**The Hebrew University**
**Robert H. Smith Faculty of Agriculture, Food & Environment**
**Division for International Studies in Agriculture, Food & Environment**

# Program Requirements and Course Descriptions

## Summer Program

### July 6-31 2014

## Program Requirements

- Third-year or second-year B.Sc. student* or completed B.Sc. degree in agriculture, animal sciences, plant sciences, biology or related fields from a recognized university.
- Basic courses in genetics and molecular biology.
- GPA at least 80 (B- on the letter scale).
- A high level of proficiency in all English skills, either:
    - At least 89 on the TOEFL internet-based test.
    - At least 6.7 on the IELTS.
    - Or documentation of academic studies conducted in English.

*Depending on courses taken.

## Course Descriptions

| Course # | COURSE | COURSE COORDINATORS | CREDITS |
|---|---|---|---|
| 73913 | Principles of Plant Breeding | Dr. Yonatan Elkind, Dept. of Plant Sciences & Genetics | 2 |
| 71184 | Genetic Engineering | Prof. Hanokh Czosnek<br>Prof. Berta Levavi-Sivan, Dept. of Animal Sciences | 3 |

### Principles of Plant Breeding

**Course Code:** 73913
**Cycle:** 2nd cycle
**Responsible Department:** **Plant Sciences and Genetics in Agriculture**
**Academic Year:** 2013-14
**Semester:** Summer program
**Contact Hours:** 28
**HU Credits:** 2
**Location of Instruction:** Smith Faculty
**Course coordinator:** Dr. Yonatan Elkind
**Office Hours:** By appointment
**General Prerequisites:** Basic course in genetics
**Module Description:** Students will learn the principles of plant breeding of both sexually and vegetatively-propagated crops, conservation and utilization of natural genetic variation, creation of genetic variation by classical and molecular methods, breeding methods and their adaptation to various propagation systems.
**Aims:** To study the principles of plant breeding:

- Theoretical genetic knowledge of breeding
- Biological knowledge relevant to breeding
- Widely used breeding schemes to demonstrate the principles of plant breeding

**Outcomes:**

**On successful completion of this module, students should be able to**:

Understand the structure and logic of plant breeding project and to plan a breeding project for any given crop.

**Attendance:** 93%

**Teaching arrangements and method of instruction**: Lecture and discussions based on reading assignment.

**Module Content:**

- **Introduction**: What is plant breeding, history, objectives, approaches achievements and implications
- **Genetic Variation:** The foundation of breeding, potential and available genetic variation
- **Mating and Propagation Systems:** Their effect on breeding approaches
- **Setting Breeding Objectives**
- **Quantitative Genetics**: Heritability, G x E, Genetic correlation's
- **Breeding schemes and selection methods**
- **Breeding for disease resistance**

**Required reading/literature:** Modern genetic Analysis – Griffithes et al
Principles of plant genetics and breeding – G. Acquaah
An Introduction to plant breeding Brown & Caligari

**Module Evaluation: Written Assignment** - Plan of a Breeding Project

**Additional Information:** None

## Genetic Engineering

**Course Code:** 71184
**Cycle:** 2nd cycle
**Responsible departments**: Plant Science and Animal Science
**Academic Year**: 2013
**Semester:** Summer program
**Contact hours:** 42
**HU credits**: 3
**Location of instruction**: Smith Faculty
**Course coordinators**: Prof. Hanokh Czosnek; Prof. Berta Levavi-Sivan
**Office hours**: By appointment

**General prerequisites**: Basic courses in Molecular biology and Genetics

**Module description**:

Students will learn the basics of genetic engineering. This will include manipulation of DNA, cloning and sequencing, mutagenesis and gene synthesis. The methods allowing to genetically engineer the genome of bacteria, yeast, plants and animals will be discussed. The applications of genetic engineering in biotechnology such as mass-production of proteins and metabolic pathways will be presented. The applications of genetic engineering in medicine, agriculture , food improvement and security will be analyzed. Questions related to GMOs and their safety will be discussed.

**Aims:** To provide a comprehensive understanding of the methods used by the genetic engineer in the genomics era. To provide the tools allowing to understand professional reports.

**Attendance:** Obligatory

**Teaching arrangement and method of instruction**: Lectures (2 h), weekly home assignment and discussion of exercises in class (1 h).

**Module content**:

- Manipulation of DNA: enzymes, amplification, sequencing, mutagenesis gene and genome synthesis
- Cloning in bacteria: plasmid, phage, cosmid, BAC
- Overexpression of proteins in bacteria
- Libraries: cDNA, genomics, differential, full-length
- Genetic engineering of yeast: cloning, mutagenesis, protein expression, two hybrid system
- Genetic engineering in plants: plant transformation, expression of foreign proteins, metabolic engineering
- Food improvement, resistance to biotic and abiotic stresses
- Genetic engineering in animals: farm animals and fish
- Application in human medicine: diagnostic, gene therapy

**Required reading/literature**: Mentioned throughout the lectures.

**Module evaluation**: Written exam, 2 h, 50 questions multiple choice covering the entire course

**Program Costs:**

| **Student receiving scholarship** | **Estimated Cost in New Israeli Shekels** |
|---|---|
| Daily expenses (food, personal expenses) | 3,900 |
| Travel | Cost of airfare |
| | |
| **Student not receiving scholarship** | |
| Tuition and housing | 10,000 |
| Daily expenses (food, personal expenses) | 3,900 |
| Travel | Cost of airfare |
| Health insurance | 200 |

***Scholarships are available only for students from China and India**