INDBIOT-04:	**GENERAL PLANT BIOTECHNOLOGY**
GENERAL INFORMATION	
Course Coordinator	Tihana Marček, PhD, assist. prof.
Associate(s)	Maja Ižaković, assistant
Study Programme	Interdisciplinary Graduate Study Programme in English: Biotechnology
Course Status	Obligatory
Year of Study, Semester	2nd Year / 3rd Semester
Credits (ECTS)	**4.5**
Teaching Method (number of classes)	Lectures 30; Seminars 10; Exercises 15
Expected Number of Students in the Course	25-30
COURSE DESCRIPTION	
Course Aims	
To teach students with the basic principles of *in vitro* plant cultivation in order to produce healthy plants, preservation of the parental plants (gene pool) as well as application of micropropagation in isolation of biotechnological important metabolites. Furthermore, course aim is to give basic knowledge about the usage of plant hydroponic systems in Biotechnology.	
Prerequisites for Enrolment and the Entry Competencies Required for the Course	
-	
Learning Outcomes at the Programme Level Contributed by the Course	
BIOTECH-6; INDBIOT-1	
Learning Outcomes at the Course Level	
After successful completion of this course students are expected to be able to: 1. Explain the organisation of the plant cell and plant tissue types and adopt a basic knowledge of plant cell proliferation and differentiation. 2. Learn and be able to distinguish different types of plant cell and tissue cultures. 3. Perform the subcultivation of plant material *in vitro*. 4. Realize the importance of photosynthesis in primary metabolite biosynthesis. 5. Recognize the basic interactions among primary and secondary metabolism. 6. Explain the basic principles of hydrophone plant cultivation and raise the plants in hydroponic conditions.	
Course Content	
Lectures. Plant cell and the tissues. Cell proliferation and callus growth. Plant cell differentiation, totipotency, organogenesis and apomixis. Nutrition media composition. Vegetative propagation *in vitro*. Plant cell and tissue culture. Organised and unorganised explant growth of explants *in vitro*. Micropropagation; axillar buds, culture of embrio, meristem and protoplast. Incision of meristem and inoculation of explants for micropropagation. Multiplication of plant material. Haploids and androgenesis. Somatic embryogenesis. Hydroponic plant cultivation application in biotechnology and industry. Hoagland's nutritive solution. Carbon and nitrogen metabolism. Photosynthesis - a source of primary metabolite synthesis. Primary and secondary metabolic pathways in plants. Plant cell culture – a source of secondary metabolites. **Seminars.** Choose one secondary metabolite (or group) which is important in biotechnology. Explain the role, application, metabolite pathways and plant species (or plant family) in which this metabolite is produced. **Exercises.** Murashige and Skoog nutrition medium preparation. Inoculation of explants on nutrition medium and multiplication of the plant material. Inoculation of plant material in a	

hydroponic nutrient solution.

Teaching Methods

Lectures, seminars, exercises

Students' Obligations

Attendance at all forms of classes is mandatory and the students are obligated to attend all knowledge tests. The students may be absent from 30% (full-time students) and 50% (part-time students) of each of the forms of classes, provided that the absence is justified. An exercise or a seminar which has not been completed must be made up through a midterm exam.

Monitoring the Activity of the Students *(Connecting Learning Outcomes, Teaching Methods, and Grading)*

Class-related activity	ECTS	Learning outcome	Student activity	Evaluation method	Grade points	
					Min.	Max.
Attending lectures	0.5	1-6	Class presence	Tracking records	5	10
Seminars	1.5	4-5	Seminar completed	Presentation of seminar	10	30
Exercises	0.5	3,6	Pratical work	Exercise done and signed	5	10
Final exam	1	1-6	Learning for exam	Written exam	30	50
Total	**4.5**				**50**	**100**

Evaluation of the written part of the final exam

Percentage of correct answers (%)	Grade
>95.00	50
90.00-94.99	47
85.00-89.99	45
80.00-84.99	40
75.00-79.99	38
70.00-74.99	35
65.00-69.99	33
60.00-64.99	30

Forming the final grade:
The grade points accumulated during the classes will be added to the points achieved from the final exam. The grading will be done by absolute distribution, i.e. on the basis of the final results, and it will be compared to the numerical system in the following manner:
A – Excellent (5): 90-100 grade points; B – Very Good (4): 80-89.99 grade points; C – Good (3): 65-79.99 grade points; D – sufficient (2): 50-64.99 grade points

Mandatory Literature (available in the library and via other media)

Title	Number of copies in the library	Availability via other media
Bahatla SC, Lal MA: Plant Physiology, Development and Metabolism. Springer Singapore, 2018	-	No

Anis M, Ahmad N: Plant Tissue Culture: Propagation, Conservation and Crop Improvement. Springer Singapore, 2016	-	No
Additional course literature		
1. Trigiano RN, Gray DJ: Plant Development and Biotechnology. Boca Raton, CRC Press, 2004 2. Scientific papers (available on-line)		
Quality Assurance Procedures Designed to Ensure the Acquisition of Outcomes and Competencies		
Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Food Technology Osijek and/or the Faculty of Medicine Osijek.		
Note		
E-learning is not included in the class quota, but it is used in teaching and it contains links to various sites and video and audio materials available on websites.		