



The Hebrew University of Jerusalem

Syllabus

TOPICS IN EPIGENETICS - 71121

Last update 02-05-2024

HU Credits: 2

Degree/Cycle: 2nd degree (Master)

Responsible Department: Animal Husbandry and Veterinary Sciences

Academic year: 0

Semester: 2nd Semester

Teaching Languages: English

Campus: Rehovot

Course/Module Coordinator: Lior David

Coordinator Email: lior.david@mail.huji.ac.il

Coordinator Office Hours: Sundays, 12:00 - 13:00

Teaching Staff:

Prof Lior David

Course/Module description:

Layers of regulation of gene expression. DNA methylation, histone modifications, chromatin and chromosome structure. Dosage compensation. Genomic imprinting and epialleles. Epigenetic contribution to commercially important phenotypes. Germ and stem cells and gene expression programs in development. The relationships among epigenetics, inheritance and evolution.

Course/Module aims:

Course aims

- 1. Studying mechanisms of gene expression regulation as a way to determine phenotypes*
- 2. Studying mechanisms affecting chromatin structure and function and the inheritance of chromatin states.*
- 3. Studying epigenetic phenomena important for agriculture and medicine and their inheritance.*
- 4. Studying epigenetics as a mediator in adaptation of the organism to its living environment.*

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

Learning outcome:

- 1. A change in the perception of the genotype-to-phenotype relationship.*
- 2. Deeper understanding of the complexity of gene expression regulation.*
- 3. More comprehensive knowledge of mechanisms determining the cell and tissue function.*
- 4. Recognizing epigenetics as an important factor in adaptation of the organism to its living environment.*

Attendance requirements(%):

Attendance is critical for understanding but it is not mandatory.

Teaching arrangement and method of instruction: The course includes frontal lectures and discussion of questions and problems with the students. At the end, the students are required to write a short essay and take an exam that are based on reading up-to-date scientific papers relating to subjects of the course.

Course/Module Content:

- 1 Introduction; What is epigenetics?; Chromatin structure; Histones modifications
- 2 DNA methylation -Enzymes; Replication; Patterns; Evolution
- 3 Histones - Types; Modifications; Enzymes; Histone code
- 4 Histone variants - Replication; Centromers; Special variants; Meiotic drive
- 5 Nucleosomes - Positioning; Sliding; Transcription; Nucleosome code;
- 6 ncRNA, Polycomb and Trithorax
- 7 Long ncRNA, Chr. X inactivation
- 8 Embryos, Development
- 9 Embryos, Development
- 10 Genomic imprinting
- 11 Paramutations
- 12 Evolution
- 13 Evolution

Required Reading:

Towards the end, the students are required to read scientific papers for the final exam.

Additional Reading Material:

Epigenetics - Eds. Allis, Jenuwein and Reinberg. CSHL press.
Current articles according to subjects

Grading Scheme:

Written / Oral / Practical Exam 60 %
Essay / Project / Final Assignment / Home Exam / Referat 40 %

Additional information:

The course will be given in English unless all students are Hebrew speaking