



## SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Teaching Language
MAT	381	Mathematical Methods	3	2	0	2	5	MAT 331	6 <sup>1</sup>	English

### A. Course Description

This course covers a broad spectrum of mathematical techniques essential to the solution of advanced problems. Topics include Series Solutions of ODES, Laplace Transforms, Fourier series and Fourier transform. Each topic is given a formal treatment and illustrated by examples of varying degrees of difficulty.

### B. Course Outcomes

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

- Develop an understanding of commonly encountered mathematical methods used in the analysis of a wide range of physical systems
- Solve differential equations in some critical cases using power series and Frobenius method.
- Be familiar with some special functions.
- Study in depth Laplace transforms with their applications.
- Study in depth Fourier series and Fourier transforms with some of their applications.
- Prepare for advanced courses, in particular MAT 434 Partial Differential Equations

### C. References:

#### Required Textbook

*Elementary Differential Equations and Boundary Value Problems*, W. Boyce and R. DiPrima, 9th edition, New York: John Wiley & Sons, (2010).

#### Other references:

- *Advanced Engineering Mathematics*, E. Kreyszig, John Wiley & Sons, INC 10th ed. (2010).
- *Mathematical methods in the physical sciences*, Boas, Mary L.: John Wiley & Sons, INC., (2005).

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

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



## D. Topics Outline

**Series Solutions of ODEs:** Review of the Power Series, Power series solution about ordinary points. Power series solution about ordinary points. Singular points, Regular and Irregular Singular points. Power series solution about singular points. Method of Frobenius. Power series solution about singular points, Method of Frobenius continued.

**Laplace Transforms:** Basic definitions and properties of Laplace Transforms, Some standard Laplace and Inverse Laplace transforms. Partial Fractions and their use in finding Laplace and inverse Laplace Transforms. First shifting theorem and its use for finding Laplace and inverse Laplace Transforms. Unit-Step function, Second shifting theorem and its use for finding the Laplace and inverse Laplace Transforms. Differentiation of Laplace Transforms, Dirac Delta function and use of Laplace Transforms for solving differential equations, Convolution.

**Fourier Transforms:** Review of Fourier Series, Convergence of Fourier Series, Fourier Integrals and their convergence, Complex Fourier series and Integrals. Fourier Transform, Inverse Fourier Transform, Time and frequency shifting. Properties and Applications of the Fourier transforms. Fourier Cosine and Sine transforms.

## 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+</b>	<b>A</b>	<b>B+</b>	<b>B</b>	<b>C+</b>	<b>C</b>	<b>D+</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)

