

The Hebrew University of Jerusalem

Syllabus

Contemporary Breeding Approaches in Agricultural Plants - 73939

Last update 04-03-2025

HU Credits: 2

Degree/Cycle: 2nd degree (Master)

Responsible Department: Plant Sciences in Agriculture with specialization in Biotechnology

Academic year: 0

Semester: 2nd Semester

Teaching Languages: English

Campus: Rehovot

Course/Module Coordinator: Roni Tadmor-Levi

Coordinator Email: roni.tadmor@mail.huji.ac.il

Coordinator Office Hours: By appointment

Teaching Staff:

Dr. Roni Tadmor

Course/Module description:

Consumption of plants for food, medicine and recreation goes back to the beginning of our history. In this course the genetics of traits valuable for humans and how breeding is used to improve them will be considered. Relevant principals of population genetics and quantitative genetics will be taught that allow understanding the domestication process of plants and the differences from their wild relatives. Using these same principals the methodology and rational of genetic breeding will be demonstrated. Lastly, more advanced topics in breeding and biotechnological tools that make use of molecular information will be presented and their potential advantages for breeding will be discussed. Examples from contemporary breeding programs in Israel will be given.

Course/Module aims:

1. Understanding the major principles of population genetics and quantitative genetics.
2. Obtaining sufficient knowledge to understand the genetic principles and considerations used for plant breeding.
3. Understanding of how the biology of each species and the traits of interest affect the breeding program.
4. Obtaining current knowledge in methods and terms of modern genetics, which will enable students to stay updated in the field on their own.

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

1. Recognize the major areas of genetics.
2. Describe of principles underlying the acts of breeding programs.
3. Approach breeding of new traits, in different species, pending on their biology.
4. Gain new knowledge and remain updated in this field.

Attendance requirements(%):

Attendance is recommended, but not mandatory

Teaching arrangement and method of instruction: Frontal learning, online learning, short explanatory videos and online quizzes. Students will be given exercises for

home, problems in home exercise will be discussed in class.

Course/Module Content:

1. Principles in genetics. Reviewing general genetic principals relevant to breeding.
2. Principals in population genetics. Alleles and genes in populations. Genetic variation. H-W equilibrium.
3. Natural selection. Genetic drift, domestication, types of plant populations.
4. Principles of quantitative genetics. The genetic basis of quantitative traits. Dominance and epistasis. Mass selection. Heritability.
5. Other methods for selection. Estimating genetic improvement.
6. Long-term selection, Crossbreeding. Heterosis. Inbreeding.
7. DNA markers. Genetic maps. Linkage between markers and traits.
8. Biotechnology in plant breeding.
9. Genomics and advanced methods in breeding.
10. Examples of present-day plant breeding programs.

Required Reading:

None

Additional Reading Material:

None

Grading Scheme:

Written / Oral / Practical Exam 80 %

Submission assignments during the semester: Exercises / Essays / Audits / Reports / Forum / Simulation / others 20 %

Additional information: