

ME755
SPECIAL FUNCTIONS & APPLIED DIFFERENTIAL EQUATIONS

Winter 2004

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Recommended: *Handbook of Mathematical Functions with Formulas, Graphs, and*
Textbook *Mathematical Tables*, Edited by Milton Abramowitz and Irene Stegun,
9th Printing, Dover Publications, New York, 1972.

Supplementary see reference list for each section

Objective: Introduce students to a wide range of special mathematical functions found in engineering applications. The course will examine analytical formulations and relationships used to determine these special functions. Given the power and accessibility of computer algebra tools such as Maple and Mathematica, we will also explore the use of these powerful software programs to solve a range of problems from simple to complex.

Outline:

1. General Introduction
2. Introduction to Computer Algebra Systems
3. Factorial, Gamma and Beta Functions
4. Error and Complimentary Error Functions
5. Elliptic Integrals, Theta Functions and Elliptic Functions
6. Bessel Functions of the First and Second Kind
7. Legendre Polynomials and Functions
8. Chebyshev Polynomials
9. Hypergeometric Functions

Assignments: Five problems sets will be assigned. Each problem set must be completed using a computer algebra tool of your choice. Given the availability of Maple on the University wide computer network, I fully expect that most people will choose to you this for their assignments. This course is designed to provide an opportunity for students to explore algebraic, symbolic and numerical methods used to solve engineering problems. While the assigned problems may appear to be straight forward in some instances, I encourage you to provide as much detail, including plots, secondary proofs and any other material that provides insight into the assigned problems.

Assessment:	Assignment #1: Gamma and Beta Functions	20%
	Due Date: January 29, 2004	
	Assignment #2: Error and Complementary Error Functions	20%
	Due Date: February 12, 2004	
	Assignment #3: Elliptic Integrals and Elliptic Functions	20%
	Due Date: February 26, 2004	
	Assignment #4: Bessel Functions	20%
	Due Date: March 11, 2004	
	Assignment #5: Legendre Functions and Chebyshev Polynomials	20%
	Due Date: March 25, 2004	