ÇANKAYA UNIVERSITY
Faculty of Arts and Sciences
Course Definition Form

This form should be used for either an elective or a compulsory course being proposed and for a curriculum development process for an undergraduate curriculum at Çankaya University, Faculty of Arts and Sciences. Please fill in the form completely and submit the print-out carrying the approval of the Department Chair to the Dean's Office. Upon receipt of both copies, the print-out will be forwarded to the Faculty Academic Board for approval. Incomplete forms will be returned to the Department. The approved form is finally sent to the President's office for approval by the Senate.

Part I. Basic Course Information

Department Name	MATHEMATICS					**Dept. Numeric Code**	27
Course Code	MATH421	**Number of Weekly Lecture Hours**	3	**Number of Weekly Lab/Tutorial Hours**	0	**Number of Credit Hours**	3
Course Web Site	http:// math491.cankaya.edu.tr					**ECTS Credit**	05

Course Name *This information will appear in the printed catalogs and on the web online catalog.*	
English Name	Fourier Analysis
Turkish Name	Fourier Analizi

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.

Introducing the Fourier series using the heat equations and the wave equations, Convergence, derivatives and integrals of Fourier series, introducing the orthogonal set of functions using the inner products and orthogonal polynomials including Legendre, Hermite and Laguerre polynomials, the Fourier transform, some applications of Fourier transforms, Sturm-Liouville problems, Discrete Fourier transform, Mellin transform, Laplace transform and connection between the Fourier transform and the Laplace transform

Prerequisites (if any) *Give course codes and check all that are applicable.*	1st: MATH154	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	70	30			

Part II. Detailed Course Information

Course Objectives
Maximum 100 words.

The main purpose of this course is to give some elementary properties of Fourier series and Fourier transforms. For this aim some partial differential equations are used and some applications are given for quantum mechanics. Moreover, some related transforms will be given such as the Mellin transform, the Laplace transform and discrete Fourier transform. Some lectures will also be devoted to introducing Sturm-Liouville equations and orthogonal polynomials that are suitable to apply Fourier transforms. Therefore after completing the lecture the students will be able to employ one of the most important theory in mathematics to some real-world applications.

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

Students know the way to solve some partial differential equations with the aid of Fourier transforms, will be able to apply Fourier transforms to some Sturm-Liouville boundary-value problems, and will know some orthogonal polynomials on the real line. Moreover, they will learn the relation between Laplace transforms and Fourier transforms.

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

Author(s)	Title	Publisher	Publication Year	ISBN
Anders Vretblad	Fourier Analysis and Its Applications	Springer	2003	0-387-00836-5
Gerald B. Folland	Fourier Analysis and Its Applications	Books/Cole Publishing Company	1992	0-8218-4790-2

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

Author(s)	Title	Publisher	Publication Year	ISBN
Murray R. Spiegel	Fourier Analysis with Applications to Boundary Value Problems	McGraw-Hill Book Company	1974	0070602190

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

Attendance to the lectures 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	Introduction (Heat equation, separation of variables technique)
2	Fourier series, convergence of Fourier series
3	Derivatives and integrals of Fourier series
4	Inhomogeneous heat equation, inhomogeneous wave equation
5	Orthogonal set of functions
6	Orthogonal polynomials (Legendre polynomials, Hermite polynomials)
7	Orthogonal polynomials (Laguerre polynomials)
8	Fourier transforms, The Riemann-Lebesgue Lemma)
9	Inverse Fourier transforms
10	Fourier transforms on L^2, The Plancherel theorem
11	Some applications of Fourier transforms on PDEs and quantum mechanics
12	Fourier transforms and Sturm-Liouville problems
13	Transforms related to Fourier transforms (Discrete Fourier transforms, Mellin transforms)
14	Connection of Fourier transforms with the Laplace transforms

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	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
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*)			
Compilation and finalization of course/lecture notes (*weekly basis*)	14	1	14
Collection and selection of relevant material (*once*)	1	10	10
Self study of relevant material (*weekly basis*)	11	1	11
Take-home assignments	2	1	2
Preparation for quizzes			
Preparation for mid-term exams (*including the duration of the exams*)	2	13	26
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 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