

MATH-205

Analysis IV - Lebesgue measure, Fourier analysis

Colombo Maria

Cursus	Sem.	Type
Mathematics	BA4	Obl.

Language of teaching	English
Credits	7
Session	Summer
Semester	Spring
Exam	Written
Workload	210h
Weeks	14
Hours	5 weekly
Lecture	3 weekly
Exercises	2 weekly
Number of positions	

Summary

Learn the basis of Lebesgue integration and Fourier analysis

Content

Lebesgue integral

- Measurable sets and functions
- Lebesgue integral
- Monotone and dominated convergence theorems
- L^p spaces

Fourier analysis

- Fourier series
- Introduction to Fourier transform
- Applications to partial differential equations

Learning Prerequisites**Required courses**

Analysis I, II, III

Learning Outcomes

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

- Describe the fundamental concepts on the Lebesgue measure, the Lebesgue integration and the Fourier series/transform
- Define the objects and prove their properties
- Solve exercises and identify meaningful examples
- Use the Fourier series/transform to solve linear PDEs

Teaching methods

Lectures and assisted/discussed exercises

Assessment methods

- Written exam. A midterm will be organized and the final grade will be assigned according to a formula like

Final grade = $\max \{ \text{Final grade}, 0.4 * \text{Midterm grade} + 0.6 * \text{Final grade} \}$

Supervision

Assistants Yes

Resources

Bibliography

Polycopié of the course

T. Tao: "Analysis II"

B. Dacorogna: Polycopié

E. Stein: "Real analysis: measure theory, integration, and Hilbert spaces"

E. Stein: "Fourier analysis: an introduction"

S.D. Chatterji: "Cours d'analyse 1 et 3" PPUR

S.D. Chatterji: "Equations différentielles ordinaires et aux dérivées partielles"

Ressources en bibliothèque

- [Analysis II / Tao](#)
- [Polycopié / Dacorogna](#)
- [Real analysis / Stein](#)
- [Fourier analysis / Stein](#)
- [Cours d'Analyse \(volume 1\) / Chatterji](#)
- [Equations différentielles ordinaires et aux dérivées partielles / Chatterji](#)

Moodle Link

- <https://go.epfl.ch/MATH-205>

Prerequisite for

Master cycle of mathematics