



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 4 8 5	Number of Weekly Lecture Hours	3
		Number of Weekly Lab/Tutorial Hours	0
		Number of Credit Hours	3
Course Web Site	http:// math485.cankaya.edu.tr	ECTS Credit	0 5

Course Name <i>This information will appear in the printed catalogs and on the web online catalog.</i>	
English Name	Integral Equations
Turkish Name	İntegral Denklemler

Course Description <i>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.</i>	
Classification of Linear Integral Equations, Solution of an Integral Equation, Converting Volterra Equation to an ODE, Converting IVP to Volterra Equation, Converting BVP to Fredholm Equation, Fredholm Integral Equations, Volterra Integral Equations, Fredholm Integro-Differential Equations, Volterra Integro-Differential Equations, Real World Applications	

Prerequisites (if any) <i>Give course codes and check all that are applicable.</i>	1 st	2 nd	3 rd	4 th
	_ _ _ _ _ _ _	_ _ _ _ _ _ _	_ _ _ _ _ _ _	_ _ _ _ _ _ _
	<input type="checkbox"/> Consent of the Instructor		<input type="checkbox"/> Senior Standing	
	<input type="checkbox"/> Give others, if any. _ _ _ _ _ _ _ _			
Co-requisites (if any)	1 st	2 nd	3 rd	4 th
	_ _ _ _ _ _ _	_ _ _ _ _ _ _	_ _ _ _ _ _ _	_ _ _ _ _ _ _
Course Type <i>Check all that are applicable</i>	<input type="checkbox"/> Must course for dept. <input type="checkbox"/> Must course for other dept.(s) <input checked="" type="checkbox"/> Elective course for dept. <input checked="" type="checkbox"/> Elective course for other dept.(s)			

Course Classification <i>Give the appropriate percentage for each category.</i>				
Category	Mathematics & Natural Sciences	Engineering & Architectural Sciences		
Percentage	80	20		

Part II. Detailed Course Information**Course Objectives***Maximum 100 words.*

On successful completion of this course students will be able to: recognize the integral equations, Fredholm and Volterra integral equations, converting the IVPs and BVPs to the corresponding integral equations and Fredholm and Volterra integro-differential equations, learn how to apply the theory of integral equations to the real-world problems appearing in the fields of engineering and physics

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

Students know the integral equations, able to classify these equations, learn to solve such equations, know the Fredholm and Volterra integro-differential equations and how to apply these knowledge to the complex problems from physics and engineering.

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

Author(s)	Title	Publisher	Publication Year	ISBN
Abdul-Majid Wazwaz	A First Course in Integral Equations	World Scientific Publishing Co.	2015	978-9814675123

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

Author(s)	Title	Publisher	Publication Year	ISBN
F. Smithies, J. A. Todd	Integral Equations	Cambridge, University Press	2009	9780521100038
C. M. Bender, S. A. Orszag	Advances Mathematical Methods for Scientists and Engineers I	McGraw-Hill Book Company	1978	0-07-0044S2-X

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

Attendance to the lectures is compulsory. Some homework assignments will be given. The students will use MATHEMATICA or MATLAB when they investigate the real world applications.

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

MATHEMATICA or MATLAB will be used to present the outputs of the integral equations corresponding to real-world applications in physics and engineering.

Course Outline <i>List the weekly topics to be covered.</i>	
Week	Topic(s)
1	Linear integral equations: preliminaries, classification, solution
2	Conversion between Volterra equation and ODE; BVP and Fredholm equation
3	Numerical approximation techniques for Fredholm equation
4	Homogeneous Fredholm integral equations; Fredholm integral equations of first kind
5	Numerical approximation techniques for Volterra integral equations; Volterra integral equations of first kind
6	Fredholm integro-differential equations
7	Numerical techniques for solution
8	Converting to Fredholm integral equations
9	Converting to Volterra integral equation
10	Volterra integro-differential equations of the first kind; Singular integral equations
11	The weakly-singular Volterra integral equations
12	Numerical treatment of Fredholm and Volterra type integral equations
13	Real-world applications of Volterra, Fredholm and singular integral equations in physics and engineering
14	Real-World Applications of Volterra, Fredholm and singular integral equations in physics and engineering

Grading Policy <i>List the assessment tools and their percentages that may give an idea about their relative importance to the end-of-semester grade.</i>								
Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage
Homework	2	20	Case Study			Attendance		
Quiz(es)			Lab Work			Field Study		
Midterm Exam	2	40	Classroom Participation			Project		
Term Paper			Oral Presentation			Final Exam	1	40

ECTS Workload <i>List all the activities considered under the ECTS.</i>			
Activity	Quantity	Duration (hours)	Total Workload (hours)
Attending Lectures (<i>weekly basis</i>)	14	3	42
Attending Labs/Recitations (<i>weekly basis</i>)			
Compilation and finalization of course/lecture notes (<i>weekly basis</i>)	13	1	13
Collection and selection of relevant material (<i>once</i>)	1	10	10
Self study of relevant material (<i>weekly basis</i>)	14	1	14
Take-home assignments			
Preparation for quizzes			
Preparation for mid-term exams (<i>including the duration of the exams</i>)	2	13	26
Preparation of term paper/case-study report (<i>including oral presentation</i>)			
Preparation of term project/field study report (<i>including oral presentation</i>)			
Preparation for final exam (<i>including the duration of the exam</i>)	1	20	20
TOTAL WORKLOAD / 25			125/25
ECTS Credit			5

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

Program Qualifications vs. Learning Outcomes <i>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.</i>						
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 mathematics 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

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