



## SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Teaching Language
MAT	235	Ordinary Differential Equations	3	2	0	2	5	MAT 106	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, Series solutions of differential equations 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.
- Be familiar with techniques for solving first, second and higher order differential equations.
- Solve systems of linear differential equations by using matrix techniques and eigenvalues and notion of the exponential of matrices.
- Use Laplace transforms to solve differential equations and systems of differential equations.

### C. References:

#### Required Textbook

*Fundamentals of Differential Equations*, R. Nagle, E. Saff and A. Snider; Addison-Wisley, 6<sup>th</sup> Edition, 2011.

#### Other references

- *Advanced Engineering Mathematics*, E. Kreyszig, H. Kreyszig, E.J. Norminton, John Wiley & Sons, INC., 10<sup>th</sup> Edition, 2011.
- *A first course in differential equations with modelling applications*, Dennis G. Zill, Cengage Learning, 10<sup>th</sup> Edition, 2013.
- *Elementary Differential Equations and Boundary Value Problems*, W. Boyce, R. DiPrima, John Wiley & Sons, 9<sup>th</sup> Edition, 2010.

<sup>1</sup> B.Sc. of Engineering.



## D. Topics Outline

- 1. First Order Differential Equations:** Introduction and First Definitions, Initial Value Problems, Differential Equations as Mathematical Models, Separable Equations, First Order Linear Equations, Exact Differential Equations, Homogeneous Differential Equations, Bernoulli Equations.
- 2. Second Order Linear Differential Equations with Constant Coefficients:** General Solution of the Homogeneous Equation, Reduction of the Order Method, Particular Solution of the Nonhomogeneous Equation, The Undetermined Coefficients and Variation of Constants Methods, Variation of Parameters Method, Euler-Cauchy Equation, Some Applications: Damped Free and Forced Vibrations, Mechanical Vibrations...
- 3. Laplace Transform:** Basic Definitions, Properties of Laplace Transform, Inverse Laplace Transform, Solving Initial Values Problems using Laplace Transform.
- 4. Series Solutions of Differential Equations:** Review of Power Series, Power Series Solution to Linear Differential Equations.
- 5. Systems of First Order Linear Differential Equations:** Linear System in Normal Form, Homogeneous Systems of Linear Differential Equations with Constant Coefficients.

## 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:

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



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## 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)

