ISTANBUL TECHNICAL UNIVERSITY
DEPARTMENT OF MECHANICAL ENGINEERING

ENGINEERING MATHEMATICS - MIA 501E - CRN 23801
2019-2020 Spring

Instructor : **Hakan Öksüzoğlu**
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Lecture hours : **Wednesday 09:30 – 12:30**
Office hours : **See my web page http://web.itu.edu.tr/hoksuzoglu/ for up to date hours.**
Prerequisites : **Undergraduate mathematics**

Course Description:
Linear Algebra: Matrices, Vectors, Determinants, Linear Systems, Matrix Eigenvalue Problems. ***Ordinary Differential Equations (ODEs):*** First-Order ODEs, Second-Order Linear ODEs, Higher-Order Linear ODEs, Systems of ODE's, Series Solutions of ODEs. Special functions. Laplace Transforms. ***Fourier analysis:*** Series, Integrals, and Transforms. ***Partial Differential Equations (PDEs)***.

Textbook:
Erwin Kreyszig, *"Advanced Engineering Mathematics"*
John Wiley & Sons, Inc. New York, 2006, 9th Edition.

Other references:
1- **Dennis G. Zill, Michael R. Cullen**, *"Advanced engineering mathematics"* Jones and Bartlett Publishers , 2006
2- **Peter V. O'Neil**, "*Advanced Engineering Mathematics"* Thomson Brooks/Cole, Australia, 2003.
3- **C. Ray Wylie, Louis C. Barrett**, *"Advanced engineering mathematics"* Imprint New York : McGraw-Hill, 1995

Objectives:
1) Provide graduate students with the advanced analytical methods that will form the basis for their research areas.
2) A sound understanding of linear algebra and systems of linear equations.
3) To give a feel what an ODE is and what is meant by solving it.
4) To extend the concepts from first-order to second-order ODEs and to present the properties of linear ODEs.
5) Extension of the concepts and theory from second-order to higher order ODEs.
6) Solving systems of ODE's.
7) Solving linear ODEs by using series solutions techniques.
8) An introduction to important special functions and their use in the solution of engineering problems.
9) To introduce the Laplace transform method for solving linear ODEs and corresponding initial value problems.
10) Theory and applications of Fourier analysis methods.
11) To give a feel to solve important Partial Differential Equations (PDEs).

Outcomes:
1) Understanding the basics of linear algebra, solutions of linear systems of equations and eigenvalue problems.
2) Ability to solve first, second and nth order ODEs. Ability to solve systems of ODE's.
3) Ability to perform series solution methods in the solution of ODEs.
4) Understanding the applications of various special functions in engineering problems.
5) Application of Laplace transforms in the solution of linear ODEs and initial value problems.
6) A sound understanding of Fourier analysis in terms of Fourier series, transforms and integrals and their applications.
7) Being familiar with the most widely used PDEs and their solutions.

COURSE PLAN

Week	Date	Textbook (9th Edition)	Topics
1	Feb 12	Chap. 7,8	Linear Algebra
2	Feb 19	Chap. 1	ODEs (First-Order)
3	Feb 26	Chap. 2	ODEs (Second-Order)
4	Mar 4	Chap. 3,4	ODEs (Higher-Order and Systems)
5	Mar 11		**Midterm exam**
6	Mar 18		
7	Mar 25		
			Mid- Semester Break
8	Apr 8	Chap. 5	Series Solutions of ODEs, Special Functions
9	Apr 15	Chap. 6	Laplace Transforms
10	Apr 22	Chap. 11	Fourier Analysis
11	Apr 29	Chap. 12	Partial Differential Equations (PDE's)
12	May 6	Chap. 12	Partial Differential Equations (PDE's)
13	May 13	Chap. 12	Partial Differential Equations (PDE's)
14	May 20	Chap. 12	Partial Differential Equations (PDE's)

Assessment Criteria:

Midterm Exam **Percentage: 25%**
Final Exam **Percentage: 75%**