SYLLABUS

Course Code	*Course Num.*	*Course Name*	*Credit Hours*	*Lec.*	*Lab.*	*Tut.*	*Private study*	*Pre-requisites*	*Course Level*	*Teaching Language*
MAT	**631**	**Partial Differential Equations**	**4**	**3**	**0**	**1**	**9**		**1^2**	**English**

A. Course Description

This course describes the most important ideas, theoretical results, and applications in Partial Differential Equations.. The course includes the essential fundamentals of PDEs classifications. It covers the concept hyperbolic, parabolic, and elliptic PDEs. It also introduces the theory of distributions. The emphasis is on theoretical results and their applications.

B. Course Outcomes

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

1. Learn the basics of PDEs,
2. Understand the fundamental analytical techniques and simple solution methods for PDEs,
3. Analyze some PDEs.

C. References:

Required Textbook

1. ***R. Haberman, Applied Partial Differential Equations with Fourier Series and Boundary Value Problems; Pearson 2012. (Main Reference)***

Other references:

2. **L.C. Evans, *Partial Differential Equations*; American Mathematical Society, 2nd Ed. 2010.**
3. **R. McOwen, *Partial Differential Equations: Methods and Applications*; 2nd Ed. 2002.**
4. **K. Sankara Rao, *Introduction to Partial Differential Equations*, third Edition, Prentice-Hall of India Pvt.Ltd, 2010.**

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

D. Topics Outline

1. **Introduction and Preliminaries:** Transport Equation, Solution of first order linear PDE, characteristic method, the Cauchy problem for first order PDE, Fist order non-linear equations, Charpit's method, classification of second-order equations, canonical forms for hyperbolic, parabolic, and Laplace equation.
2. **Introduction to Distributions:** Test functions, support of smooth functions, proprieties of distributions, weak derivatives, space of distributions, convergence of distributions.
3. **Hyperbolic Partial Differential Equations:** One-dimensional wave equation and d'Alembert's formula, wave with source, method of characteristic coordinates, method using Green's theorem, energy methods and the uniqueness, separation of variable method.
4. **Parabolic Partial Differential Equations:** Fundamental solution of heat equation and heat kernel, maximum principle and the uniqueness, nonnegative solutions, Diffusion on the whole line, diffusion with a source.
5. **Elliptic Partial Differential Equations:** Green's identities, Green's function, fundamental solution of Laplace's equation, mean value property, maximum principle, weak solution and weak formulation, Laplace's equation in different coordinate systems.

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 :** 8^{th} or 9^{th} week.
- **Quizzes & Homeworks:** During the semester.
- **Final Exam:** 16^{th} week.

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

Midterm : 30 %	**Final Exam:** 40 %
Quizzes, Homework, Attendance & Participation: 30 %	

The grading distribution:

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

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 Examsgoo.gl/ykm7t3

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