



## SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Teaching Language
MAT	231	Introduction to Differential Equations	3	2	0	2	6	MAT 102	4 <sup>1</sup>	English

### A. Course Description

This course describes the most important ideas, theoretical results, and examples of first order differential equations, second and higher order linear differential equations, Laplace transform and linear systems of linear differential equations. The course includes the essential fundamentals of these topics. The emphasis is on calculations, and some applications are mentioned.

### B. Course Outcomes

At the end of this course the student will be able to:

- Classify differential equations by order, linearity, and homogeneity.
- Use techniques for solving first, second and higher order differential equations.
- Apply power series method to find solutions of linear differential equations with polynomial coefficients.
- Solve systems of linear differential equations using matrix techniques, eigenvalues and notion of the exponential of matrices.

### C. References:

#### Required Textbook

*Elementary Differential Equations and Boundary Value Problems*, W. Boyce and R. DiPrima, 9<sup>th</sup> Edition, New York: John Wiley & Sons, 2010.

#### Other references:

- *Advanced Engineering Mathematics*, E. Kreyszig, 10<sup>th</sup> Edition, John Wiley & Sons, INC 2010.
- *Fundamentals of Differential Equations*, R. Nagle, E. Saff and A. Snider, 6<sup>th</sup> Edition, Addison-Wisley, 2011.
- *A first course in differential equations with applications*, 5<sup>th</sup> Edition, Dennis G. Zill, PWS Kent Publishing Company, 2000.

**Course Website:** Google Classroom Webpage: <http://www.imamm.org/>

<sup>1</sup> B.Sc. in Applied Mathematics.



#### D. Topics Outline

- 1. First Order Differential Equations:** Separable Equations, First Order Linear Equations, Exact Differential Equations, Homogeneous Differential Equations, Bernoulli Equations, Riccati Equations.
- 2. Second Order Linear Differential Equations:** General Solution of the Homogeneous Linear Equation with Constant Coefficients, Particular Solution of the Non-Homogeneous Equation, Method of Undetermined Coefficients, Variation of Parameters Method.
- 3. Higher Order Linear Differential Equations:** General Theory of Linear Differential Equations, Homogeneous Linear Equations with Constant Coefficients, Undetermined Coefficients Method, Variation of Parameters Method.
- 4. Power Series Method:** Power Series Solutions of Linear Differential Equations with Polynomial Coefficients around Regular Points.
- 5. Linear Systems of Differential Equations:** Superposition Principle, Independence, Matrix Exponential, Basic Theory of Systems of First Order Linear Equations, Homogeneous Linear Systems with Constant Coefficients, Non-Homogeneous Linear Systems of Differential Equations.

#### E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

#### F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6<sup>th</sup> or 7<sup>th</sup> week.
- **Midterm 2:** 11<sup>th</sup> or 12<sup>th</sup> week.
- **Quizzes & Homework:** During the semester.
- **Final Exam:** 16<sup>th</sup> week.

Your course grade will be based on your semester work as follows:

<b>Midterm 1:</b> 20 %	<b>Midterm 2:</b> 20 %	<b>Final Exam:</b> 40 %
<b>Quizzes, Homework, Attendance &amp; Participation:</b> 20 %		

The grading distribution:

<b>A<sup>+</sup></b>	<b>A</b>	<b>B<sup>+</sup></b>	<b>B</b>	<b>C<sup>+</sup></b>	<b>C</b>	<b>D<sup>+</sup></b>	<b>D</b>	<b>F</b>
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)



## G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](http://goo.gl/ykm7t3)  
[goo.gl/ykm7t3](http://goo.gl/ykm7t3)

