

University of Óbuda		Institute of Applied Mathematics		
John von Neumann Faculty of Informatics				
Name and code:		Credits:		
Analysis NMXAN1PMNE		2022/23 1st semester		
Subject lecturers: Dr. Zoltán Léka				
Prerequisites (with code):		-		
Weekly hours:	Lecture: 2	Seminar.: 1	Lab. hours: 0	Consultation: 0
Way of assessment:	Final grade based on two midterm exams			
Course description:				
Goal: Our goal is to introduce the fundamental concepts of functional analysis and Lebesgue integration. These concepts are crucial in modern study of probability theory, partial differential equations, and quantum theory.				
Course description: The problem of the measure. Lebesgue integral, convergence theorems. Lebesgue and Riemann integrals. Study of Hilbert spaces with orthogonal systems, duality.				

Lecture schedule					
Education week	Topic				
1.	Introduction to measure theory				
2.	Exterior measure and Lebesgue measure of \mathbb{R}^d				
3.	Measurable functions and their properties				
4.	Lebesgue integral				
5.	Convergence theorems: Fatou lemma, Monotone convergence theorem and Lebesgue's dominated theorem				
6.	1 st midterm exam				
7.	General measures and Lebesgue L_p -spaces				
8.	Differentiation: absolute continuous functions				
9.	Functions of bounded variations				
10.	Introduction to Hilbert spaces, normed spaces				
11.	Geometry of Hilbert spaces, inner product spaces				
12.	Duality, orthogonal basis of L_2 spaces, integral operators, kernels				
13.	2 nd midterm exam				
14.	Resit exam				
Midterm requirements					
	<table> <tr> <th>Education week</th><th>Topic</th></tr> <tr> <td>6, 13</td><td>Midterms</td></tr> </table>	Education week	Topic	6, 13	Midterms
Education week	Topic				
6, 13	Midterms				

Final grade calculation methods

Achieved result	Grade
89%-100%	excellent (5)
76%-88<%	good (4)
63%-75<%	average (3)
51%-62<%	satisfactory (2)
0%-50<%	failed (1)

Type of exam

To get the signature, one needs to accomplish at least 50% of the weekly home assignments. There will be two written midterms.

Type of replacement

At the last week of the semester one can have a resit exam.

References

Mandatory:

E. Stein: Real Analysis

Recommended:

Rynne and Youngson: Linear Functional Analysis