



# *The Hebrew University of Jerusalem*

## *Syllabus*

### *Analysis of Boolean functions - 80585*

*Last update 12-08-2023*

*HU Credits: 2*

*Degree/Cycle: 1st degree (Bachelor)*

*Responsible Department: Mathematics*

*Academic year: 0*

*Semester: 1st Semester*

*Teaching Languages: English*

*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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Dr. 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.*

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:

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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: