ÇANKAYA UNIVERSITY
Faculty of Arts and Sciences
Course Definition Form

Part I. Basic Course Information

Department Name	MATHEMATICS				Dept. Numeric Code	2 7
Course Code	M A T H 2 8 2	**Number of Weekly Lecture Hours** 3	**Number of Weekly Lab/Tutorial Hours** 2	**Number of Credit Hours** 4		
Course Web Site	http://math282.cankaya.edu.tr			ECTS Credit	0 7	

Course Name
This information will appear in the printed catalogs and on the web online catalog.

English Name	Numerical Analysis
Turkish Name	Sayısal Analiz

Course Description
Provide a brief overview of what is covered during the semester. This information will appear in the printed catalogs and on the web online catalog.
Maximum 60 words.

Roundoff errors, algorithms and convergence, bisection method, fixed point iteration, Newton's method, error analysis, accelerating convergence. Interpolation and Lagrange polynomial, divided differences. Cubic splines. Numerical differentiation, Richardson's extrapolation. Numerical integration, trapezoid, Simpson's and Boole's rules. Romberg integration, adaptive quadrature. Gaussian quadrature. Multiple integrals.

Prerequisites (if any) *Give course codes and check all that are applicable.*	1st	2nd	3rd	4th
	☐ Consent of the Instructor	☐ Senior Standing	☐ Give others, if any.	
Co-requisites (if any)	1st	2nd	3rd	4th
Course Type *Check all that are applicable*	☒ Must course for dept.	☐ Must course for other dept.(s)	☐ Elective course for dept.	☐ Elective course for other dept.(s)

Course Classification
Give the appropriate percentage for each category.

Category	Mathematics & Natural Sciences	Engineering & Architectural Sciences	Technology		
Percentage	70	20	10		

Part II. Detailed Course Information

Course Objectives
Maximum 100 words.

To teach fundamental concepts in numerical analysis which are root finding, interpolation, numerical differentiation and integration.

Learning Outcomes
Explain the learning outcomes of the course. Maximum 10 items.

1) The students will learn about round off errors and convergence of algorithms.
2) The students will formulate and find the roots of a function of one variable by numerical methods.
3) The students will learn how to interpolate the given data points by using Lagrange, divided difference , Hermite and cubic spline interpolation techniques.
4) The students will learn to derive numerical differentiation techniques.
5) The students will learn to improve their numerical techniques by Richardson extrapolation.
6) The students will learn elements of numerical integration.

Textbook(s)
List the textbook(s), if any, and other related main course material.

Author(s)	Title	Publisher	Publication Year	ISBN
R. L. Burden, J. D. Faires, A. M. Burden	Numerical Analysis	Cengage Learning	2015	978-1305253667

Reference Books
List, if any, other reference books to be used as supplementary material.

Author(s)	Title	Publisher	Publication Year	ISBN
J. H. Mathews-K. D. Fink	Numerical Methods using MATLAB	Pearson/ Prentice Hall	2004	978-0898715606
M. Heath	Scientific Computing: An introductory Survey	Mc-Graw Hill	2002	978-0072399103

Teaching Policy
Explain how you will organize the course (lectures, laboratories, tutorials, studio work, seminars, etc.)

3 hours of lecturing per week. 2 hours of application per week. Attendance to the lecture is compulsory.

Laboratory/Studio Work
Give the number of laboratory/studio hours required per week, if any, to do supervised laboratory/studio work and list the names of the laboratories/studios in which these sessions will be conducted.

Students learn basic concepts of MATLAB program and write algorithms for the numerical calculations.

Computer Usage
Briefly describe the computer usage and the hardware/software requirements for the course.

Numerical analysis is an applied mathematics course. The laboratory works aim at teaching students the application of the techniques that are thought at theoretical classes by using MATLAB program. The homeworks are also solved by MATLAB.

Course Outline
List the weekly topics to be covered.

Week	Topic(s)
1	Roundoff Errors, Algorithms and Convergence
2	Root finding: Bisection Method, Fixed Point Iteration
3	Root Finding: Newton's Method
4	Error Analysis, Accelerating Convergence
5	Interpolation and Lagrange Polynomial
6	Divided Differences
7	Hermite Interpolation
8	Cubic Spline Interpolation
9	Numerical Differentiation
10	Richardson's Extrapolation
11	Elements of Numerical Integration
12	Composite Numerical Integration, Romberg Integration
13	Adaptive Quadrature, Gaussian Quadrature
14	Multiple Integrals

Grading Policy
List the assessment tools and their percentages that may give an idea about their relative importance to the end-of-semester grade.

Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage
Homework	5	10	Case Study			Attendance		
Quiz(es)	5	5	Lab Work			Field Study		
Midterm Exam	2	50	Classroom Participation			Project		
Term Paper			Oral Presentation			Final Exam	1	35

ECTS Workload
List all the activities considered under the ECTS.

Activity	Quantity	Duration (hours)	Total Workload (hours)
Attending Lectures (*weekly basis*)	14	3	42
Attending Labs/Recitations (*weekly basis*)	14	2	28
Compilation and finalization of course/lecture notes (*weekly basis*)	14	1	14
Collection and selection of relevant material (*once*)	1	5	5
Self study of relevant material (*weekly basis*)	14	1	14
Take-home assignments	5	2	10
Preparation for quizzes			
Preparation for mid-term exams (*including the duration of the exams*)	2	20	40
Preparation of term paper/case-study report (*including oral presentation*)			
Preparation of term project/field study report (*including oral presentation*)			
Preparation for final exam (*including the duration of the exam*)	1	22	22
TOTAL WORKLOAD / 25			175/25
ECTS Credit			**7**

Total Workloads are calculated automatically by formulas. To update all the formulas in the document first press CTRL+A and then press F9.

No	Program Qualifications	Contribution				
		0	1	2	3	4
1	Adequate knowledge in mathematics; ability to use applied and theoretical information in these areas to solve pure and applied mathematical problems.			X		
2	Ability to use modern computational tools to analyze an abstract or real life problem			X		
3	Adequate knowledge in theoretical and historical background in mathematics				X	
4	Ability to work individually and in teams efficiently, ability to collaborate effectively in teams to analyze complex systems from intra-disciplinary and multi-disciplinary areas				X	
5	Ability to communicate effectively in English about technical subjects, both orally and in writing				X	
6	Ability to use, develop and implement new experiments and algorithms to solve scientific, engineering and financial problems				X	
7	Ability to analyze a mathematical problem using both analytical and numerical methods; use and compare theoretical and simulational methods to gain deeper insight				X	
8	Ability to report the findings, conclusions and interpretations related to a project in the area of pure and applied mathematics, ability to write technical reports, to prepare and conduct effective presentations				X	
9	Recognition of the need for lifelong learning; ability to access information, to follow developments in science and technology, and to keep continuous self improvement				X	
10	Awareness of professional and ethical responsibility issues and their legal consequences					X

Program Qualifications vs. Learning Outcomes *Consider the program qualifications given below as determined in terms of learning outcomes and acquisition of capabilities for all the courses in the curriculum. Look at the learning outcomes of this course given above. Relate these two using the Likert Scale by marking with X in one of the five choices at the right.*

Scale for contribution to a qualification: **0**-none, **1**-little, **2**-moderate, **3**-considerable, **4**-highest