האוניברסיטה העברית בירושלים
THE HEBREW UNIVERSITY OF JERUSALEM

The Hebrew University of Jerusalem

Syllabus

Random Signals - Gaussian Stationary Functions - 80710

Last update 01-09-2021

HU Credits: 2

Degree/Cycle: 2nd degree (Master)

Responsible Department: Mathematics

Academic year: 0

Semester: 1st Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Dr. Ohad Noy Feldheim

Coordinator Email: ohad.feldheim@mail.huji.ac.il

Coordinator Office Hours:

Teaching Staff:
Prof Feldheim Ohad

Course/Module description:
The course aims at Master And Ph.D students. IT will open with introduction to random functions, and be focused around Gaussian stationary functions, using tools from classical analysis (real, harmonic and complex).
This is a rich subjection with applications in physics and engineering.
We shall try to present general principles such as concentration of measure, rarity of events, coupling, ergodicity, decomposition in to independent processes etc'

Course/Module aims:
Providing a broad and up-to-date basis for the theory of Gaussian processes and the probabilistic treatment of random functions.

Learning outcomes - On successful completion of this module, students should be able to:
transfer between spectral and temporal representation of a process. Decompose a process to basis functions. Compute the expected number of zeroes and its variance and understand what governs these. Provide exponential and sub-exponential estimates for events of no-zeroes or abnormal amount of zeroes. Control the main tools for handling Gaussian functions.

Attendance requirements(%):

Teaching arrangement and method of instruction: Lecture and homework.

Course/Module Content:
Examples of random sequences and functions, 0-1 laws, Kolmogorov's inequality, continuity conditions, series in Hilbert space and series of analytic functions. Gaussian free field, high dimensional central limit theorem. Induced metric. Continuity and boundedness. Isoperimetry, convexity and log-concavity, Slepian's lemma and Anderson's Lemma.
Ornstein–Uhlenbeck process. Zeroes of Gaussian functions. Ball inequalities. Other or additional topics may be studied.

Required Reading:
Lecture notes.

Additional Reading Material:
An Introduction to Continuity, Extrema, and Related Topics for General Gaussian Processes
Book by Robert J. Adler

Course/Module evaluation:
End of year written/oral examination 0 %
Presentation 0 %
Participation in Tutorials 0 %
Project work 100 %
Assignments 0 %
Reports 0 %
Research project 0 %
Quizzes 0 %
Other 0 %

Additional information: