

The Hebrew University of Jerusalem

Syllabus

More is Different: from individual behavior to economic and social crises - 77139

Last update 24-08-2021

HU Credits: 2

Degree/Cycle: 1st degree (Bachelor)

Responsible Department: Physics

Academic year: 0

Semester: 1st Semester

Teaching Languages: English

Campus: Mt. Scopus

Course/Module Coordinator: Sorin Solomon

Coordinator Email: sorin@huji.ac.il

Coordinator Office Hours: By appointment;

Teaching Staff:

Prof Sorin Solomon

Course/Module description:

During the last decade, progress in theory and access to massive empirical data allowed the extension of the physics methods to crises in a wide range of disciplines. I will review the main paradigms that emerged up to this moment.

The "More is Different" paradigm bridging between various disciplines

The "Positive Feedback Loop" paradigm leading to exponentiation of local small events.

The Peer-to-Peer "contagion" paradigm leading to "viral propagation" in social networks.

The "Importance of being Discrete" paradigm leading to (mis-)adaptive collective dynamics: epidemics, economic booms and crashes, social movements, revolutions, government overthrows.

I will review the application of methods and ideas from physics to crises in social and human sciences.

We will present specific applications in:

Schumpeter creative destruction in economic growth,

Effects of nationalization vs privatization in countries development

Dynamics of social and technological innovation propagation.

Control of epidemics and economic crisis propagation,

Effects of education on economic growth,

Power law distribution of wealth and effects of social policy on wealth inequality

Globalization and monoculture effects on financial /economic instability / development

ecological patterns and resilience,

emergence of altruism and cooperation,

immune system dynamics,

innovation diffusion and adoption.

Course/Module aims:

- Give general knowledge level of the methods and ideas from natural sciences that have been adopted and used in the study of crises in social and humanistic research

- Prepare capabilities that - if needed in future projects - the student will be able to select and learn at practitioner level those methods

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

-Recognize and describe various methods from natural sciences that have been applied to the study of crises in social and human sciences

-Recognize and describe the main assumptions and results of those applications

-Recognize and describe the empirical facts that were fit , explained or predicted by those methods

- Evaluate and sketch the applicability of the methods to additional social and humanistic systems.

Attendance requirements(%):

70%

Teaching arrangement and method of instruction: Zoom

Course/Module Content:

Emergence of wealth inequality in simple economic systems.

Emergence of Pareto law of social wealth distribution in economic models with social security.

*Schumpeter theory
of economic development based on creative destruction.*

Generalization of the global model of economic growth to multi-agents distributed economies.

Effects of various policies of wealth social redistribution.

Emergence of altruism and cooperation as a survival strategy

Required Reading:

See materials that I uploaded in the Moodle course page.

<https://www.europhysicsnews.org/articles/ePN/pdf/2003/02/ePN03204.pdf>

<https://arxiv.org/ftp/arxiv/papers/1402/1402.0153.pdf>

<http://www.sciencemag.org/content/285/5433/1495.summary>

<https://www.newscientist.com/article/mg16622374-200-ordinary-miracles/>

Additional Reading Material:

Recommended to look at but not necessary to read in detail

- *The Microscopic Simulation of Financial Markets: From Investor Behavior to Market Phenomena* Moshe Levy, Haim Levy, Sorin Solomon Academic Press, 2000 - Business & Economics - 300 pages

- *Four Horsemen: The Survival Manual* [Paperback]
Ross Ashcroft (Author), Mark Braundhttp://www.amazon.com/Four-Horsemen-Survival-Ross-Ashcroft/dp/0956398510/ref=sr_1_1?s=books&ie=UTF8&qid=1372174097&sr=1-1&keywords=Four+Horsemen%3A+The+Survival+Manual+%5BPaperback%5D

- *Cracking the Ad Code* Jacob Goldenberg, Amnon Levav, David Mazursky, Sorin Solomon Cambridge University Press, 2009 - Business & Economics - 168 pages

- *Debunking Economics - Revised and Expanded Edition: The Naked Emperor Dethroned?* [Paperback]

Steve Keen <http://www.amazon.com/books/dp/1848139926>

- *Essentials of Econophysics Modelling* Frantisek Slanina, (Oxford University Press, in print 2013)

- *Econophysics and Physical Economics* [Hardcover]

Peter Richmond (Author), Jurgen Mimkes (Author), Stefan Hutzler (Author) OUP 2013

http://www.amazon.com/Econophysics-Physical-Economics-Peter-Richmond/dp/0199674701/ref=sr_1_1?s=books&ie=UTF8&qid=1372174016&sr=1-1&keywords=peter+richmond+mimkes

- *The Economics Anti-Textbook: A Critical Thinker's Guide to Microeconomics* [Paperback]

Rod Hill (Author), Anthony Myatt (Author) [http://www.amazon.com/The-Economics-Anti-Textbook-Critical-](http://www.amazon.com/The-Economics-Anti-Textbook-Critical-Microeconomics/dp/1842779397/ref=pd_sim_b_2/186-8466868-6344422)

[Microeconomics/dp/1842779397/ref=pd_sim_b_2/186-8466868-6344422](http://www.amazon.com/The-Economics-Anti-Textbook-Critical-Microeconomics/dp/1842779397/ref=pd_sim_b_2/186-8466868-6344422)

Grading Scheme:

Additional information:

According to the instructions in the past from the university leadership, we must find alternatives to the usual final exam in writing in case the corona situation will not permit it.

I decided accordingly that in that case the assessments would be based on assignments that the students would write each week .

As an other alternative, the students may choose to submit an Essay/Project work at the end of the course.

Above , in the Course/Module assessment I wrote 25% for each of the alternatives because the form requires the sum to be 100, but any of these options gives actually 100% of the grade.