

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)		
NUMERICAL METHODS	MAT 202E	BS	Fall	3+0	6	3	0	0
Department	Astronautical Engineering							
Lecturer and Office Hours	Dr. Mehmet SAHIN (333), Thursday 09:00-12:00 URL:www2.itu.edu.tr/~msahin							
Teaching Assistant and Office Hours								
Language	English							
Compulsory/Elective	Compulsory							
Classroom and Meeting Time	D-Z09, Thursday 13:30-16:30							
Contents	Accuracy estimation in numerical methods, error propagation. Root finding for system of nonlinear equations; Newton's and Newton-Raphson's methods. Solution methods for system of linear equations. Interpolation, extrapolation and curve fitting. Numerical differentiation integration. Numerical solutions of ordinary differential equations. Finite Differences; forward, backward and central differences, Runge-Kutta Methods.							
Objectives	Introduce numerical methods for solution of engineering problems							
Course Educational Outcomes	<p>On completing this course students should :</p> <ol style="list-style-type: none"> 1. Know how numbers are represented in computer memory and be able predict the consequential outcomes of this (a1,b1,f1,h1,i1,j1,k2)* 2. Be able find the roots of a function dependent on a single parameter via a number of methods (a2,b1,c1,e1,h1,k2)* 3. Be able to solve linear systems of equations (a3,b2,c3,e3,i1,k3)* 4. Be able to solve non-linear systems of equations (a3,b2,c3,e3,i1,k3)* 5. Be able to interpolate and extrapolate (a3,b3,c2,e2,i1,j1,k2)* 6. Be able to conduct regression analysis through the least squares method (a3,b3,c2,e2,j1,k2)* 7. Be able to discretize continuous integrals and evaluate them numerically (a3,b2,c1,e2,i1,j1,k2)* 8. Be able to numerically integrate ordinary differential equations (a3,b1,c2,e3,h1,i1,j1,k3)* 9. Be able to discretize partial differential equations via finite differences and turn them into algebraic equations (a3,b1,c2,e3,h1,i1,j1,k3)* 10. Be able to understand numerical error and estimate (a2,b2,c2,e2,i1,j1,k2)* 11. Carry out computations by computer programming (a3,b3,c3,e2,h1,i3,j3,k3)* 12. Be able to appreciate the need and importance of numerical methods in the solution engineering problems (a2,b2,c2,e2,h1,i2,j2,k3)* 							
Topics – Course Outline	Mathematical modeling, approximations and round-off errors	Date	Duration	C.E.O.				
	Truncation errors and Taylor series	01.10.2009	1 week	1,10,12				
	Roots of equations	08.10.2009	1 week	1,10				
	Linear equations and Gauss elimination	15.10.2009	1 week	4				
	Holiday	22.10.2009	1 week	3,11				
	LU factorization and matrix inverse	29.10.2009	1 week	-				
	Gauss-Seidel and several other iterative methods	05.11.2009	1 week	3,11				
	Interpolation, extrapolation and curve fitting	12.11.2009	1 week	3,11				
	Numerical differentiation and integration	19.11.2009	1 week	5,6				
	Midterm Examination	26.11.2009	1 week	7				
	Numerical methods for ordinary differential equations	03.12.2009	1 week	-				
	Boundary-value and eigenvalue problems	10.12.2009	1 week	8,11				
	Partial differential equations	17.12.2009	1 week	8				
	Finite difference method	24.12.2009	1 week	9				
		31.12.2009	1 week	9,10,11,12				

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Prerequisite(s)	MAT 102, MAT 104										
Textbook	Numerical Methods for Engineers. S. C. Chapra and R. P. Canale										
Other References	An introduction to Numerical Computation. S. Yakowitz and F. Szidarovszky										
Laboratory Work	None										
Computer Usage	Computer programming skills are required.										
Others											
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	1	1	3	1	1	2	1	1	2

Prepared by

Dr. Mehmet SAHIN

Date

24.09.2009