Content

Course Code	Course Name	Semester	Theory	Practice	Lab	Credit	ECTS
MAT452	Introduction to Functional Analysis	7	3	0	0	3	5

Prerequisites	MAT201, MAT261, MAT262
Admission Requirements	MAT201, MAT261, MAT262

Language of Instruction	French
Course Type	Elective
Course Level	Bachelor Degree
Objective	The primary objective of the course is to teach, without resorting to measure theory, the fundamental tools of functional analysis, namely metric spaces, normed spaces, Banach spaces, inner product spaces, and Hilbert spaces. In addition, we will address contractive mappings in metric spaces as well as applications of approximation theory in normed and Hilbert spaces. Finally, particular attention will be given to the application of these theories to various mathematical, physical, and economic problems, so that students will have studied and explored their concrete applications.
Content	Metric Spaces: Review Normed Spaces, Banach Spaces Inner Product Spaces, Hilbert Spaces 4 İmportant Theorems about Hilbert Spaces: Projection Theorem, Decomposition Theorem, Riesz Representation Theorem, Hahn-Banach Theorem Applications: Banach Fixed Point Theorem and Approximation Theorems
References	Introductory Functional Analysis with Applications, E. Kreyszig, Wiley An İntroduction to Real Analysis, T. Terzioğlu, ODTÜ Fonksiyonel Analizin Yöntemleri, T. Terzioğlu, Matematik Vakfı Fonksiyonel Analiz, E. Şuhubi, İTÜ Vakfı Bir Analizcinin Defterinden Seçtikleri, T.Terzioğlu, NMK Real Analysis with Economic Applications, Efe A. Ök, Princeton University Press

Theory Topics

Week	Weekly Contents
1	Metric Spaces: Review
2	Further Examples of Metric Spaces: Sequences Spaces, Function Spaces
3	Completeness
4	Complete Metric Spaces
5	Normed Spaces, Banach Spaces
6	Compactness and Finite Dimension
7	Linear Operators
8	Bounded Operators
9	Linear Functionals

Week	Weekly Contents
10	Normed Spaces of Operators and Dual Space
11	Inner Product Spaces, Hilbert Spaces
12	4 İmportant Theorems about Hilbert Spaces: Projection Theorem, Decomposition Theorem, Riesz Representation Theorem, Hahn-Banach Theorem
13	Application: Banach Fixed Point Theorem
14	Application: Approximation Theorems