MATH-303

Measures and integration

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Cursus	Sem.	Type
Mathematics	BA5	Opt.
Statistics	MA1, MA3	Opt.

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

Summary

This course provides an introduction to the theory of measures and integration on abstract measure spaces.

Content

Measure theory serves as a foundation for many areas of modern analysis, such as harmonic analysis, functional analysis, probability theory, and ergodic theory. This course focuses on buliding up the general framework and introducing frequently-used tools in measure theory. Topics include:

- Abstract measure spaces
- Lebesgue integration
- Convergence theorems
- Product measures and Fubini's theorem
- L^p spaces
- Borel measures on locally compact Hausdorff spaces
- Decomposition and differentiation of measures

Keywords

analysis, measure theory, Lebesgue integration, L^p spaces

Learning Outcomes

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

- Define fundamental objects such as sigma-algebras, measures, measurable functions, etc.
- Apply the main theorems to problems in analysis and other areas
- Prove results in measure theory
- Identify common proof techniques used in analysis

Transversal skills

- Use a work methodology appropriate to the task.
- Continue to work through difficulties or initial failure to find optimal solutions.
- Demonstrate a capacity for creativity.
- Demonstrate the capacity for critical thinking

Teaching methods

Weekly lectures and exercise sessions

Expected student activities

Participate in lectures and exercise sessions and complete homework problems outside of class meetings

Assessment methods

Written homeworks and a written exam

Supervision

Office hours	No
Assistants	Yes
Forum	Yes

Resources

Bibliography

- G. B. Folland, *Real Analysis* (second edition), John Wiley & Sons, Inc., New York, 1999.
- W. Rudin*, Real and Complex Analysis* (third edition), McGraw-Hill Book Co., New York, 1987.
- E. M. Stein and R. Shakarchi, *Real Analysis*, Princeton University Press, Princeton, NJ, 2005.
- T. Tao, *Introduction to Measure Theory*, American Mathematical Society, Providence, RI, 2011.

Notes/Handbook

Lecture notes will be provided

Moodle Link

- https://go.epfl.ch/MATH-303