EGN 3433 Modeling and Analysis of Engineering Systems (Elective course, May be substituted for Differential Equations Course)

1. Catalog Description of Course:
Dynamic analysis of electrical, mechanical, hydraulic and thermal systems; Laplace transforms; numerical methods; use of computers in dynamic systems; analytical solution to first and second order ODEs. Restricted to majors. Prereq: MAC 2283 and PHY 2049. 3 credits.

2. Textbook Used: Differential Equations - Modeling with Matlab. Paul Davis

3. Course Objectives:
1. to learn how to represent a physical situation by a differential equation and initial or boundary conditions. Applications will be made to problems from all engineering disciplines.
2. to learn standard methods for solution of ordinary differential equations, similar to what is covered in Differential Equations but with an emphasis on the physical meaning of the equation and solution.
3. to learn how to use current software available for the numerical and analytical solution of ordinary differential equations.

4. Course Outcomes: At the end of course students will be able to:
1. solve first order differential equations by anti-differentiation and separation of variables.
2. solve analytically linear first order equations by the integrating factor method.
3. solve analytically homogeneous and non-homogeneous second order differential equations with constant coefficients.
4. solve linear first and second order differential equations by Laplace transforms.
5. solve non-linear equations numerically using Euler's method.
6. represent differential equations and systems of differential equations by block diagrams.
7. use commercial software to obtain numerical solutions for complex differential equations.
8. generate from first principles the differential equations representing various electrical circuits.
9. generate from first principles the differential equations representing various spring-mass systems.
10. generate from first principles the differential equations representing various thermal systems.

In table below, indicate how the outcome relates to ABET a-k criteria:

Outcome	a	b	c	d	e	f	g	h	i	j	k
Outcome 1	X										
Outcome 2	X										
Outcome 3	X										
Outcome 4	X										
Outcome 5	X	X									
Outcome 6	X						X				
Outcome 7	X	X					X				X
Outcome 8	X				X						
Outcome 9	X				X						
Outcome 10	X				X						

5. Assessment Tools and Techniques Used:
List tools used such as homework, quizzes, tests, projects etc. If possible relate each tool to the outcome being assessed.
Quiz 1: Outcomes 1 and 6
Quiz 2: Outcomes 1 and 6
Quiz 3: Outcomes 1 and 10
Quiz 4: Outcome 2
Quiz 5: Outcome 9
Quiz 6: Outcome 3
Quiz 7: Outcome 8
Quiz 8: Outcome 5
Quiz 9: Outcome 4
Quiz 10: Outcome 4
Exam 1: Outcomes 1, 2, 6, 10
Exam 2: Outcomes 3, 8, 9
Final: Outcomes 1, 2, 3, 4
Lab Exercise 1: outcomes 6 and 7
Lab Exercises 2, 3, 4: Outcomes 6, 7, 10
Lab Exercises 5, 6, 7: Outcomes 6, 7 and 9
Lab Exercises 8, 9: Outcomes 6, 7 and 3
Lab Exercises 10, 11: Outcomes 6, 7 and 8
Lab Exercises 12, 13: Outcome 5

6. Course Structure and Course Schedule:
Two 75 minute lectures per week
One 2 hour computer lab per week for about 10 of the 15 weeks
Homework is assigned but not graded.

7. Faculty Member Responsible: Scott W. Campbell
May 22, 2007.