MATH-405

Harmonic analysis

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Cursus	Sem.	Type
Ing.-math	MA2, MA4	Opt.
Mathematics for teaching	MA2, MA4	Opt.
Mathématicien	MA2, MA4	Opt.

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

Summary

An introduction to methods of harmonic analysis. Covers convergence of Fourier series, Hilbert transform, Calderon-Zygmund theory, Fourier restriction, and applications to PDE.

Content

-Fourier series, convergence and summability.
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-Hilbert transform.
-Calderon-Zygmund theory of singular integrals.
-Liitlewood-Paley theory.
-Fourier restriction.
-Applications to dispersive PDE.

Keywords

Fourier series, convergence, singular integrals, Calderon-Zygmund theory, Fourier restriction.

Learning Prerequisites

Required courses

Analyse I - IV, Algebre lineaire I et II.

Recommended courses

Analyse I - IV, Algebre lineaire I et II.

Important concepts to start the course

Understand key concepts of real analysis, such as measure and Lebesgue integral. Be able to construct a rigorous mathematical argument.

Learning Outcomes

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

- Analyze convergence of Fourier series
- Examine bounds for singular integrals

- Prove bounds for dispersive PDE

Transversal skills

- Communicate effectively with professionals from other disciplines.
- Access and evaluate appropriate sources of information.
- Give feedback (critique) in an appropriate fashion.

Teaching methods

Two hours ex cathedra lectures, two hours of exercises led by teaching assistant.

Expected student activities

Attend lectures and exercise sessions, read course materials, solve exercises.

Assessment methods

Oral exam at the end of course.
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
Assistants	Yes
Forum	No

Resources

Bibliography

-Classical multilinear harmonic analysis by C. Muscalu and W. Schlag.
-Singular integrals and differentiability properties of functions by E. Stein.

Notes/Handbook

No.

Websites

- http://pde.epfl.ch