האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

HARMONIC ANALYSIS - 80908

Last update 26-09-2024

HU Credits: *4*

Degree/Cycle: *2nd degree (Master)*

Responsible Department: *Mathematics*

Academic year: *0*

Semester: *1st Semester*

Teaching Languages: *Hebrew*

Campus: *E. Safra*

Course/Module Coordinator: *Prof Alexander Sodin*

Coordinator Email: *alexander.sodin@mail.huji.ac.il*

Coordinator Office Hours: *Sundays 14:20-15:20 or by appointment*

Teaching Staff:

Prof. Alexander Sodin

Course/Module description:

The course will provide an introduction to harmonic analysis on the three simplest groups: circle, the integers, and the real numbers. We shall develop the general theory explaining how and in which sense can a function be approximated by linear combinations of "harmonics", and also provide applications in various parts of mathematics (analysis, partial differential equations, probability theory and number theory).

Course/Module aims:

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

apply the theory and methods of harmonic analysis.

Attendance requirements(%):

Teaching arrangement and method of instruction: Three hours of lectures, and an hour devoted to the discussion of problems from the homework assignments.

Course/Module Content:

Fourier series:

– convergence and divergence in various senses
– Cesaro summation
– Wiener algebra and Wiener lemma
– Fourier series of measures
– Fourier series and complex analysis.

Applications:

– diagonalisation of operators commuting with shifts
– random walk on the lattice
– heat equation
– polynomial approximation
– the spectral theorem for unitary operators
– equidistribution modulo one

Fourier transformation:

– construction
– Poisson formula and applications
– additional topics

Required Reading:
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Additional Reading Material:
Y. Katznelson, "Introduction to harmonic analysis"

H. Dym and H. McKean, "Fourier Series and Integrals"

H. Montgomery, "Early Fourier Analysis"

Grading Scheme:
Written / Oral / Practical Exam 70 %
Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 30 %

Additional information: