Application form for approval of a Midrasha course

Title in English	Formulation Approaches in Crops Protection
Title in Hebrew	גישות לפורמולציה בהגנת צמחי יבול
Lecturers	Dr. Roy Weinstain, Dr. Nir Sade, Dr. Harry Teicher (non-TAU staff, industry expert) CVs of the lecturers are attached at the end of this document
Responsible school	School of Plant Sciences and Food Security
Type of course (lecture, laboratory, field trip)	Lectures
Final grade (exam, seminar, exercises)	Final home assignment
Language of instruction	English
Semester / starting year	א' 2020/2021
Course frequency	Once every two years
Credit points	2
Admission prerequisites	BA in Chemistry, Biology, Pharmacology, Medical Sciences, Engineering
Syllabus	The course focuses on current formulations in use for crops protection. It provides fundamentals in plant physiology and anatomy as well as in active ingredients “pharmacokinetics” in plants, which present challenges in crops protection. The course focuses on cutting edge formulation strategies to overcome these challenges, from formulation chemistry to its interaction with the plants and their environment. A detailed syllabus is attached at the end of the document
Comments	Number of students is restricted to 15

	Priority will be given to ADAMA Center Fellows
TA requirements (Number and degree)	None

Syllabus

Proposed Lecture topics - Formulation Biology	
1	Overview: state of the crop protection industry, challenges and opportunities for the formulation industry. Agchem and Pharma industry innovations. Case example: follow an active ingredient from production to target site - challenges and opportunites adressed by formulating the ai. Harry
2-3	Plant physiology and anatomy: barriers to ai uptake and translocation - cuticula, trichomes, intra- and extracellular transport, xylem and phloem transport, systemic and translaminar movement. Nir
4	Fungicide formulation: pathogen biology overview; fungicide modes of action (target sites) - Case study: formulating contact vs. systemic fungicide active ingredients. And - just in case you thought this course was going to be simple - protopesticides! Harry
5	Insecticide formulation: pest biology overview; insecticide modes of action (target sites); formulating active ingredients for sucking pests vs. chewing pests. Case study: thinking smart - microencasulated insecticides against insect nests; attractants and repellants. Harry
6	Herbicide formulation: weed biology overview; herbicide modes of action (target sites). Case study: formulating herbicides for increased uptake and translocation - and why this can go wrong :-/ Harry
7	Formulation types: from simple suspension and emulsions (SC, EC, EW, CS) to formulating multiple active ingredients through complex formulations (ZC, ZW, OD) Roy
8	Pesticide application as affected by formulation "utility adjuvants": sprayers and nozzles, drift, stability (hydrolysis, dispersion vs precipitation); sprayability, handling, safety. Case study - ADAMA Biokinetic Lab checklist Roy
9	Effect of formulation "activator adjuvants" (wetters, spreaders, penetrants, translocators) on the leaf: dispersion, precipitation, droplet retention, drying time vs uptake, spreading vs uptake, cuticula effects vs. uptake; rainfastness, UV stability Harry
10	Active ingredient uptake and translocation: logP, pKa and Bromilow diagram - can we change the laws of solubility (and should we?) Roy
11	Formulation registration: toxicology and EPA's Pesticide Inert Ingredient List, phytotoxicity and how to alleviate it - case study MLT and Vitamin E); selectivity Nir
12	Understanding formulation biokinetic evaluations: considerations for trial setup (uptake, systemicity, translocation; evaluation parameters etc.) Harry
13	Formulation innovations: examples from the pharma industry; examples from biological formulations (hydrogels; chitosan; yeast microcapsules) - open discussion forum (student participation) - revisiting Lecture 1: challenges and opportunities in crop protection formulation. Harry