**MATH 321 DIFFERENTIAL EQUATIONS**

**Department:** Mathematics and Computer Science

**Designation:** Required

**Catalog Data:** (4-0) 4 credits. Prerequisite: MATH 125 with a minimum grade of “C”. Selected topics from ordinary differential equations including development and applications of first order, higher order linear and systems of linear equations, general solutions and solutions to initial-value problems using matrices. Additional topics may include Laplace transforms and power series solutions. MATH 225 and MATH 321 may be taken concurrently or in either order. In addition to analytical methods this course will also provide an introduction to numerical solution techniques.

**Prerequisites:** Math 125 with a grade of ‘C’ or better.

**Textbook:** Differential Equations With Boundary Value Problems, 7th edition, Zill

**Course Learning Outcomes:**

A student who successfully completes this should, at a minimum:

1. be able to analytically solve first order ordinary differential equations
2. be able to demonstrate the solution techniques covered in class that solve second order linear ordinary differential equations
3. be familiar with at least one science or engineering application of differential equations
4. be able to compute the Laplace transform and inverse Laplace transform for simple functions
5. understand the basic process of how to use the Laplace transform to solve an initial value problem
6. be familiar with a numerical technique for solving an initial value problem, such as Euler’s Method or the Runge Kutta method
7. be able to carry out basic matrix addition and matrix multiplication
8. be able to solve a linear system in matrix form
9. be able to use matrices to solve simple linear first order systems of ordinary differential equations

**Topics:**

Direction fields, separation of variables, analytical methods to solve linear differential equations with constant coefficients, applications of higher order differential equations, Laplace transforms, linear systems of ordinary differential equations, and basic numerical methods for solving ordinary differential equations.

**Class/Laboratory Schedule:** Variable

**Contribution to Criterion 5:** Basic math and sciences

**Relationship of Course to ABET Outcomes (a) through (k)**

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| --- | --- | --- | --- |
|  | **Level of Emphasis** | | |
|  | Low | Medium | High |
| **ABET Outcome** |  |  |  |
| (a) an ability to apply knowledge of mathematics, science, and engineering |  |  | X |
| (b) an ability to design and conduct experiments, as well as to analyze and interpret data |  |  |  |
| (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability |  |  |  |
| (d) an ability to function on multidisciplinary teams |  |  |  |
| (e) an ability to identify, formulate, and solve engineering problems |  |  |  |
| (g) an ability to communicate effectively |  |  |  |
| (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context |  |  |  |
| (i) a recognition of the need for, and an ability to engage in life-long learning |  |  |  |
| (j) a knowledge of contemporary issues |  |  |  |
| (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice. |  | X |  |

**Prepared By:** Dr. Kyle Riley, Department Chair; June 1, 2010