



Course Information

Course Code	2360497
Course Section	1
Course Title	HILBERT SPACE TECHNIQUES
Course Credit	3
Course ECTS	6.0
Course Catalog Description	Inner product spaces. Examples of inner product spaces; Hilbert spaces (definition and examples); convergence in Hilbert spaces; orthogonal complements and the projection theorem; linear functionals and the Riesz representation theorem; applications to various branches of Mathematics.
Prerequisites	Students must complete one of the following sets to take this course.

Set Prerequisites

1 2360262, 2360349

2 2360262, 2360313

Schedule Wednesday, 10:40 - 12:30, M102
Monday , 09:40 - 10:30, M102

Instructor Information

Name/Title	Assist.Prof.Dr BURAK KAYA
Office Address	M126
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Office Hours	TBA

Course Objectives

This course is intended to provide an introduction to the theory of Hilbert spaces together with various applications of Hilbert spaces in mathematics at an advanced undergraduate level.

Program Outcomes Matrix

Undergraduate

Program Outcomes	Level of Contribution			
	0	1	2	3
1 Acquires mathematical thinking skills (problem solving, generating ways of thinking, forming correspondence, generalizing etc.) and can use them in related fields.				X
2 Can produce innovative thoughts and products.				X
3 Can design mathematics related problems, devise solution methods and apply them when appropriate.			X	
4 Has a comprehension of mathematical symbols, concepts together with the interactions among them and can express his/her solutions similarly.				X
5 Has a command of Turkish and English languages so that he/she can actively communicate (read, write, listen and speak).		X		
6 Contributes to solving global, environmental and social problems either individually or as being part of a social group.	X			

Program Outcomes	Level of Contribution			
	0	1	2	3
7 Respects ethical values and rules; applies them in professional and social issues.		X		
8 Can work cooperatively in a team and also individually.	X			
9 Is responsive to life-long learning, improving his/her skills and abilities			X	
10 Comprehends necessity of knowledge, can define it and acquires it; uses knowledge effectively and shares it with others				X

0: No Contribution 1: Little Contribution 2: Partial Contribution 3: Full Contribution

Instructional Methods

Lectures will be held in person in a classical classroom environment.

Course Textbook(s)

The textbook of the course is

- An Introduction to Hilbert Space, by Nicholas Young, Cambridge University Press, 1988

a physical copy of which is available in the METU Library and an electronic copy of which can be accessed at [the publisher's official link](#) through the university internet access. We may also occasionally use

- [Introduction to Hilbert Spaces with Applications](#) by Lokenath Debnath and Piotr Mikusinski

to cover various topics.

Course Material(s) and Reading(s)

Material(s)

No additional material or equipment is necessary.

Reading(s)

There may be occasional reading material posted on ODTÜ Class. Besides these, no additional reading material is necessary.

Supplementary Readings / Resources / E-Resources

Readings

- [Introductory Functional Analysis with Applications](#) by Erwin Kreyszig
- [Introduction to Hilbert Spaces with Applications](#) by Lokenath Debnath and Piotr Mikusinski

Assessment of Student Learning

Assessment	Dates or deadlines
<p>There will be two midterm exams each out of 100 points. Each midterm will have %30 weight in your overall score that is to be used for letter grades.</p> <p>I will use Gradescope to grade your exams, unless you prefer otherwise in which case you should let me know in advance.</p>	

Assessment**Dates or deadlines**

There will be one **final** exam out of 100 points. The final exam will have %40 weight in your overall score that is to be used for letter grades.

I will use **Gradescope** to grade your exams, unless you prefer otherwise in which case you should let me know in advance.

Course Grading

Deliverable	Grade Points
Midterm I	30
Midterm II	30
Final Exam	40
Total	100

Course Policies

Class Attendance

Attendance is **not mandatory**, however, is **strongly suggested**.

Make up for Exams and Assignments

No make-ups will be given without an official report. This policy is non-negotiable. If you are going to miss an exam because of extraordinary conditions, which may not be documented via reports, you should contact me *in advance*.

Information for Students with Disabilities

Students who experience difficulties due to their disabilities and wish to obtain academic adjustments and/or auxiliary aids must contact ODTU Disability Support Office and/or course instructor and the advisor of students with disabilities at academic departments (for the list: <http://engelsiz.metu.edu.tr/en/advisor-students-disabilities>) as soon as possible. For detailed information, please visit the website of Disability Support Office: <https://engelsiz.metu.edu.tr/en/>

Academic Honesty

The METU Honour Code is as follows: "Every member of METU community adopts the following honour code as one of the core principles of academic life and strives to develop an academic environment where continuous adherence to this code is promoted. The members of the METU community are reliable, responsible and honourable people who embrace only the success and recognition they deserve, and act with integrity in their use, evaluation and presentation of facts, data and documents."