COURSE #: 39100 **COURSE TITLE: Methods of Differential Equations** CATEGORY: required course for engineering majors TERM OFFERED: Spring 2010 PRE-REQUISITES: Math 20300 PRE/CO-REQUISITES: HOURS/CREDITS: 3HR/WK; 3 CR DATE EFFECTIVE:8/27/07 COURSE SUPERVISOR: Ethan Akin	**CATALOG DESCRIPTION :** First order equations; higher order linear equations with constant coefficients, undetermined coefficients, variation of parameters, applications; Euler's equation, series solutions, special functions; linear systems; elementary partial differential equations and separation of variables; Fourier series. Suggested Text: Elementary Differential Equations and Boundary Value Problems, W. Boyce and R. DiPrima.

Math 391 Topics and Allotted Times

Text: Boyce and DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th edition, or 10th edition Wiley

Suggested Periods	Sections	Topics
1	1.2-3	Solutions & Classifications
1	2.1	First order linear equations
2	2.2	Separable equations and homogeneous equations (exercises 30-38)
3	2.3	Modeling with linear equations (do examples 1-3; skip escape velocity)
1	2.6	Exact equations; skip integrating factors
1	3.1	Second order homogeneous LODE
2	3.2	Wronskians; Linear Independence; Abel's Theorem
1	3.3	Complex roots of the associated polynomial
1	3.4	Reduction of order; repeated roots
2	3.5	Undetermined coefficients
1	3.6	Variation of Parameters
2	3.7	Free vibrations in mechanical systems
1	3.8	Forced Vibrations
1	4.1	General homogeneous LODE
1	4.2	Higher order honogeneous LODE
1	4.3	Undetermined coefficients
1	5.1	Power series
1	5.2	Solutions near ordinary points
1	5.4	Euler's equation
2	5.5	Regular singular points
2	6.1-2	Laplace transforms
1	10.1	Two point boundary value problems
2	10.2	Fourier series
1	10.3	Fourier convergence theorem
1	10.4	Even / Odd functions
2	10.5	Heat Conduction Problems, separation of variables

COURSE LEARNING OUTCOMES

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After taking this course, the student should be able to:	Contributes to Departmental Learning Outcome(s):
1. Solve a variety of first order differential equations selecting from a variety of techniques covered in the syllabus..	a. b, e2, g.
2. Likewise, solve a variety of second order differential equations, selecting from several techniques covered in the syllabus.	a, b, e2, g.
3. Be able to analyze certain physical problems (tank flow, compound interest, mechanical and electrical vibration), set up their determining differential equations , solve them using the techniques in 1. and 2. above, and use these solutions to answer questions about the physical system.	a, b, c, g.
4. Give series solutions (and approximations) for second order linear differential equations, both at ordinary points and at regular singular points.	a, b, g.
5. Have a fundamental understanding of Fourier series and be able to give Fourier expansions of a given function.	a, b, e1, e2, g.
6. Understand and be able to apply all the mathematical aspects that contribute to the solution of heat conduction of a rod problem with constant temperature boundary conditions (the method of separation of variables, the use of Fourier series, as well as the specific solution).	a, b, c, g.
7. Understand and be able to use various theoretical ideas and results that underlie the mathematics in this course covered in the syllabus (including various existence/uniqueness results, ideas of linear independence and the Wronskian, and convergence properties of Fourier series).	e1, e2, g.

COURSE ASSESSMENT TOOLS

1. The average of class examinations: 60% of grade
2. Comprehensive written final exam: 40% of grade.

DEPARTMENTAL LEARNING OUTCOMES

The mathematics department, in its varied courses, aims to teach students to

a. perform numeric and symbolic computations
b. construct and apply symbolic and graphical representations of functions
c. model real-life problems mathematically
d use technology appropriately to analyze mathematical problems
e. state (e1) and apply (e2) mathematical definitions and theorems
f. prove fundamental theorems
g. construct and present (generally in writing, but, occasionally, orally) a rigorous mathematical argument.