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 5 2	Number of Weekly Lecture Hours	4	Number of Weekly Lab/Tutorial Hours	0	Number of Credit Hours	4
Course Web Site	http://math452.cankaya.edu.tr					ECTS Credit	0 5

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

English Name	Functional Analysis
Turkish Name	Fonksiyonel 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.

Metric Spaces, Completion of Metric Spaces, Normed Spaces, Finite Dimensional Normed Spaces, Bounded Linear operators, Linear Functional, Dual Space, Inner Product Spaces and Hilbert Spaces, Riesz Representation Theorem, Hilbert Adjoint Operator; Self-Adjoint, Unitary and Normal Operators; Hahn-Banach Theorem, Uniform Boundedness Principle, Strong and Weak Convergence.

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			
Percentage	85	15			

Part II. Detailed Course Information

Course Objectives
Maximum 100 words.
To teach metric sequence spaces, Normed, Banach spaces and Hilbert spaces, the basic theorems in Hilbert spaces such as Riesz Representation Theorem, basic theorems in Banach spaces such as Hahn-Banach , Baire Category and uniform boundedness theorem, bounded and continuous linear operators.

Learning Outcomes
Explain the learning outcomes of the course. Maximum 10 items.
The students will be able give examples of Banach function spaces and state at least the basic theorems in Banach spaces. Also will prepare students to do research in in the theory of differential equations by applying the basic theory of Banach spaces.

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

Author(s)	Title	Publisher	Publication Year	ISBN
Erwin Kreyszig	Introductory Functional Analysis With Applications	John-Wiley and sons	1989	0-471-50731-8

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

Author(s)	Title	Publisher	Publication Year	ISBN
John B. Conway	A Course in Functional Analysis	Springer New York	2010	978-1441930927

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

3 hours of lecturing per week. Attendance 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.

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

Course Outline
List the weekly topics to be covered.

Week	Topic(s)
1	Metric Spaces, Open and closed sets.
2	Convergence and Completion of metric spaces.
3	Definition of normed and Banach spaces
4	Finite dimensional normed spaces, compactness.
5	Bounded linear operators
6	Linear functionals and dual space
7	Inner product spaces, Hilbert spaces:definitions and properties
8	Orthonormal sets and sequences
9	Riesz's representation theorem, Sesquilinear forms
10	Hilbert-Adjoint operator, Self-Adjoint, unitary and Normal operators
11	Zorn's Lemma and Hahn-Banach Theorems
12	Adjoint Operators, Category Thm
13	Uniform Boundedness Principle, Strong and weak convergence
14	Review

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	2	10	Case Study			Attendance		
Quiz(es)			Lab Work			Field Study		
Midterm Exam	2	50	Classroom Participation			Project		
Term Paper			Oral Presentation			Final Exam	1	40

ECTS Workload
List all the activities considered under the ECTS.

Activity	Quantity	Duration (hours)	Total Workload (hours)
Attending Lectures (*weekly basis*)	14	4	56
Attending Labs/Recitations (*weekly basis*)			
Compilation and finalization of course/lecture notes (*weekly basis*)	14	0,5	7
Collection and selection of relevant material (*once*)	1	5	5
Self study of relevant material (*weekly basis*)	14	0,5	7
Take-home assignments	2	5	10
Preparation for quizzes			
Preparation for mid-term exams (*including the duration of the exams*)	2	10	20
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	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 *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.*

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

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