**MATH 2341**         **Differential Equations and Linear Algebra**         Summer 1 2017

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| **Class info:** | CRN 40687 | **Time**: Monday-Thursday 1:30-3:10 pm in 157 Ryder | |
| **Instructor:** | Monika Pichler | **Office**: 537 Nightingale | |
| | pichler.mo@husky.neu.edu | **Office Hours:** Mon-Thu 11am-12pm, and by appointment | |

**Text**: *Worldwide Differential Equations and Linear Algebra* by Robert McOwen, available in PDF and printed format from the website: http://www.centerofmathematics.com/wwcomstore/index.php/diffeqns.html The PDF version costs $14.95 and contains free links to videos and online resources. But you can alternately order a printed version for $39.95.

**Course Description:** This course introduces separable differential equations with a main focus on first and second order linear differential equations with constant coefficients-both homogeneous and nonhomogeneous. Various methods for obtaining the solution will be studied including undetermined coefficients and the Laplace transform. Applications include cooling problems, velocity problems, mixing problems and spring problems. In addition, basic topics from linear algebra will be applied to obtain the solution to systems of equations and systems of linear differential equations.

**At the end of the semester, every student is expected to complete the online TRACE survey evaluation of the course.**

**Course Policies:**

1. There will be **quizzes** every other class except for the two classes when we have the hour exams. The **two lowest quiz grades will be dropped**. There will be **no make-ups**.
   There will be **two midterm exams** on the material indicated on page two.
   There will be **one Cumulative Departmental Final Exam** during the final week.

2. Your grade is determined as follows:

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   |---|---|---|---|
   | Quizzes: | 20% | Hour Exam 1: | 20% |
   | Hour Exam 2: | 20% | Final Exam: | 40% |

   and you will be graded according to the following scale

   | A | A− | B+ | B | B− | C+ | C | C− | D+ | D | D− | F |
   |---|---|---|---|---|---|---|---|---|---|---|---|
   | 93-100 | 90-92 | 87-89 | 83-86 | 80-82 | 77-79 | 73-76 | 70-72 | 67-69 | 63-66 | 60-62 | 0-59 |

3. **Homework** will be assigned at each class but will not be graded. You are expected to keep up with the homework in order to perform well on the weekly quizzes and the two exams. Quiz questions are similar to those in the homework. **Homework will not be collected**. The problems in this course tend to be long and involved. Therefore, we will not be able to go over all homework problems in class. Therefore, if you have a lot of questions on homework, it will be essential for you to come to my office hours or make an appointment to see me.

**Note the following dates:**

1. Monday, May 8: **Summer 1 classes begin**
2. Sunday, May 21: Last day to drop a Summer 1 class without a "W"grade
3. Thursday, May 25: Last day to file a Summer 1 Final Exam conflict form
4. Monday, May 29: **Memorial Day, no classes**
5. Thursday, June 22: **Last day of Summer 1 classes**
6. Sunday, June 25: Last day to drop a Summer 1 class with a "W"grade
7. June 26- 27: **Final Exam Period**

**Everyone is expected to take the departmental exam at this time. Please do not make travel plans prior to this date**.

**Academic Honesty:** The University views academic dishonesty as one of the most serious offenses that a student can commit while in college and imposes appropriate punitive sanctions on violators. Cheating on a quiz or exam will not be tolerated. For more information, visit http://www.northeastern.edu/osccr/academichonesty.html.

**Notes:** On the midterm exams and on the final exam you will be allowed one 8.5 x 11 in. sheet of notes. **You may not use a sheet of notes on the quizzes.**

**Additional Resources**: In addition to my office hours, there is the Math Department Tutoring Center in 540B NI. Tutoring begins a week after the start of classes. The tentative schedule is Monday-Wednesday 11am-7pm and Thursdays 11am-5pm. You must make an appointment by signing up on-line at My-Neu.

**Issues with the course/instructor:** If you have a concern about the course or the instructor that is not or cannot be resolved by speaking with the instructor, the next step is to speak with the course coordinator, Rekha Bai (541LA, r.bai@neu.edu). If the course coordinator does not settle the matter, contact Professor David Massey 529NI, x5527? d.massey@neu.edu

**Class cancellation:** If classes should be cancelled due to instructor illness, or for other official reasons, any scheduled quiz or exam will occur on the next class meeting.

**Cell phones are to be turned off during class.**

**Attendance requirements:** The University expects students to meet attendance requirements in all courses. Attendance requirements vary from course to course. In this course, if you miss four classes, you will be dropped two letter grades from whatever you attain as a final average. Missing six or more classes, you will be asked to withdraw from the class.

The instructor reserves the right to make changes to the syllabus. The present version was revised on May 8, 2017.

## SYLLABUS

| TOPIC | HOMEWORK |
|---|---|
| *Chapter One: First Order Equations* | |
| 1.3 Separable Equations & Applications | #1(a,b,c,e,f), 2(a,c), 8-10 |
| 1.4 Linear Equations & Applications | #1(b,c,d,f), 2(a,b), 3-5 |
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| *Chapter Two: Second Order Equations* | |
| 2.1 Introduction | #1(a,b,d) |
| 2.2 General Solutions | #2, 3, 5-8 |
| 2.3 Constant Coefficients | #1(a,b), 2, 3 |
| 2.4 Free Mechanical Vibrations | #1-7 |
| 2.5 Nonhomogeneous Equations | #1, 2 |
| 2.6 Forced Mechanical Vibrations | #1, 2, 3 (resonance only), 6(a,b), 7a |
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| *Chapter Three: The Laplace Transform* | |
| 3.1 Laplace Transform & Its Inverse | #4(a,d), 5(b,c,f, g), 6(a,b), 7, 8(a,c) |
| 3.2 Transforms of Derivatives and IVPs | #2(b,c), 3(b,c,d), 4 |
| 3.3 Shifting Theorems | #1(a,b,c,d), 2(a,b,c), 3-6, 8 |
| 3.4 Discontinuous Inputs | #1, 2b, 3(b,c), 4b, 5(b,c), 6, 8 |

<div align="center">EXAM ONE</div>

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|---|---|
| *Chapter Four: Systems of Equations and Matrices* | |
| 4.1 Introduction to Systems and Matrices | #2, 3, 4 |
| 4.2 Gaussian Elimination | #1-4 |
| 4.3 Row-Echelon Form and Rank | #1, 2(a,b,d,e), 3(a,b,d,e), 4(a,d), 5 |
| 4.4 Inverse of a Square Matrix | #4, 5(a,c), 6(a,c) |
| 4.6 Cofactor Expansions | #1(a-f) |
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| *Chapter Five: Vector Spaces* | |
| 5.2 General Vector Spaces | #3 |
| 5.3 Subspaces | #1(a,b), 2(a,b), 3(a,b,c), 4(a,b), 5(a,b), 6(a,c), 7b |
| 5.4 Linear Independence | #1(a-e), 2c, 3(a,c), 4a |
| 5.5 Bases and Dimension | #1, 3, 4 |

<div align="center">EXAM TWO</div>

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|---|---|
| *Chapter Six: Linear Transformations and Eigenvalues* | |
| 6.1 Eigenvalues and Eigenvectors | #1(a,c,d,e,f), 2(a,b) |
| | |
| *Chapter Seven: Systems of Differential Equations* | |
| 7.2 First Order Linear Systems | #1(a,b,c), 2(a,b,c,d), 3(a,b,c), 5a |
| 7.3 Eigenvalue Method for Linear Systems | #1(a,b,c,d), 4(a,b,c,d) |

Review and Cumulative Departmental Final Exam