



## SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Teaching Language
MAT	434	Partial Differential Equations	4	3	0	2	6	MAT 231	7 <sup>1</sup>	English

### A. Course Description

The aim of this course is to introduce students to the theory and applications of partial differential equations (PDEs), and to explore various methods of solutions. On successful completion of this unit, students should be able to classify PDEs and solve them by using appropriate methods.

### B. Course Outcomes

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

- Be familiar with the theory and applications of partial differential equations (PDEs).
- Classify PDEs and solve them by using appropriate methods.
- Use necessary mathematical tools of applied mathematics in order to solve a wide variety of model problems that arises in physics and engineering.

### C. References:

#### Required Textbook

- *Linear Partial Differential Equations for Scientists and Engineers*, T. Myint-U and L. Debnath, 4<sup>th</sup> Edition, Birkhauser Boston, 2007.
- *Partial Differential Equations, Theory and Completely Solved Problems*, T. Hillen, I. E. Leonard, H. Van Roessel, Wiley, 2012.

#### Other references:

- *Partial Differential Equations Methods and Applications*, R. McOwen, Prentice Hall/Pearson Education, 2<sup>nd</sup> Edition, 2002.
- *Partial Differential Equations of Mathematical Physics*, R.B. Guenther & J.W. Lee, Prentice Hall/Dover publication, Mineola, 1996.

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

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



## D. Topics Outline

- 1. Introduction to PDEs & Basic Concepts:** Definition of General PDEs; Order, Linear and nonlinear PDEs, homogeneous and nonhomogeneous PDEs, Principle of Superposition; Classification as Parabolic, Hyperbolic, and Elliptic Equations.
- 2. Classical PDEs of Mathematical Physics and Boundary-Value Problems:** Initial conditions; Boundary Conditions: Dirichlet, Neumann, and Mixed conditions; Definition of a Boundary-Value Problem, Well-posedness of a BVP. Heat Equation (conduction of heat in a rod), Wave Equation (vibrating of a string), Laplace Equation (Steady-state temperature distribution).
- 3. First-order PDEs:** Definition of PDEs of first order, Linear and quasi-linear PDEs; The characteristics method for solving quasi-Linear equations.
- 4. Analytic Methods for Solving PDEs:** The D'Alembert Method for the wave equation, Review of Fourier Series, Separation of Variables Method.
- 5. Integral Transform Methods for Solving PDEs:** Solving PDEs Using Fourier Transform, Solving PDEs Using Laplace 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<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)

