The Hebrew University of Jerusalem

Syllabus

Evolution and Development (evo-devo) - 90708

Last update 05-03-2025

HU Credits: 2

Degree/Cycle: 2nd degree (Master)

Responsible Department: Cellular & Developmental Biology

Academic year: 0

Semester: 2nd Semester

Teaching Languages: Hebrew

Campus: E. Safra

Course/Module Coordinator: Dr. Uri Gat

Coordinator Email: uri.gat@mail.huji.ac.il

Coordinator Office Hours: By appointment

Teaching Staff:

Dr. Uri Gat

Course/Module description:

The study of the evolutionary changes in development, which is responsible for the change in the body patterns of all organisms, is considered by many biologists to be a dynamic and fast evolving field. This course is a graduate level seminar based course that covers the interface between evolutionary biology and developmental biology. The course will discuss how changes in development mediate evolutionary changes and how development itself evolves. During the course examples of research in evolutionary developmental biology will be given, ranging from species level and ecological changes, up to novelties and changes in overall body plan. The molecular base of processes in evolutionary development will be emphasized and discussed at a high level. The course will cover the current advance in the science of what is considered to be at the front of both development and evolution, the synthesis of which greatly contributes to both of these important disciplines and much beyond.

Course/Module aims:

During the course examples of research in evolutionary developmental biology will

be given, ranging from species level and ecological changes, up to novelties and changes in overall body plan. The molecular base of processes in evolutionary development will be emphasized and discussed at a high level. The course will cover
the current advance in the science of what is considered to be at the front of both development and evolution, the synthesis of which greatly contributes to both of these
important disciplines.

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

Be familiar and understand the basic subjects in the field.
Analyze developmental results in an evolutionary context.
Find relevant literature for specific evolutionary questions

Attendance requirements(%):

It is possible to be electively absent from one course session only with prior permission obtained at least a week before.

Teaching arrangement and method of instruction: Lectures and seminars

Course/Module Content:

Part 1: introductory lectures and short student summaries (~ 7 weeks):

Week 1: Introduction to evo-devo, history, concepts & terminology
Week 2: Phylogenetic terminology. Developmental repatterning
Week 3: Types of repatterning: Hetero –chrony, topy, metry and typy – Students summaries.*
Week 4: Development of body shapes and the developmental toolkit
Week 5: The major developmental signaling pathways - Students summaries.*
Week 6: Genome level control and Gene Regulatory Networks (GRNs)
Week 7: Developmental constraints, bias, novelties, character identity

** The students will work in pairs to shortly describe the above subjects from the course textbooks.*

Part 2: Student seminars (6-7 weeks):
The students will be given a list of subjects to choose from (and they can propose their own subjects). The presentation will provide a short introduction on the subject and cover several specific key research papers that will be read, analyzed and discussed by the student. Each seminar will be 30-40 minutes long, with time for discussion (2 seminars per meeting).

Depending on the number of students who register for the course, in the last weeks of the semester, the course lecturers may present additional specific subjects in the format of a journal club.

Required Reading:

Abstracts for the students' seminars in the second part of the course and selected and up to date papers according to the subjects of the students' seminars

Additional Reading Material:

1. Evolution a developmental approach by Wallace Arthur 2011.

2.From DNA to diversity by Carroll, Grenier and Weatherbee 2001; 2005.

3. Developmental Biology/ Scott Gilbert 10th-11th ed., Relevant chapters and especially "Developmental mechanisms of evolutionary changes.

4. Principles of Development/ Lewis Wolpert 5th ed.
Relevant chapters and especially "Evolution&Development"

Grading Scheme:

Essay / Project / Final Assignment / Home Exam / Referat 25 %

Presentation / Poster Presentation / Lecture/ Seminar / Pro-seminar / Research proposal 70 %

Active Participation / Team Assignment 5 %

Additional information:

The seminars by the teacher will be given in English unless there are no English speakers while the seminars by
the students will be given in Hebrew or in English according to their preference.
A bonus will be awarded for active and continuous participation in the lectures and seminars, on attentiveness during the seminars as well as for the short presentations during the course.