Course Syllabus

Ordinary Differential Equations (Math 270)

Description:	*Study of linear differential equations of a single variable, and their solutions (graphical, exact, and numerical), applications of ordinary differential equations, Laplace transforms, introduction to systems of linear differential equations, use of eigenvalues and eigenvectors in solving such systems.*
Credit Hours:	3
Audience:	Required for engineering and meteorology majors. Prerequisite for MATH 330; PHYS 371, 381, 421; ECE 360, ME 364, 405, 444, 460 Recommended for CHEM 321.
Prerequisites:	Grade of C- or better in MATH 132, and MATH 260 or 264 (may be taken concurrently).
Format:	3 lectures (50 min) per week
Textbook:	*Differential Equations and Linear Algebra, 2nd Ed*, by Farlow. (Required) ISBN: 9780131860612
Software:	Use of *Maple* is recommended (available on campus computers; purchase of student version is recommended).
Internet:	Course material and grades are often maintained in Blackboard, at the discretion of the instructor.
Access & Accommodations:	The Access & Accommodations Resource Center (AARC) is the campus office that works with students to provide access and accommodations in cases of diagnosed mental or emotional health issues, attentional or learning disabilities, vision or hearing limitations, chronic diseases, or allergies. You can contact the office at aarc@valpo.edu or 219.464.5206. Students who need, or think they may need, accommodations due to a diagnosis, or who think they have a diagnosis, are invited to contact AARC to arrange a confidential discussion with the AARC office. Further, students who are registered with AARC are required to contact their professor(s) if they wish to exercise the accommodations outlined in their letter from the AARC.
Notice of Cancellation:	In the event class is cancelled, you will be notified through your Valparaiso University e-mail account

Student Learning Objectives:

A. Students can perform both exact and numerical procedures for finding solutions to problems of differential equations.
B. Students interpret and present graphical and qualitative representations of solutions to problems.
C. Students understand fundamental concepts of differential equations, and the interrelationship between differential equations and linear algebra.
D. Students prepare for success in disciplines which rely on differential equations, and in more advanced mathematics which incorporate these topics, such as Partial Differential Equations.
E. Students can communicate mathematics effectively, with proper notation and terminology.

Topics & Performance Requirements Include (but are not limited to):

1. define and identify systems of differential equations by order, linearity, and homogeneity (C)
2. find (manually, numerically, and graphically) and interpret solutions to differential equations, systems of differential equations, and initial value problems (A, B, C)
3. understand the principle of superposition and its use in constructing solutions to differential equations, and systems of differential equations (A, C)
4. obtain solutions to a variety of differential equations and initial value problems through exact and numerical means (A, B)
5. understand how differential equations and systems of differential equations arise in mathematical models, including models of population growth, mixing, cooling, harmonic motion, and electric circuits (C, D)
6. determine and analyze the behavior of autonomous first-order differential equations using phase lines (A, B)
7. construct and analyze direction fields of first-order differential equations (A, B, D)
8. determine and analyze the behavior of linear systems of differential equations using phase plane diagrams (A, B, C, D)
9. distinguish between stable and unstable equilibrium of linear systems using phase plane diagrams (A,B, D)
10. use phase plane diagrams of non-linear autonomous systems of differential equations to analyze their solution near equilibrium points (time permitting) (A, B, C, D)
11. use Laplace transforms to solve first and second order initial value problems, particularly with piece-wise functions