Theory*, 2nd ed. (Dover, 1998, 0-486-67551-3)
3. C. Constanda, *Solution Techniques for Elementary Partial Differential Equations* (Chapman & Hall/CRC, 2002 1-58488-257-3)

### Some other useful books:

1. M. R. Spiegel (Schaum's Outline Series), *Fourier Analysis*
2. E. J. Hinch, *Perturbation Methods*
3. D. L. Kreider et al., *Introduction to Linear Analysis* (Our library has this in both English and Spanish.)

### 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

<b>Grading system:</b> Hour tests:	$100 \times 2 = 200$
Final exam:	200
Homework:	$\geq 150$
Class participation:	$\leq \underline{50}$
Total	$\underline{600}$

The “curve” will be at least as generous as the “standard” scale [i.e., 90% (= 540 pts) will guarantee an **A**, etc.].

Dates of hour tests: Friday, Feb. 27; Monday, Apr. 13

Final exam on Monday, May 11, 10:30–12:30

**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.)

**An Aggie does not lie, cheat, or steal or tolerate those who do.** See Honor Council Rules and Procedures, <http://www.tamu.edu/aggiehonor> .

**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.

**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.

**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).

**Copyright:** Course materials (on paper or the Web) should be assumed to be copyrighted by the instructor who wrote them or by the University.

**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.

**Disabilities:** The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Disability Services Office in Cain Hall, Room B118, or call 845–1637.