Course Information

Division: Mathematics
Course Number: MAT 260 (SUN# MAT 2262)
Title: Differential Equations
Credits: 3
Developed by: Pedro Dabalsa
Lecture/Lab Ratio: 3 Lecture/0 Lab
Transfer Status: ASU NAU UA

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<thead>
<tr>
<th>ASU</th>
<th>NAU</th>
<th>UA</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 274, Mathematics (MA)</td>
<td>MAT 239</td>
<td>MATH 254</td>
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</tbody>
</table>

Activity Course: No
CIP Code: 27.0101
Assessment Mode: Pre/Post Test (12 Questions/100 Points)
Semester Taught: Spring
GE Category: Mathematics
Separate Lab: No
Awareness Course: No
Intensive Writing Course: No

Prerequisites
MAT 230 with a grade of "C" or higher

Educational Value
Students majoring in Mathematics, Physics, Chemistry, and Engineering.

Description
Basic concepts, ordinary differential equations of first order, higher order linear equations, variation of parameters, undetermined coefficients. Systems of equations, series solutions and Laplace transform methods.

Supplies
Graphic calculator; T189 or Voyage 200 recommended
Competencies and Performance Standards

1. Understand the origins, definitions and classifications of ordinary differential equations.
   
   Learning objectives
   What you will learn as you master the competency:
   a. Define and classify various types of differential equations.

   Performance Standards
   You will demonstrate your competence:
   o On assigned activities
   o On written exams
   o On a two hour cumulative final exam
   Your performance will be successful when:
   o You can define and classify ordinary differential equations.

2. Understand and apply the fundamental existence and uniqueness theorem for solutions of ordinary differential equations.
   
   Learning objectives
   What you will learn as you master the competency:
   a. Describe when solutions exist and, if so, are they unique.

   Performance Standards
   You will demonstrate your competence:
   o On assigned activities
   o On written exams
   o On a two hour cumulative final exam
   Your performance will be successful when:
   o You can apply the fundamental existence and uniqueness theorem

3. Understand the nature of boundary value problems and the role of boundary values in determining solutions.
   
   Learning objectives
   What you will learn as you master the competency:
   a. Apply boundary values in solutions of differential equations.

   Performance Standards
   You will demonstrate your competence:
   o On assigned activities
   o On written exams
   o On a two hour cumulative final exam
   Your performance will be successful when:
   o You can determine the boundary values for a given equation and use them to determine integration constants for the solution.
4. Use direction fields and the method of isoclines to study possible solutions.

**Learning objectives**

*What you will learn as you master the competency:*

a. Study the nature of solutions without solving the equations.

**Performance Standards**

*You will demonstrate your competence:*

- On assigned activities
- On written exams
- On a two hour cumulative final exam

*Your performance will be successful when:*

- You can study the nature of possible solutions using isoclines

5. Understand the differential operator.

**Learning objectives**

*What you will learn as you master the competency:*

a. Use operators to rewrite equations in operator form.

**Performance Standards**

*You will demonstrate your competence:*

- On assigned activities
- On written exams
- On a two hour cumulative final exam

*Your performance will be successful when:*

- You can write differential equations in operator form

6. Solve exact equations.

**Learning objectives**

*What you will learn as you master the competency:*

a. Apply the formal solutions to particular exact equations.

**Performance Standards**

*You will demonstrate your competence:*

- On assigned activities
- On written exams
- On a two hour cumulative final exam

*Your performance will be successful when:*

- You can solve the exact equation

7. Solve first order linear equations.

**Learning objectives**

*What you will learn as you master the competency:*

a. Apply the general solution to particular first order linear equations.
Performance Standards
You will demonstrate your competence:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Your performance will be successful when:

- You can solve the first order linear equation

8. Solve selected linear equations of order higher than first.

Learning objectives
What you will learn as you master the competency:

a. Apply general techniques to selected linear equations of order higher than first.

Performance Standards
You will demonstrate your competence:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Your performance will be successful when:

- You can solve higher order equations

9. Solve problems in forced, damped, simple, harmonic motion.

Learning objectives
What you will learn as you master the competency:

a. Apply general theory to study harmonic motion.

Performance Standards
You will demonstrate your competence:

- On assigned activities
- On written exams
- On a two hour cumulative final exam

Your performance will be successful when:

- You can solve the equations of harmonic motion which may be simple, forced or damped

10. Define and compute Laplace transforms.

Learning objectives
What you will learn as you master the competency:

a. Use the definition to compute Laplace transforms of simple functions and their derivatives.

Performance Standards
You will demonstrate your competence:

- On assigned activities
- On written exams
- On a two hour cumulative final exam
Your performance will be successful when:
  o You can define the Laplace transform
  o You can compute elementary Transforms from the definition
  o You can use tables of Laplace transforms

11. **Use Laplace transforms techniques to solve ordinary differential equations.**

   **Learning objectives**
   What you will learn as you master the competency:
   a. Apply the transforms to elementary equations and find their solutions.

   **Performance Standards**
   You will demonstrate your competence:
   o On assigned activities
   o On written exams
   o On a two hour cumulative final exam
   Your performance will be successful when:
   o You can use the transform to solve ordinary differential equations

**Types of Instruction**
Classroom Presentation

**Grading Information**

**Grading Rationale**
Each instructor has the flexibility to develop evaluative procedures within the following parameters.
1. Written exams must represent at least 50% of the final course grade
2. Final exam must represent at least 20% of the final course grade.
3. The Post Test is to be embedded in the final exam and must represent at least 10% of the final course grade.
4. Other activities may represent at most 20% of the final course grade.

**Grading Scale**

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<tr>
<th>Grade</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>A</td>
<td>90%-100%</td>
</tr>
<tr>
<td>B</td>
<td>80%-89%</td>
</tr>
<tr>
<td>C</td>
<td>70%-79%</td>
</tr>
<tr>
<td>D</td>
<td>60%-69%</td>
</tr>
<tr>
<td>F</td>
<td>Below 60%</td>
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