EPFL

MATH-400

Advanced analysis I

Ruppen Hans-Jörg

Cursus	Sem.	Type
Bioengineering	MA1, MA3	Opt.
SC master EPFL	MA1, MA3	Opt.
Sciences du vivant	MA1, MA3	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	Oral
Workload	120h
Weeks	14
Hours	**4 weekly**
Courses	2 weekly
Exercises	2 weekly
Number of positions	

Remark

Advanced Analysis I and Advanced Analysis II must be taken together as a whole

Summary

Getting access to the concept of measures and probabilities, to that of Lebesgue's integral as well as to the idea of Fourier.

Content

1. Measuring sets
2. Integrating measurable functions
3. Convergence theorems
4. Fubini's theorem
5. Normed spaces
6. Banach spaces

Keywords

System of sets, fields, Lebesgu-Stieltjes measures, probabilities measures generated by monotn mappings, Lebesgue's integral, integrability and quasi-integrability, monotone convergence theorem, deminated convergence theorem, Fubini's therem, noremd Spaces, Banach spaces, Lp-spaces

Learning Outcomes

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

- Characterize the domain of a measure
- Construct measures and probability spaces
- Explain Lebesgue's integral
- Compare different notions of integrals
- Formulate hypotheses for the validity of results as interchanging the order of sums, integrals and limits
- Explain the main concepts and propositions presented in the lecture
- Exploit the main propositions in concrete examples

Transversal skills

- Assess one's own level of skill acquisition, and plan their on-going learning goals.
- Continue to work through difficulties or initial failure to find optimal solutions.

• Communicate effectively with professionals from other disciplines.

Teaching methods

Ex cathedra lecture with exercises

Expected student activities

Understanding the mathematical language necessary for a deep understanding of the notions of measure and integral as well as of the notion of function spaces.

Assessment methods

Oral exam

Supervision

Office hours	No
Assistants	No
Forum	No

Resources

Bibliography

M. Capinski, E. Kopp : Measure, Integral and probability, Springer.
Y. M. Berezansky, Z. G. Sheftel, G. F. Us: Functiona Analysis (I & II), Birkhäuser ISBN 3-7643-5344-9
C. Gasquet, P. Witomski: Fourier Analysis and Applications, Springer, ISBN 0-387-98485-2
W. Kammler: A First Course in Fourier AnalysisDavid, Online ISBN: 9780511619700 Hardback ISBN: 9780521883405 Paperback ISBN: 9780521709798

Ressources en bibliothèque

• A First Course in Fourier Analysis David / Kammler
• Measure, Integral and probability / Capinski
• Fourier Analysis and Applications / Gasquet
• Functiona Analysis / Berezansky

Notes/Handbook

Lecture notes: Advanced Analysis I by Hans-Jörg Ruppen (Librairie La Fontaine)

Websites

• http://cmspc11.epfl.ch/hjr
• https://cmspc11.epfl.ch/AFNextGen

Prerequisite for

Advanced Analysis II, probabilities, signal processing