<table>
<thead>
<tr>
<th>Course Abbreviation &amp; Number:</th>
<th>Math 2652</th>
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<tr>
<td>Course Title:</td>
<td>Ordinary Differential Equations</td>
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<tr>
<td>Credit Hours:</td>
<td>4</td>
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<td>Prerequisites:</td>
<td>None</td>
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<td>Co-requisites:</td>
<td>Math 2633</td>
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<td>Course Description:</td>
<td>This course is an introduction to the basic ideas of ordinary differential equations. Topics include linear differential equations, series solutions, simple non-linear equations, Laplace transforms, systems of differential equations, numerical methods, and applications.</td>
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| Expected Educational Results:| As a result of completing this course, the student will be able to do the following:  
1. Analyze problems using critical thinking skills.  
2. Use functions and their derivatives to construct mathematical models.  
3. Solve application problems for which differential equations are mathematical  
4. Solve the following kinds of first order, ordinary differential equations:  
   a. separable  
   b. homogeneous  
   c. exact  
   d. linear, and  
   e. Bernoulli.  
5. Solve second order linear ordinary differential equations:  
   a. Homogeneous and non-homogeneous equations with constant coefficient  
   b. Power series solutions about ordinary and regular singular  
7. Solve systems of linear differential equations. |
8. Approximate a solution to a differential equation with a numerical method
9. Use some basic commands of a computer algebra system, and solve differential equations with them.
10. Determine the stability of linear systems.
11. Analyze almost linear systems.
12. Use the Energy Method to describe nonlinear systems.
13. Be able to identify the basic forms of bifurcation.

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<th>General Educational Outcomes:</th>
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| I. This Students produce well-organized communication that exhibit logical thinking and organization, use appropriate style for audience and meet conventional standards of usage.  
  A. Students develop their listening and speaking skills through participation and through group problem solving.  
  B. Students develop their reading comprehension skills by reading the text and the instructions for text exercises, problems on tests, or on projects. Reading mathematics text requires recognizing symbolic notation as well as problems written in prose.  
  C. Students develop their writing skills through the use of problems requiring written explanations of concepts. |
| II. Students demonstrate effective problem-solving and critical thinking skills through interpreting, presenting or evaluating ideas.  
  A. Students must apply mathematical concepts previously mastered to new problems and situations.  
  B. In applications, students must analyze problems and describe problems with their pictures, or diagrams, or graphs, then determine the appropriate strategy for solving the problem. |
| III. Students demonstrate the ability to interpret and analyze quantitative information; apply mathematical principles and techniques; and to use mathematical models to solve applied problems.  
  A. Students must demonstrate proficiency in problem-solving skills including applications of differential equations and systems of differential equations.  
  B. Students must write differential equations to describe real-world situations and interpret information from the solution of differential equations and systems of differential equations.  
  C. Students must solve equations and systems of equations (both linear and which often arise in modeling numerical relationships). |
# Course Content:

1. First Order Differential Equations (Exact Solutions)
2. Application of First Order Differential Equations
3. Linear Differential Equations of Higher Order
4. Applications of 2\textsuperscript{nd} Order Differential Equations with Constant Coefficient
5. Laplace transforms: partial fractions, convolution, piecewise
6. Differential Equations with Variable Coefficients, Series Solutions
7. Systems of Linear Differential Equations
8. Numerical Methods of Approximating Solutions
9. Stability of Systems
10. Almost Linear Systems
11. Bifurcation

# Assessment of Outcome Objectives

## Course Grade:

The course grade will be determined by the individual instructor using a variety of evaluation methods. A portion of the course grade will be determined through the use of frequent assessment using such means as tests, quizzes, projects, or homework as developed by the instructor. Some of these methods will require the student to demonstrate ability in problem solving and critical thinking as evidenced by explaining and interpreting solutions. A comprehensive final examination is required which must count at least one-fifth and no more than one-third of the course grade.

## Course Assessment:

A. This course will be assessed in the fall semester on a three-year assessment cycle. Objective questions assessing student mastery of outcomes for this course will be included in either the final exam or unit tests for this course. Each instructor must include these questions in the appropriate exam. Each instructor is responsible for reviewing and tabulating the results of these outcome assessment questions and transmitting them to the course or curriculum committee responsible for this course. Individual instructors should use feedback from assessment in their classes to review and evaluate their own teaching practices.

B. The construction of the outcome assessment questions will be the responsibility of the college-wide Math 2420/2641/2652 Curriculum Committee.
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<th>Use of Assessment Findings:</th>
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<td>The Math 2420/2641/2652 Curriculum Committee will meet in the spring term after the fall assessment to review the course and to evaluate the results. The review of the course outcome assessment findings will provide information on success in achieving the desired outcomes for this course on a college-wide basis. If fewer than 70% of the students perform successfully on questions measuring any particular educational outcome, the committee will examine teaching practices related to that outcome, the assessment instrument, and the desired learning outcomes to determine which, if any, of these need modifying. The committee will share its findings and recommendations with all faculty teaching this course, and may make changes to the desired educational outcomes, teaching practices, or assessment instrument as appropriate.</td>
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<th>Last Revised:</th>
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<tr>
<td>April 2015</td>
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