ENG T 502

Advanced Applied Engineering Mathematics I

Syllabus—Fall Semester 2005

MWF 12:00–12:50 pm, 393 CB

Instructor: REINHARD O. W. FRANZ, 472 CB, 422-8173, franz@et.byu.edu.

Office Hours: MWF 3:00–3:45 pm or by appointment.

Instructor: VLADIMIR SOLOVJOV, 131 CB, 422-3051, vps@et.byu.edu

Office Hours: MW 3-3:50pm.

Text: *Advanced Applied Engineering Mathematics,* Jordan Cox, Reinhard Franz, Vladimir Solovjov.

Objectives:

- be mathematically literate; be able to read the respective mathematical literature and formulate mathematical descriptions of engineering problems adequately in mathematical terms;
- have a broad general view and understanding of mathematics; be able to determine the area in which a mathematical problem encountered in the work as engineers belongs;
- be able to make the transition from a physical probem encountered in the engineering practice to the mathematical model using the pertinent fundamental principles and empirical laws;
- use the large arsenal of tools provided in class to solve the mathematical problem modeling the original physical probem, interpret the solution and provide an adequate presentation;
- feel satisfaction for having succeeded in a hard subject.

Topics: Linear Algebra, Ordinary Differential Equations, Fourier Analysis, Partial Differential Equations.

Study Sessions: We offer study sessions, T Th 3:00–3:50pm, in 383 CB, to be able to give additional support.

Homework: Solutions to the assigned homework problems should be clearly labeled and in order. The style of your written solutions should be very much like that of a text book example; solutions should contain enough explanation so that one of your classmates would be able to easily understand what you have done. Generally, it is inadequate to merely write down a final answer. You are strongly encouraged to study together and work together on homework assignments. The assignments need to be submitted on the due day.

Exams: There will be two tests ($\sim$ Oct 14, Nov 4) and a comprehensive final.

Grading: Grades will be based on homework and exams. The homework will constitute 30 %, the two tests 30 % and the final 40 % of the grade.

Tentative Schedule:

AUG 30–SEP 22 (10): *Linear Algebra:* Sets: notations, operations; the field of real numbers: algebraic, order-theoretic, topological properties, the natural number and mathematical induction; the field of complex numbers: algebraic properties, polar presentation, De Moivre's theorem, roots of unity; vector spaces: linear independence, spanning sets, basis, dimension, linear maps, matrices, representations, determinants, systems of linear equations, Eigenvalue problems.

SEP 23–OCT 12 (9): *Ordinary Differential Equations:* Introduction, 1st-order equations, theory of linear differential equations, linear equations with constant coefficients, Cauchy-Euler equations, power series solutions, Frobenious method, systems of linear differential equations.

OCT 14–NOV 2 (9): *Fourier Analysis:* Lebesgue integral, L^p-spaces, Fourier series, Fourier integrals, Fourier transform, (Laplace transform)

NOV 4–DEC 7 (14): *Partial Differential Equations:* Fundamental principles and definitions, modeling and deriving partial differential equations, classical partial differential equations (classifications, intial-boundary value problem), method of separation of variables, Sturm-Liouville theorem, examples of partial differential equations in different coordinate systems: Laplace's equation (superposition principle, maximum principle, Poisson's equation), heat equation (maximum principle, steady-state solution), wave equation; integral transform method.