



ISTANBUL TECHNICAL UNIVERSITY
DEPARTMENT OF MECHANICAL ENGINEERING

ENGINEERING MATHEMATICS - MAK 501E - CRN 24161 2013-2014 Spring

Instructors : Hakan Öksüzöğlü (Gümüşsuyu, Room 435)
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Lecture hours : Tuesday 13:30 – 16:30 (MKB A501 - Gümüşsuyu)
Office hours : see <http://web.itu.edu.tr/hoksuzoglu/> for up to date office hours
Wednesdays and Thursdays (Orhan Atabay)

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 , 2006
- 2- Peter V. O'Neil, "*Advanced Engineering Mathematics*" Thomson Brooks/Cole, Australia, 2003.
- 3- C. Ray Wylie, Louis C. Barrett, "*Advanced engineering mathematics*" 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 (9 th Edition)	Topics
1	Feb 11	Chap. 7,8	Linear Algebra
2	Feb 18	Chap. 7,8	Linear Algebra
3	Feb 25	Chap. 1,2,3,4	ODEs (First-Order, Second-Order and Higher-Order, Systems of ODE's)
4	Mar 4	Chap. 1,2,3,4	ODEs (First-Order, Second-Order and Higher-Order, Systems of ODE's)
5	Mar 11	Chap. 5	Series Solutions of Differential Equations, Special Functions
6	Mar 18	Midterm 1	
7	Mar 25	Chap. 6	Laplace Transforms
8	Apr 1	Chap. 6	Laplace Transforms
9	Apr 8	Chap. 11	Fourier Analysis
10	Apr 15	Chap. 11	Fourier Analysis
11	Apr 22	Chap. 12	Partial Differential Equations (PDE's)
12	Apr 29	Chap. 12	Partial Differential Equations (PDE's)
13	May 6	Midterm 2	
14	May 13	Chap. 12	Partial Differential Equations (PDE's)

Assessment Criteria:

Midterm Exam	Quantity: 2 , Percentage: 50%
Quiz	Quantity: 4 , Percentage: 10%
Final Exam	Quantity: 1 , Percentage: 40%

Remarks:

- **Make-up exams** shall only be conducted upon the decision of the Executive Board of the Institute of Graduate School of Science, Engineering and Technology. **No make up for quizzes!**
- **Midterm exams will be held on March 18, and May 6, 2013, between 13:30–16:30 am.**
- **In order to qualify for the final you will need minimum 20 points (out of 60)**