

MUHENDISLIK TEMEL BILIMLERI BOLUMU

Date	2015-16	Credits	5 credits
Course Title	Functional Analysis II	Course Number	MAT462
Pre-requisite (s)	MAT461 Functional Analysis I	Co-requisite (s)	
Hours	42 hours	Out Of Class Work Hours	84 Hours

Place and Time of Class Meeting

To be announced

Name and Contact Information of Instructor

Dr. Neil Course
neil.course@okan.edu.tr

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Book suggested

Gerald Teschl, **Topics in Real and Functional Analysis**, free ebook
(www.mat.univie.ac.at/~gerald/ftp/book-fa).

Hüsnü Kızmaz, **Fonksiyonel Analize Giriş**, K.Ü.Fen-Edebiyat Fakültesi.

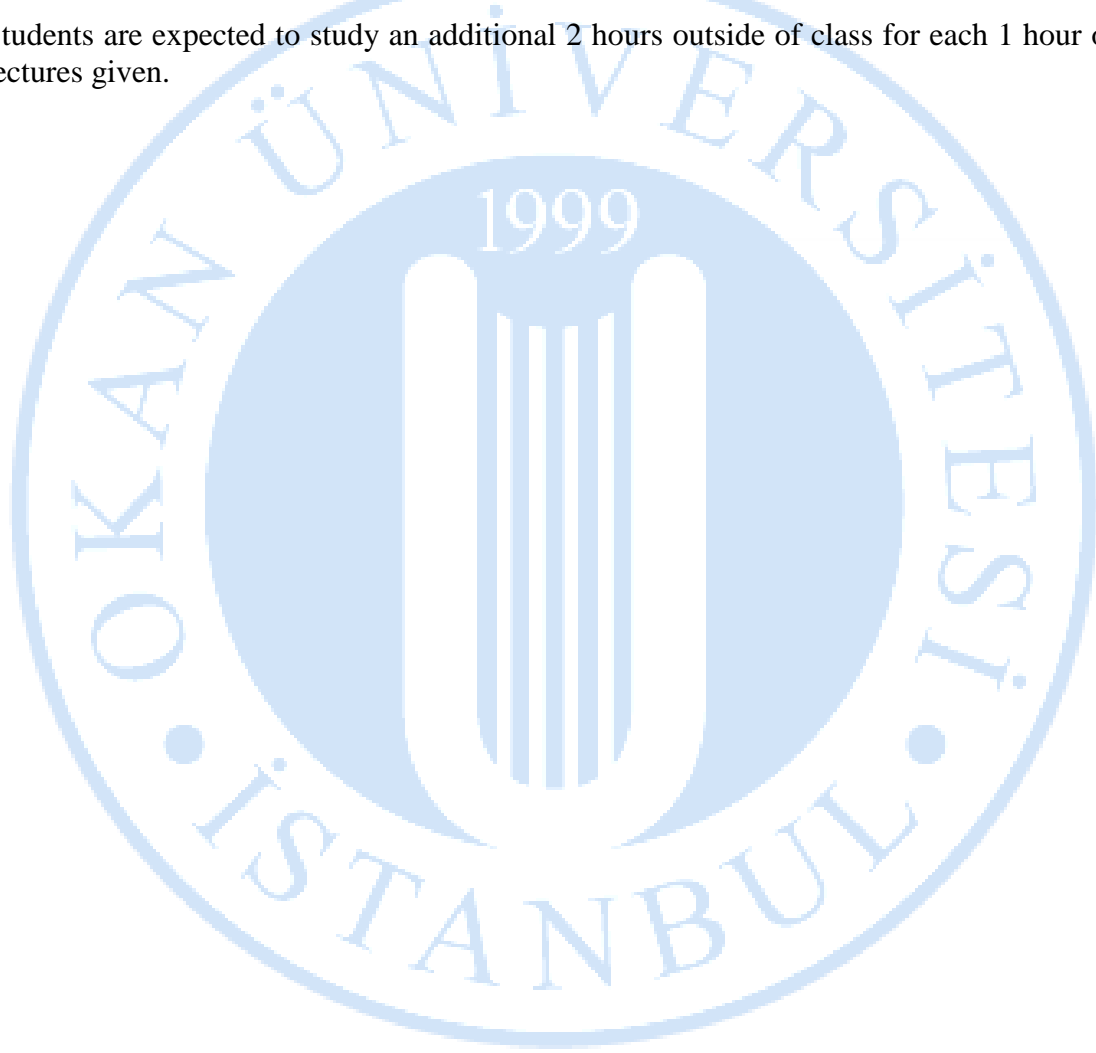


Classroom expectations for students

Attendance Policy

Students are expected to attend greater than 70% of scheduled lectures for the courses that they are registered for and to achieve the goals set forth by each class instructor. Attendance is taken for each lecture. It is the student's responsibility to arrange to make up work missed because of an absence. The assumption is that for each hour of class missed, the student will need to study for two hours independently to catch up.

Students are expected to study an additional 2 hours outside of class for each 1 hour of lectures given.



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Student Tardiness Policy

A student is considered tardy/late if he/she comes to class 15 minutes late. With three tardies the student accumulates one full absence. If the student misses half of the class period, it is a full absence. When a student has more than 3 tardies, the instructor will contact the Institution Coordinator of Student Affairs and Academic Department and request an intervention session with the student. The goal of the intervention session is to develop and implement an intervention program to help students learn new ways to save and manage time.



Plagiarism

Plagiarism is defined as the use, without proper acknowledgment, of the ideas, phrases, sentences, or larger units of discourse from another writer or speaker. Plagiarism includes the unauthorized copying of software and the violation of copyright laws. Plagiarism is considered academic dishonesty.

Plagiarism includes, but is not limited to,

1. Submitting someone's work one's own.
2. Taking passages from their own previous work without adding citations.
3. Re-writing someone's work without properly citing sources.
4. Using quotations, but not citing the source.
5. Interweaving various sources together in the work without citing.
6. Citing some, but not all passages that should be cited.
7. Melding together cited and uncited sections of the piece.
8. Providing proper citations, but fails to change the structure and wording of the borrowed ideas enough.
9. Inaccurately citing the source.
10. Relying too heavily on other people's work. Fails to bring original thought into the text.

Plagiarism is not acceptable!

Students who commit plagiarism will obtain a mark of 'zero (0)' on their exam or assignment, and are subject to investigation according to the rules of Yükseköğretim

Kurumları Öğrenci Disiplin Yönetmeliği. In addition, students who facilitate the committing of plagiarism by others (for example but not limited to; allowing another student to copy one's work with the intention of passing it off as the second student's own) will also be considered to have committed plagiarism and will be punished accordingly.

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Course Description (must correspond exactly to Catalog description)

This course is designated to provide a basic introduction to the area of mathematics described by the course title. In particular, students will study The Baire Category Theorem, The Hahn-Banach Theorem, Weak Convergence, Canonical Forms of Compact Operators, Hilbert-Schmidt Operators, Fredholm Theory, Banach Algebras, The C^* -algebra of Operators, The Spectral Theorem, Spectral Measures, The Stone-Weierstraß Theorem.



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Learning Objectives

At the end of this course students will be able:

- To appreciate the motivation for study in this field;
- To understand and recall the definitions of key concepts in this area of mathematics;
- To understand and recall the important results discussed;
- To apply all of the methods and techniques discussed and developed in the course;
- To provide proofs to elementary problems in this area of mathematics;
- To be able explain the contents of this course to students in the year below.



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Topical Outline and Schedule

DATE		WEEK 1
SPECIFIC OBJECTIVES		<ul style="list-style-type: none"> • Introduction to the course
TOPIC (S)		<ul style="list-style-type: none"> • Syllabus • Book • Course website • Homework • Expectations
LEARNING ACTIVITIES		<ul style="list-style-type: none"> • none
OUT OF CLASS WORK ASSIGNMENT		<ul style="list-style-type: none"> • none
DATE		WEEK 2
SPECIFIC OBJECTIVES		<ul style="list-style-type: none"> • Students will have developed a basic understanding of the topics listed below
TOPIC (S)		<ul style="list-style-type: none"> • The Baire-Category Theorem and its consequences • Nowhere dense • First category • Second category • The uniform boundedness principle • The open mapping theorem • The inverse mapping theorem • The graph of an operator • Closed graph • The closed graph theorem • Closed operators • Closable operators • The closure of an operator • The Hellinger-Toeplitz Theorem
LEARNING ACTIVITIES		<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS		<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various

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WORK ASSIGNMENT	<p>editions, but should be immediately obvious to candidates.</p> <ul style="list-style-type: none"> • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 3
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • The Baire-Category Theorem and its consequences • Nowhere dense • First category • Second category • The uniform boundedness principle • The open mapping theorem • The inverse mapping theorem • The graph of an operator • Closed graph • The closed graph theorem • Closed operators • Closable operators • The closure of an operator • The Hellinger-Toeplitz Theorem •
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems

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DATE	WEEK 4
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • The Hahn-Banach Theorem and its consequences • The dual space • Convex functions • The double dual space • Isometric maps • Reflexive spaces •
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 5
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • The Hahn-Banach Theorem and its consequences • The dual space • Convex functions • The double dual space • Isometric maps • Reflexive spaces •
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study

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OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 6
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Weak Convergence • Weakly convergent sequences of vectors • Weak Cauchy sequences • \limsup and \liminf • Norm convergence of operators • Strong convergence of operators • Weak convergence of operators • Weak-* convergence of functionals
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 7
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Weak Convergence

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	<ul style="list-style-type: none"> Weakly convergent sequences of vectors Weak Cauchy sequences limsup and liminf Norm convergence of operators Strong convergence of operators Weak convergence of operators Weak-* convergence of functionals
LEARNING ACTIVITIES	<ul style="list-style-type: none"> Lectures Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. Attempt a significant number of the exercises in the text book Read around the subject Complete homework problems
DATE	WEEK 8
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> Assessment
TOPIC (S)	<ul style="list-style-type: none"> Midterm Exam
LEARNING ACTIVITIES	<ul style="list-style-type: none"> Exam
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> Revision
DATE	WEEK 9
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> Canonical Forms of Compact Operators Eigenvalues and eigenvectors Singular values The rank of an operator Finite rank operators

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LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 10
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Canonical Forms of Compact Operators • Eigenvalues and eigenvectors • Singular values • The rank of an operator • Finite rank operators
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 11
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a deeper understanding of the topics listed below

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TOPIC (S)	<ul style="list-style-type: none"> • Canonical Forms of Compact Operators • Eigenvalues and eigenvectors • Singular values • The rank of an operator • Finite rank operators
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 12
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Hilbert-Schmidt and Trace Class Operators • The Schatten p-class of operators • The Schatten p-norm • The Hilbert-Schmidt norm • Trace
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems

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DATE	WEEK 13
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a more substantial understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Hilbert-Schmidt and Trace Class Operators • The Schatten p-class of operators • The Schatten p-norm • The Hilbert-Schmidt norm • Trace
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject • Complete homework problems
DATE	WEEK 14
SPECIFIC OBJECTIVES	<ul style="list-style-type: none"> • Students will have developed a basic understanding of the topics listed below
TOPIC (S)	<ul style="list-style-type: none"> • Fredholm Theory
LEARNING ACTIVITIES	<ul style="list-style-type: none"> • Lectures • Independent Study
OUT OF CLASS WORK ASSIGNMENT	<ul style="list-style-type: none"> • Read relevant sections of text book. Section numbers will not be given in this schedule due to difference between various editions, but should be immediately obvious to candidates. • Attempt a significant number of the exercises in the text book • Read around the subject

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- Complete homework problems



Instructional Methods

In developing methodological strategies, it is best to discuss them between teachers and students in an environment of freedom and mutual agreement in order to ensure that the students make them their own and take responsibility for their execution and for attaining the goals of this course.

The following strategies may be used in this class:

1. A review of the literature.
2. Check of the reading.
3. Analysis of assigned readings.
4. Group discussions and implementations.
5. Individual and group discussions.
6. Preparation of homework.



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Instructional Materials and References

- Gerald Teschl, **Topics in Real and Functional Analysis**, free ebook (www.mat.univie.ac.at/_gerald/ftp/book-fa).
- Hüsnu Kızmaz, **Fonksiyonel Analize Giriş**, K.Ü.Fen-Edebiyat Fakültesi.
- Home study materials provided online at www.neilcourse.co.uk



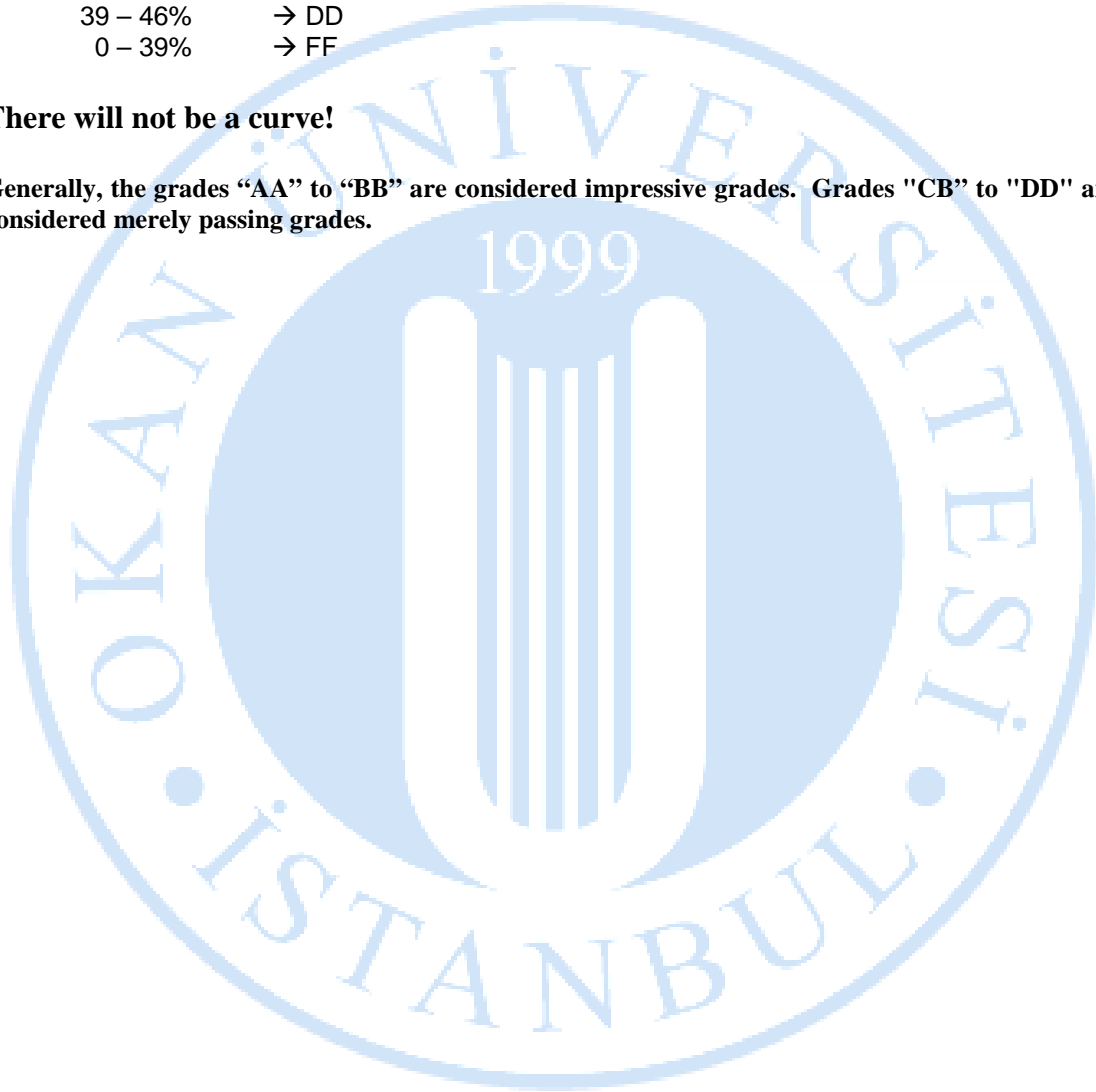
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Assessment Criteria and Methods of Evaluating Students

76 – 100%	→ AA
70 – 75%	→ BA
65 – 69%	→ BB
59 – 64%	→ CB
53 – 58%	→ CC
47 – 52%	→ DC
39 – 46%	→ DD
0 – 39%	→ FF

There will not be a curve!

Generally, the grades “AA” to “BB” are considered impressive grades. Grades "CB" to "DD" are considered merely passing grades.



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Distribution of Grade Elements

4 pieces of homework:	25%
Midterm Exam:	25%
Final Exam:	50%

Total: 100 %

