

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	UZH218E	BS	Spring	3+0	6	3	0	0	
Department	Astronautical Engineering								
Lecturer and Office Hours	Dr. Mehmet SAHIN (333), Wednesday 9:00-12:00 E-mail: msahin@itu.edu.tr URL: www2.itu.edu.tr/~msahin								
Teaching Assistant and Office Hours									
Language	English								
Compulsory/Elective	Elective								
Classroom and Meeting Time	D-108, 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., 3 rd 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		
	Quizzes										
	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