

The Hebrew University of Jerusalem

Syllabus

Computational Physics of Complex Systems - 77732

Last update 06-03-2023

<u>HU Credits:</u> 3

Degree/Cycle: 2nd degree (Master)

Responsible Department: Physics

<u>Academic year:</u> 0

Semester: 2nd Semester

Teaching Languages: English and Hebrew

<u>Campus:</u> E. Safra

<u>Course/Module Coordinator:</u> Prof. Ofer Biham

Coordinator Email: ofer.biham@mail.huji.ac.il

<u>Coordinator Office Hours:</u> Wednesday at 17:00-18:00

Teaching Staff:

Prof Ofer Biham

Course/Module description:

The focus of this course is on computational methods and their applications in the field of statistical physics and the theory of complex systems.

Course/Module aims:

The aim of the course is to teach the skills of using computational methodologies in the contexts of statistical physics and complex systems

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

Upon completion of this course the students will be able to solve a variety of problems in statistical physics and complex systems using Monte Carlo simulations and related computational techniques

Attendance requirements(%):

70%

Teaching arrangement and method of instruction: The instruction is based on frontal teaching and discussions in class, as well as homework problem sets in which the students apply the computational methodologies, write computer codes, perform computer simulations and analyze the results.

Course/Module Content:

Markov processes, Monte Carlo simulations, cluster algorithms, kinetic Monte Carlo methods, chemical master equation, rate equations, cellular automata, fractal structures and power-laws, complex networks and dynamical processes on networks.

<u>Required Reading:</u> None

<u>Additional Reading Material:</u> Newman and Barkema, Monte Carlo methods in statistical physics

Course/Module evaluation:

End of year written/oral examination 80 % Presentation 0 % Participation in Tutorials 0 % Project work 0 % Assignments 20 % Reports 0 % Research project 0 % Quizzes 0 % Other 0 %

<u>Additional information:</u> None