# CAAM 336
## Differential Equations in Science and Engineering
Spring 2008, Section 1

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| Instructor: | Kirk Blazek |
| Classroom: | Duncan Hall 1070 |
| | MWF 1:00-1:50 |
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| Web: | `http://www.caam.rice.edu/~caam336-S08/` |
| Office hours: | Monday 2:00-3:00, Tuesday 10:00-12:00 |
| Teaching Assistant: | Dong Sun |
| Recitation: | Monday 7:00-9:00pm |

PREREQUISITES: CAAM 210 Introduction to Scientific Computing; MATH 212 Multivariable Calculus or equvialent background in MATLAB programming, vector calculs, and basic linear algebra.

TEXT: Mark S. Gockenbach, Partial Differential Equations: Analytical and Numerical Methods, SIAM, 2002.

GRADING: 60% exams, 40% homework. Class participation will be considered when assigning borderline grades.

EXAMS: Two take-home, four-hour, closed-book exams will each account for 30% of the final grade. Each of these pledged exams must be your individual, unassisted effort. The first exam will be given about halfway through the semester, the second during the final exam period.

HOMEWORK: Problem sets will be assigned roughly once a week, each worth 100 points. Mathematically rigorous solutions are expected; strive for clarity and elegance. You may collaborate on the problems, but your write-ups and coding must be your own independent work. Transcribed solutions are unacceptable. You may not consult solutions from previous sections of this class.

Unless it is specified that a particular calculation must be performed "by hand," you are encouraged to use MATLAB's Symbolic Math Toolbox (or Mathematica or Maple) to compute and simplify tedious integrals and derivatives on the problem sets. As always, you must document your calcu-

lations clearly.

LATE POLICY: You may turn in two homework assignments one class period late without penalty. Subsequent late assignments will be penalized 20% each. Homework will not be accepted more than one class period late without a written excuse. (This implies that you may not use two "lates" on one assignment.)

MATLAB: Most of the problem sets will require a modest amount of MATLAB programming. Your solutions should adhere to good programming standards, and must not be copied from another student. See the website for some links to MATLAB resources.

Topics:

1. Classification of ordinary and partial differential equations
2. Derivation of PDEs from physical models
3. Linear operators
4. Fourier series; eigenfunctions of the Laplacian
5. Poisson equation: the spectral method
6. Galerkin approximation and the finite element method
7. Poisson equation: the finite element method
8. Heat equation: the spectral method
9. Heat equation: the finite element method, stability
10. Wave equation: the spectral method
11. Wave equation: the finite element method
12. Multidimensional problems
13. Other topics if time permites: nonlinear equations, other numerical methods

*Any student with a disability requiring accommodation in this course is encouraged to contact the instructor during the first week of class, and also to contact Disability Support Services in the Ley Student Center.*