



**University of International Business and Economics  
International Summer School**

**MAT 240 Differential Equations**

**Term: July 10 – August 4, 2017**

**Instructor: SEMA SALUR**

**Home Institution: UNIVERSITY OF ROCHESTER**

**Email: semasalur@gmail.com**

**Class Hours: Monday through Friday, 120 minutes each day (2,400 minutes in total)**

**Office Hours: TBC**

**Teaching Assistant: TBD**

**Email: TBD**

**Discussion session: 2 hours each week**

**Total Contact Hours: 64 contact hours (45 minutes each, 48 hours in total)**

**Credit: 4 units**

**Course Description : Differential Equations**

Mathematical Models; Direction Fields, Linear Equations; Method of Integrating Factors, Separable Equations, Homogeneous Equations with Constant Coefficients, the Wronskian, Repeated Roots; Reduction of Order, Nonhomogeneous Equations; Method of Undetermined Coefficients, Variation of Parameters, Laplace Transform, Step Functions, Homogeneous Linear systems with Constant Coefficients, Complex Eigenvalues, Fundamental Matrices, Repeated Eigenvalues, Series Solutions.

**Course Goal**

By the end of the course, students will be familiar with most of the concepts and techniques of differential equations. Applications to physical, engineering, and life sciences will be also discussed.

**Required Text**

"Elementary Differential Equations" by Boyce and Di Prima, 9th edition, Wiley & Sons.

**Attendance**

Students are expected to be present at all class meetings and examinations.

**Grading Policy**

There will be daily quizzes, two midterms and one final exam in this class. All exams will be closed-book. No notes, calculators, or other electronic devices will be allowed, and having such a device in view during the exam is an academic honesty violation.

Assignments and examinations will be graded according to the following grade scale:



- A 90-100
- A- 85-89
- B+ 82-84
- B 78-81
- B- 75-77
- C+ 72-74
- C 68-71
- C- 64-67
- D 60-63
- F below 60

### **Grading Scale**

The course grades will be calculated based on the following percentages:

- Quizzes: 20%
- Midterm 1: 20%
- Midterm 2: 20%
- Final Exam: 40%

The final exam will be cumulative. There will be no make-up exams.

### **Class Rules**

All academic work should be done with the high level of honesty and integrity. Academic misconduct of any kind may result in a grade penalty or the assignment of a failing grade.

### **Course Hours**

The course has 20 class sessions in total. Each class session is 120 minutes in length for a total of 2,400 minutes of class time. The course meets from Monday to Friday.

### **Course Schedule**

#### **Week of July 10**

#### **Topics**

Review: Infinite Sequences and Series  
Convergence Tests

Some Basic Mathematical Models; Direction Fields, Solutions of Some Differential Equations, Classification of Differential Equations (1.1-1.3)

Supplementary Problems:

Sec 1.1: 1, 7, 15-20

Sec 1.2: 3, 7, 11, 13

Sec 1.3: 1, 3, 5, 7, 9, 11, 25

Linear Equations; Method of Integrating Factors, Separable Equations, Modeling with First Order Equations (2.1-2.3)

Supplementary Problems:



Sec 2.1: 1, 13, 15, 17, 21, 31

Sec 2.2: 1, 3, 7

Sec 2.3: 1, 3, 7

Differences Between Linear and Nonlinear Equations, Autonomous Equations and Population Dynamics, Exact Equations and Integrating Factors (2.4-2.6)

Supplementary Problems:

Sec 2.4: 1, 3, 5, 7, 11, 13, 15, 23, 27

Sec 2.5: 3, 5, 9

Sec 2.6: 1, 3, 5, 7, 15, 21, 27

### **Week of July 17**

Midterm 1: Date TBD

#### **Topics**

Homogeneous Equations with Constant Coefficients, Solutions of Linear Homogeneous Equations; the Wronskian, Complex Roots of the Characteristic Equation (3.1-3.3)

Supplementary Problems:

Sec 3.1: 1, 3, 5, 7, 9, 11, 17, 21, 23

Sec 3.2: 1, 3, 5, 7, 9, 13, 17, 25

Sec 3.3: 1, 7, 9, 11, 17, 19, 23, 27

Repeated Roots; Reduction of Order, Nonhomogeneous Equations; Method of Undetermined Coefficients, Variation of Parameters (3.4-3.6)

Supplementary Problems:

Sec 3.4: 1, 3, 5, 11, 13, 23, 25

Sec 3.5: 1, 3, 5, 9, 11, 15

Sec 3.6: 1, 3, 5, 11, 15

General Theory of nth Order Linear Equations, Homogeneous Equations with Constant Coefficients (4.1-4.2)

Supplementary Problems:

Sec 4.1: 1, 3, 7, 11, 15, 17

Sec 4.2: 1, 5, 9, 11, 13, 15, 21

The Method of Undetermined Coefficients, Variation of Parameters (4.3-4.4)

Supplementary Problems:

Sec 4.3: 1, 3, 15

Sec 4.4: 1, 3, 5

### **Week of July 24**

Midterm 2: TBD

#### **Topics**



Definition of the Laplace Transform, Solution of Initial Value Problems, Step Functions (6.1-6.3)

Supplementary Problems:

Sec 6.1: 1, 3, 5

Sec 6.2: 1, 3, 5, 7, 11, 15, 25

Sec 6.3: 1, 3, 5, 7, 13, 19

Differential Equations with Discontinuous Forcing Functions, Impulse Functions, The Convolution Integral (6.4-6.6)

Supplementary Problems:

Sec 6.4: 1, 3, 5, 7

Sec 6.5: 1, 3, 15

Sec 6.6: 1, 3, 5, 9, 15

Introduction and Review of Matrices, Linear Algebraic Equations: Linear Independence, eigenvalues, Eigenvectors, Basic Theory of Systems of first Order Linear Equations (7.1-7.4)

Supplementary Problems:

Sec 7.1: 1, 3, 5, 11

Sec 7.2: 1, 3, 11, 21

Sec 7.3: 1, 3, 7, 13, 17, 23

Sec 7.4: 1, 3

### **Week of July 31**

Final Exam: Date TBD

#### **Topics**

Homogeneous Linear systems with Constant Coefficients, Complex Eigenvalues, Fundamental Matrices, Repeated Eigenvalues (7.5-7.8)

Supplementary Problems:

Sec 7.5: 9, 11, 13, 15

Sec 7.6: 7, 9

Sec 7.7: 1, 3, 9, 11

Sec 7.8: 1, 11, 15

Review of Power Series, Series Solutions near an Ordinary Point, Part I, Series Solutions near an Ordinary Point, Part II (5.1-5.3)

Supplementary Problems:

Sec 5.1: 1, 3, 7, 10, 11, 17, 21

Sec 5.2: 1, 3, 5, 7, 9

Sec 5.3: 1, 3, 5, 7



Euler Equations; Regular Singular Points, Series Solution near a Regular Singular Point, Part I,  
Series Solution near a Regular Singular Point, Part II (5.4-5.6)

Supplementary Problems:

Sec 5.4: 1, 3, 5, 7, 17, 22

Sec 5.5: 1, 3, 5, 11

Sec 5.6: 1, 3, 5, 15

Final Exam