I.T.U.
FACULTY OF AERONAUTICS & ASTRONAUTICS
DEPARTMENT OF AERONAUTICAL ENGINEERING
COURSE SYLLABUS

Course Name	*Code*	*Course Type*	*Regular Semester*	*Credit*	*ECTS*	*Lecture*	*Recitation*	*Laboratory*
						(hour/week)		
INTRO. TO PARTIAL DIFF. EQUATIONS	UZB218E	BS	Spring	3+0	6	3	0	0

Department	Astronautical Engineering
Lecturer and Office Hours	Dr. Mehmet SAHIN (333), Wednesday 9:30-10:30 E-mail: msahin@itu.edu.tr URL: www2.itu.edu.tr/~msahin
Teaching Assistant and Office Hours	
Language	English
Compulsory/Elective	Elective
Classroom and MeetingTime	D-110, Friday 14:30-17:30
Contents	Review of ordinary differential equations. Boundary value problems. Heat Equation. Method of separation of variables: One dimensional heat equation. Laplace's equation in Cartesian and polar coordinates. Fourier series, Fourier sine and cosine series. Complex form of Fourier series. Vibrating strings and membranes. Sturm-Liouville eigenvalue problems. Rayleigh quotient. Vibrating circular membrane. Bessel functions. Laplace's equation in a circular cylinder. Non-homogeneous problems. Eigenfunction expansions. Poisson's equation. A brief introduction to Laplace transforms.
Objectives	Students are introduced with linear partial differential equations through simple models, namely, the heat and wave equations, which describe a broad range of scientific phenomenon. Equations are formulated carefully from physical principles, motivating the mathematical solution techniques. Only exact solution methods are discussed.
Course Educational Outcomes	On completing this course students should : 1. Know how to solve an ordinary differential equation (a3 ,e2,h1,g1,k1)* 2. Understand what it is needed to solve a differential equation (a3 ,e1,h1,g1,k1)* 3. Be able to solve Laplace's equation for simple geometries (a3 ,e1,h1,g1,k1)* 4. Be able to use Fourier series (a3 ,b1,e1,h1,g1,k1)* 5. Be able to solve vibrating string and membrane problems (a3 ,e1,h1,g1,k1)* 6. Be able to use Bessel function for the solution of Laplace's equation (a3 ,e1,h1,g1,k1)* 7. Be able to use Laplace transform for the solution of differential equations (a3 ,e1,h1,g1,k1)* 8. Be able to use eigenvalue expansion for solving elliptic boundary value problems (a3 ,e1 ,g1,k1)* 9. Be able to appreciate the need and importance of analytical methods in the solution engineering problems (a3 ,b1,e1,h1,i1,j1,k1)*

Topics – Course Outline

	Date	Duration	C.E.O.
1. Review of ordinary differential equations	12.02.2010	1 week	1
2. Boundary Value Problems	19.02.2010	1 week	2
3. Partial differentiation. Heat Equation	26.02.2010	1 week	3
4. Method of separation of variables	05.03.2010	1 week	3,5
5. Laplace's equation in Cartesian and polar coordinates	12.03.2010	1 week	3,6
6. Fourier series. Complex form of Fourier series	19.03.2010	1 week	3,4
7. Vibrating strings and membranes	26.03.2010	1 week	5
8. Sturm-Liouville eigenvalue problems	02.04.2010	1 week	5,8
9. Rayleigh quotient. Boundary conditions of the 3rd kind	09.04.2010	1 week	2
10. Mid-term exam	16.04.2010	1 week	-
11. Vibrating circular membrane. Bessel functions.	23.04.2010	1 week	5,6
12. Nonhomogeneous problems.	30.04.2010	1 week	2
13. Eigenfunction expansions	07.05.2010	1 week	3
14. Laplace transform solutions	14.05.2010	1 week	7

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Prerequisite(s)	-
Textbook	Haberman, R. Appl. Part. Diff. Eqns.with Fourier Series and BVP's., 3rd Ed., Prentice Hall, 1998.
Other References	1. O'Neil, P.V. Beginning Partial Differential Equations, Wiley-Interscience, 2008. 2. Boyce, W.E. and DiPrima, R.C. Elementary Differential Equations and Boundary Value Problems, John Wiley and Sons Inc., 1997. 3. Zill, D.G. A First Course in Differential Equations. Thomson Brooks/Cole, 2005. 4. Powers, D.L. Boundary Value Problems. 4th Ed., Elsevier, 1999. 5. Bronson, R. Schaum's Outline of Modern Introductory Differential Equations. McGraw-Hill Book Company, 1973.
Laboratory Work	None
Computer Usage	Very limited.
Others	Attendance - student must attend at least 70% of the class to receive a passing mark.

Course Evaluation Method		**Number**	**Ratio %**
	Midterm exams	1	30
	Quizes		
	Homeworks	5	20
	Projects		
	Term Projects		
	Laboratory		
	Others		
	Final Exam	1	50

Contribution To Program Outcomes*	**a**	**b**	**c**	**d**	**e**	**F**	**g**	**h**	**i**	**j**	**k**
	3	1	0	1	3	0	1	1	1	1	1

Prepared by **Dr. Mehmet SAHIN** **Date** **04.07.2011**