



## *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:* 0

*Semester:* 2nd Semester

*Teaching Languages:* Hebrew

*Campus:* E. Safra

*Course/Module Coordinator:* Noam Lifshitz

*Coordinator Email:* [noamlifshitz@gmail.com](mailto:noamlifshitz@gmail.com)

*Coordinator Office Hours:*

*Teaching Staff:*

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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*

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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: