האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

MEASURE THEORY - 80517

Last update 14-04-2015

HU Credits: 4

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Mathematics

Academic year: 3

Semester: 1st Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Prof. Yuri Kifer

Coordinator Email: kifer@math.huji.ac.il

Coordinator Office Hours: By appointment.

Teaching Staff:

Prof Tamar Ziegler-Lehavi
Ariel Rapaport

Course/Module description:
Algebras of sets. Caratheodory extension theorem. Outer and inner measures, measurable sets. Lebesgue measure and its properties, nonmeasurable sets.
Measurable functions, convergence almost everywhere and in measure.
Lebesgue integral. Limit theorems for integrals. Spaces of integrable functions.
Product spaces and Fubini's theorem. Radon-Nikodim Theorem.
Lebesgue density theorem, Vitali covering theorem, differentiation and integration.
Hausdorff measure and Hausdorff dimension.

Course/Module aims:
See learning outcomes.

Learning outcomes - On successful completion of this module, students should be able to:
To define the notion of an Algebra of sets, and being able to prove some of its properties.
To study about the Lebesgue Integral and its applications.

To learn about the Lebesgue Integral and its applications.

To learn about the convergence of measurable functions.

To use measure theory to understand other mathematical disciplines.

Attendance requirements(%):
0

Teaching arrangement and method of instruction: Lecture + exercise.

Course/Module Content:
Lebesgue measure on the real line, measurable and non-measurable sets. Measurable functions and Lebesgue integral. Limit theorems. Spaces of integrable

functions. Lebesgue density theorem, Vitali covering theorem, differentiation and integration. Measures on general spaces.
Carathodory's extension theorem. Integration on a general measure space. Product spaces and Fubini's theorem. Radon-Nikodym theorem.
Hausdorff measure and Hausdorff dimension.

Required Reading:
none

Additional Reading Material:
Stein and Shakarchi - Princeton lectures in analysis III Paul Halmos - Measure theory
A.N. Kolmogorov and S.V. Fomin, Elements of the Theory of Functions and Functional Analysis, Dover, 1999.
Introduction to Modern Analysis – Lindenstrauss, Stein, Fezi

Course/Module evaluation:
End of year written/oral examination 90 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 0 %
Assignments 10 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information:
none