



**ISTANBUL TECHNICAL UNIVERSITY**  
**DEPARTMENT OF MECHANICAL ENGINEERING**

**ENGINEERING MATHEMATICS - MAK 501E**  
**2009-2010 FALL (CRN 13665)**

<b>Instructor</b>	: Assistant Prof. Dr. Erdinç Altuğ (Room # 442)
<b>Phone &amp; E-mail</b>	: (0212) 293 13 00 / 2838 & altuger@itu.edu.tr
<b>Lecture hours</b>	: Tuesday 13:30-16:29, (D361A)
<b>Office hours</b>	: After class or by appointment.
<b>Prerequisites</b>	: Undergraduate mathematics
<b>Course Web Site</b>	: <a href="http://www2.itu.edu.tr/~altuger/Dersler/MAK501E.htm">http://www2.itu.edu.tr/~altuger/Dersler/MAK501E.htm</a>

**Course Description:**

**Ordinary Differential Equations (ODEs):** First-Order Differential Equations, Second-Order Linear Differential Equations, Higher-Order Linear Differential Equations, Method of Undetermined Coefficients, Method of Variation of Parameters, Series Solutions of Differential Equations (SSDEs). Special Functions; Legendre's Equations, Bessel's Equation, Sturm-Liouville Problems, Orthogonality, Eigenfunction Expansions, **Laplace Transforms** and Applications. **Linear Algebra:** Matrices, Vectors, Determinants, Linear Systems of Equations, Gauss Elimination, Eigenvalues, Eigenvectors, Grad, Div, Curl. **Fourier Analysis:** Series, Integrals, and Transforms. **Partial Differential Equations.**

**Textbook :**

Erwin Kreyszig, "*Advanced Engineering Mathematics*" Wiley International Edition, 9<sup>th</sup> Edition, 2006.

**Other References :**

- 1- Peter V. O'Neil, "*Advanced Engineering Mathematics*" Thomson Brooks/Cole, Australia, 2003.
- 2- Bird J.O., May A.J.C., "*Engineering Mathematics*" Newnes, Oxford, 1992.
- 3- Glyn James, "*Advanced Modern Engineering Mathematics*" Addison-Wesley Publishing Company England, 1993.
- 4- Dennis G. Zill, Michael R. Cullen, "*Advanced Engineering Mathematics*" PWS-KENT Publishing Company, Boston, 1992.
- 5- Stephenson G. And Radmore, P.M. "*Advanced Mathematical Methods for Physics*, Cambridge University Press, Cambridge, 1990.

**Objectives :**

- Provide graduate students with the advanced analytical methods that will be bases for their research areas.
- Use these analytical methods to obtain the closed form solutions of some of the basic engineering problems.

**Outcomes :**

1. A sound understanding of the matrices and ability solve system of various algebraic equations.
2. A sound understanding of the important special functions and their use in the solution of engineering problems.
3. Ability to solve nonlinear ODEs via series solution methods.
4. Ability to employ the separation of variables to solve partial differential equations.
5. Ability to select and use an appropriate integral transform technique to solve partial differential equations.

**COURSE PLAN**

<b>Week</b>	<b>Dates</b>	<b>Topics</b>	<b>Book</b>
<b>1</b>	September 29	ODEs, First-Order Differential Equations	Chapter 1
<b>2</b>	October 6	ODEs, Second-Order Linear Differential Equations	Chapter 2
<b>3</b>	October 13	ODEs, Higher-Order Linear Differential Equations	Chapter 3 and 4
<b>4</b>	October 20	SSDEs, Special Functions	Chapter 5
<b>5</b>	October 27	SSDEs, Special Functions	Chapter 5
<b>6</b>	November 3	<b>Midterm Exam-1</b>	
<b>7</b>	November 10	Laplace Transforms and Applications	Chapter 6
<b>8</b>	November 17	Laplace Transforms and Applications	Chapter 6
<b>9</b>	November 24	Linear Algebra	Chapter 7 - 10
<b>10</b>	December 1	Fourier Analysis	Chapter 11
<b>11</b>	December 8	Fourier Analysis	Chapter 11
<b>12</b>	December 15	<b>Midterm Exam-2</b>	
<b>13</b>	December 22	Partial Differential Equations	Chapter 12
<b>14</b>	December 29	Partial Differential Equations	Chapter 12

**Assessment Criteria :**

	<b>Quantity</b>	<b>Total Percentage %</b>
<b>Midterm Exams</b>	2	40
<b>Homeworks and Quizzes</b>	5	20
<b>Final Exam</b>	1	40

**Notes:**

- Course notes, homeworks and handouts will be distributed using the course web site.
- Homeworks which display evidence of copying will receive zero grade.
- In order to take the final exam you should attend at least 70% of the lectures.