



The Hebrew University of Jerusalem

Syllabus

Analysis of Boolean functions - 80585

Last update 20-09-2024

HU Credits: 3

Degree/Cycle: 2nd degree (Master)

Responsible Department: Mathematics

Academic year: 2025

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Noam Lifshitz

Coordinator Email: noamlifshitz@gmail.com

Coordinator Office Hours:

Teaching Staff:

Prof. Noam Lifshitz

Course/Module description:

Analysis of Boolean functions is a deep field of study with applications in probability, theoretical computer science, economics, group theory, and representation theory.

Throughout the course we will understand the basic tools in the study of Boolean functions and learn how to apply them.

The course contains difficult exercises and therefore is mainly intended for excelling students in their second or third year and for Master's students

Course/Module aims:

Learning outcomes - On successful completion of this module, students should be able to:

apply the technique that translates hypercontractive statement to anti-concentration of measures of sparse $\{0,1\}$ -valued functions.

transform results about anti-concentration to combinatorial counting statements

Attendance requirements(%):

Teaching arrangement and method of instruction:

Course/Module Content:

*Fourier-Walsh and Linearity testing
The noise operator and social choice theory
Hypercontractivity
Analysis in Gaussian space
The invariance principle
Hypercontractivity for global functions
Applications to extremal combinatorica and group theory*

Required Reading:

Analysis of Boolean functions of Ryan O'Donnell

Additional Reading Material:

Grading Scheme:

Essay / Project / Final Assignment / Home Exam / Referat 70 %
Submission assignments during the semester: Exercises / Essays / Audits / Reports
/ Forum / Simulation / others 30 %

Additional information: