MATH-404

Functional analysis II

Braun Mathias

Cursus	Sem.	Type
Mathematics	BA6	Opt.

Language of teaching	English
Credits	5
Session	Summer
Semester	Spring
Exam	Written
Workload	150h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Summary

We introduce locally convex vector spaces. As an example we treat the space of test functions and the space of distributions. In the second part of the course, we discuss differential calculus in Banach spaces and some elements from nonlinear functional analysis.

Content

- Locally convex vector spaces.
- Test functions and the dual space of distributions.
- Differentiation on Banach spaces.
- Implicit function theorem and consequences on Banach spaces.
- Fixed-point theorems.
- Gradient flows in Hilbert spaces (if time permits).

Keywords

Locally convex vector spaces, test functions and distributions, analysis on Banach spaces, nonlinear functional analysis.

Learning Prerequisites

Required courses

Analysis I-IV, Linear algebra I-II, Metric and topological spaces, Functional analysis I.

Important concepts to start the course

Basic notions from topology, Banach spaces, differential calculus in finite dimensions, Lebesgue integration.

Learning Outcomes

By the end of the course, the student must be able to:

- Formulate the definitions and results of the lectures
- Apply the concepts learned in class to concrete problems
- Analyze problems related to the topics treated in the course
- Choose an appropriate method to solve a given problem
- Prove some elementary statements about the topics of the course

- Solve exercises on the topics

Teaching methods

Weekly lectures with instructor and weekly exercise sessions with assistant.

Expected student activities

Attending the lectures and solving the exercises.

Assessment methods

Written exam.
Dans le cas de l'art. 3 al. 5 du Règlement de section, l'enseignant décide de la forme de l'examen qu'il communique aux étudiants concernés.

Supervision

Office hours	No
Assistant.e.s	Yes
Forum	Yes

Resources

Virtual desktop infrastructure (VDI)

No

Bibliography

W. Rudin, Functional Analysis. McGraw-Hill, INc., 2nd ed. 1991.
M. Reed and B. Simon. I: Functional analysis. Vol. 1, Orlando Academic Press, 1980.
K. Deimling, Nonlinear Functional Analysis, Springer 1985.

Ressources en bibliothèque

- Find the references at the Library

Notes/Handbook

Lecture notes will be available in moodle.

Moodle Link

- https://go.epfl.ch/MATH-404