



Israeli Center of Research Excellence
**Plant Adaptation to
Changing Environment**

Plant Functional Phenotyping: from basic research to crop production

**I-CORE Center on Plant Adaptation to Changing Environment
in collaboration with
Manna Center for Food Safety and Security, Tel Aviv University**

The course will focus on practical approaches to plant phenotyping, from morphology to physiology, and implications to improving crop production, particularly under environmental stress

Course Number: 0466.4105

Course Dates: July 15-17, 2018, 9:00-17:30

**Course Locations: TAU (location will be announced) - July 15,16
AGRI-HUJI, Ziman classroom (Building A) - July 17**

Form of Assessment:

1. In-class multiple choice exam will be given at the end of the course on **Thurs, July 19, 2018**

AND

2. a short open-ended take home question

Credit Points: 2

Organizer: Prof. Menachem Moshelion, HUJI (menachem.moshelion@mail.huji.ac.il)

Registration for non-TAU students:

Please complete the online form: foodsecurity.tau.ac.il/food/academics/summer/IsraeliRegForm

and upload the inter-university agreement form (אישור לימודים בינומסדי) by May 31, 2018. For questions please contact Ms. Netta Lavi: foodsecurity@post.tau.ac.il

Tentative plan:

Sunday 15/07/2018

09:15-9:30 **Menachem Moshelion** (HUJI) - Welcome and introduction

9:30-11:00 **Eyal Ben-Dor** (TAU) - The Hyperspectral Remote Sensing in the Agriculture Arena

Hyperspectral remote sensing technology is playing a major role in quantitative mapping large areas from a far of the biosphere and pedosphere. In this lecture, we will provide an insight to this promising technology with a specific emphasis on agriculture activity. Examples on vegetation monitoring and soil assessment applications will be given alongside with some basic theoretical aspects.

11:00-11:30 **Coffee Break**

11:30-13:00 **Guilia Meshulam** (TAU) - High Throughput Plant Phenotyping

High throughput plant phenotyping is aimed to observe differences between genotype expressions by monitoring the plants growth patterns throughout their development. Using high-resolution cameras to detect morphological and physiological parameters in response to biotic and abiotic stresses, combined with image processing methods, enables sequential study of numerous plants in respect to their developmental stage

13:00-14:00 **Lunch Break**

14:00- 17:30 Open tours to TAU phonemics center. As space is limited the tour will be conducted as continued tour: "first in-first out". ****attendance in the tour is mandatory****

Monday 16/07/2018

9:15-10:45 **Jose Antonio Jiménez-Berni** (CSIC) - LiDAR as the next-generation field phenotyping tool.

Light Detection And Ranging (LiDAR) or laser scanning is becoming an invaluable tool in plant phenomics applications. Its capacity to generate a 3D model of the crop canopy allows the extraction of different physiological traits of interest such as plant height, fractional cover, light interception or above-ground biomass. In this lecture, we will cover the following topics: principles of operation of LiDAR; types of laser scanners; generation and processing of point clouds; canopy modelling and trait extraction from point clouds.

10:45-11:15 **Coffee Break**

11:15-12:00 **Jose Antonio Jiménez-Berni** (CSIC) - Part B; Multi-scale field phenotyping, from the single to the farm scale

12:00-12:45 **Oded Liran (MIGAL)** - Detection of Chlorophyll a Fluorescence at Crop Canopies
Level: Remote Sensing of Photosynthesis

The measurement of Chlorophyll a fluorescence can be performed either directly on a plant's leaf or far away from the plant using remote sensing techniques. The purpose of this lecture is to give a general overview of the photosynthetic processes that are responsible for the generation of the fluorescence signal of plants, discuss the differences between the methods available to us for assessing fluorescence yield at the two spatial ranges, and to explain the additional considerations necessitated by remote sensing measurements.

12:45-14:00 **Lunch Break**

14:00- 14:45 **Oded Liran (MIGAL)** ...Continued

14:45-15:30 **Idan Ifrach (HUJI)** - Plant Image Analysis: Find the Right (and Free) Tool for Your Research

In this lecture, we will expose the researchers to some free web-based (non-commercial) tools, which will help them in analyzing their plant images.

15:30-16:00 **Coffee Break**

16:00-17:00 **Idan Ifrach (HUJI)** ...Continued

Tuesday 17/07/2018 (HUJI campus at Rehovot)

9:15-10:45 **Jhonathan Ephrath (BGU)** - Measuring Roots: Exploring the Hidden Half

Special techniques are required to investigate root systems which are rather inaccessibly hidden in the soil. Traditionally, destructive techniques have been used to access roots. Recently, non-destructive techniques were developed in order to allow direct and repeated observations. During the lecture, we will describe the different methods for measuring root development and discuss the advantages and disadvantages of those methods.

10:45-11:15 **Coffee Break**

11:15-12:45 **Rony Wallach (HUJI)** - Phenotyping Root Activity and its Dependence on Soil Water Availability

A continuous measurement of soil-water depletion rate, transpiration rate and atmospheric water demand using a newly developed lysimeter system was used for the determination of the relationship between these processes and the spatial and temporal distribution of soil water uptake rate - root activity. The outcome will be presented and discussed.

12:45-14:00 **Lunch Break**



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14:00-15:30 **Menachem Moshelion** (HUJI) - Physiological Phenotyping for Whole-Plant Water Relations

Physiological phenotyping of the whole plant is a new and effective way for functional-phenotyping of the plant response to the environment. In this lecture, we will explain the principles of the simultaneous and continuous monitoring of water relations in the soil-plant-atmosphere continuum of numerous plants under dynamic environmental conditions.

15:30-16:00 **Coffee Break**

16:00-17:15 Visit to the I-CORE Center for Functional Phenotyping of Whole-Plant Responses to Environmental Stresses (at HUJI) ****attendance in the tour is mandatory****