

The Hebrew University of Jerusalem

Syllabus

Probability and Random Processes - 52817

Last update 30-07-2021

HU Credits: 6

Degree/Cycle: 2nd degree (Master)

Responsible Department: Statistics

Academic year: 0

Semester: 1st Semester

Teaching Languages: Hebrew

Campus: Mt. Scopus

Course/Module Coordinator: Prof. Offer Kella

Coordinator Email: offer.kella@gmail.com

Coordinator Office Hours: By appointment

Teaching Staff:

Prof Offer Kella

Course/Module description:

In this course we will learn important concepts in modern probability theory and stochastic processes.

The topics that we will learn will include: axioms, independence, Borel-Cantelli Lemma, various modes of convergence, expected value and convergence theorems, Holder's and Minkowski's inequalities, monotone class theorem, pseudo-inverse function of a cumulative distribution function, stochastic order, Tonelli-Fubini Theorem, characteristic functions, conditional expectation, stopping times and discrete time martingales, discrete time Markov Chains.

Course/Module aims:

The main goal of the course is to introduce to the students basic tools in modern probability and (certain) stochastic processes.

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

- 1. To quote and apply the definitions and results that were presented in the course.*
- 2. To restore independently some of the proofs of the claims that were stated in the course.*
- 3. To describe at least one example in the context of any claim.*
- 4. To prove independently simple variants of claims that were stated in class.*

Attendance requirements(%):

No attendance requirement

Teaching arrangement and method of instruction: Four teaching units will consist of theoretical material and examples and two teaching units will be for the purpose of problem solving (homework and otherwise).

Course/Module Content:

Definition of Probability space. Random variables, Fatou's Lemma, monotone classes. Fubini's Theorem, the lemma of Borel-Cantelli. Different concepts of convergence.

Central limit theorem, stochastic processes, Markov chains, Poisson process, martingales, stopping times, Wald's lemma, if time permits: Brownian motion.

Required Reading:

There is no required reading material. It is warmly recommended to read the material that will be advertised in the course website.

Additional Reading Material:

J. Jacod & P. Protter, Probability Essentials. 2nd edition.

P. Billingsley, Probability and Measure.

R. Durrett, Probability: Theory and Examples.

S.M. Ross and E.A. Pekoz A Second Course in Probability.

D. Williams, Probability with Martingales.

Course/Module evaluation:

End of year written/oral examination 100 %

Presentation 0 %

Participation in Tutorials 0 %

Project work 0 %

Assignments 0 %

Reports 0 %

Research project 0 %

Quizzes 0 %

Other 0 %

Additional information: