Annex 6

SUBJECT OUTLINE

1. Information on the study programme

1.1 Academic institution	**UNIVERSITY OF ORADEA**
1.2 Faculty	**FACULTY OF ENVIRONMENTAL PROTECTION**
1.3 Department	**ENVIRONMENTAL ENGINEERING**
1.4 Field of study	**ENVIRONMENTAL ENGINEERING**
1.5 Cycle of study	**UNDERGRADUATE STUDIES**
1.6 Study programme/Qualification	**BIOTECHNICAL AND ECOLOGICAL SYSTEMS ENGINEERING**

2. Information on the discipline

2.1 Name of discipline			**BIOTECHNOLOGIES II**				
2.2 Course holder			**Lecturer PhD. eng. AGUD ELIZA**				
2.3 Seminar/Laboratory/Project holder			**Lecturer PhD. eng. AGUD ELIZA**				
2.4 Year of study	III	2.5 Semester	VI	2.6 Type of evaluation	Summative	2.7 Regime of discipline	I

(C) Compulsory; (O) Optional; (E) Elective

3. Total estimate time (hours per semester of didactic activities)

3.1 Number of hours per week	4	out of which: 3.2 course	4	out of which 3.3 seminar/laboratory/project	4
3.4 Total hours in the curriculum	56	out of which: 3.5 course	28	out of which 3.6 seminar/laboratory/project	28
Time allotment					
Study assisted by manual, course support, bibliography and notes					10
Additional documentation in the library/ on specialised electronic platforms and in the field					10
Preparation of seminars/laboratories/ topics/reports, portfolios and essays					10
Tutorship					4
Examinations					5
Other activities.....					5
3.7 Total hours of individual study	**44**				
3.9 Total hours per semester	**100**				
3.10 Number of credits	4				

4. Pre-requisites (where appropriate)

4.1 curriculum	(Stipulations)
4.2 competences	

5. Conditions (where appropriate)

5.1. related to course	Classroom, computer and video projector
5.2. related to seminar/laboratory/ project	Autoclave, oven, UV lamp, microscope, laboratory glassware

6. Specific competences acquired	
Professional competences	C6. Introducing the best technologies in the implementation of environmental strategies and plans in accordance with the legislation in force, C6.1. Identifying and specifying information on the best available technologies in the field, C6.3. Identifying and applying technical solutions in solving problems related to environmental engineering.
Transversal competences	CT3. Efficient use of information sources and of assisted communication and professional training resources (portals, Internet, specialized software applications, databases, online courses, etc.) both in Romanian and in an international language.

7. Objectives of discipline (coming from the specific competences acquired)

7.1 General objective	- the purpose of the discipline is to make students aware of the most important methods of biotechnology and their possibilities of use. - the impact of biotechnologies in modern society is huge, it is still difficult to estimate, being a multidisciplinary branch in explosive progress. A major role belongs to plant biotechnologies that concern the capitalization of plant cells and tissues in micropropagation but also in various productive branches, contributing to the training of specialists in this interdisciplinary field.
7.2 Specific objectives	- the course aims to familiarize students with the main theoretical and practical knowledge about biotechnology, a modern scientific branch that uses various life forms, natural or created through biotechnological procedures, in the service of human society, - understanding the basic principles of plant biotechnologies, - the accumulation of knowledge and terms specific to in vitro cultures in plants and their genetic modification, - explaining the processes and phenomena of organogenesis and embryogenesis that are the basis for obtaining plants with desired characteristics,

	-development of interest in knowing the genetic mutations that occur in plants.

8. Contents*/

8.1 Course	Methods of teaching	No. of hours/Remarks
1. Plant biotechnologies. Short history	Interactive course with information presented in Power Point	2
2. Zygotic embryo cultures	Interactive course with information presented in Power Point	2
3. Meristeme cultures. Obtaining virus-free cultures of economic interest. Organ cultures.	Interactive course with information presented in Power Point	2
4. Conservative micropropagation and cloning of species	Interactive course with information presented in Power Point	2
5. Callus tissue explant cultures and cell cultures.	Interactive course with information presented in Power Point	4
6 Protoplast cultures and somatic hybridization.	Interactive course with information presented in Power Point	6
7 Obtaining haploids by andro and gynogenesis.	Interactive course with information presented in Power Point	4
8. Somatic embryogenesis and production of artificial seeds and synthetic seeds.	Interactive course with information presented in Power Point	2
9. "In vitro" stress selection of plants resistant to abiotic stressors. "In vitro" mutagenesis.	Interactive course with information presented in Power Point	2
10. Gene banks and gene pool conservation.	Interactive course with information presented in Power Point	2

Bibliography

1. ACATRINEI Gh., ACATRINEI L., 1998, Biotehnologia plantelor, Ed. CERMI, Iaşi. 2. Agud Eliza Maria, 2019 "*Micropropagarea in vitro metodă de înmulţire şi conservare a resurselor vegetale",* Ed. Universităţii din Oradea,

3. Ardelean A., şi Bolba D., 1999, Istoricul culturilor de celule şi ţesuturi vegetale, in: Culturi in vitro la cormofite. Lucrările reunite ale simpoziopanelor naţionale VII şi VIII de Cultuir de celule şi Ţesuturi Vegetale

(Arad, 1997-1998 (ed. Cachiţă) Editura Risoprint, Cluj – Napoca, 4. Ardeleanu. M., et al., 1995, Impactul biotehnologiilor moderne asupra creierii de noi soiuri de plante de cultură, Bul. USAMV, Cluj-Napoca, A-H, 49/2 , 5. Cachiţă, D., 1987, Metode in vitro la plantele de cultură – baze teoretice şi practice- Ed. Ceres, Bucureşti, 6. Cachiţă, D.,Raicu P., Badea E., 1984, Culturile de celule vegetale – aplicaŃii în agricultură. Ed. Ceres,Bucureşti, 7. Cachiţă, Deliu, Rakosy-Tican şi Ardelean A., 2004, Tratat de Biotehnologii vegetale Vol I, Ed. Dacia Cluj-Napoca, 8.Cachiţă, C-D., Ardelaen A., 2007, Tratat de Biotehnologii vegetale Vol II, Ed. Dacia Cluj-Napoca, 9. Cristea V., 2010, Culturi in vitro fotoautotrofe la speciile de Dianthus endemice şi periclitate din România. Ed Todesco, Cluj-Napoca, 10. Laslo V., 2007 Micromultilicarea caisului; Ed. Univ. din Oradea, 11. Laslo, V., 2013, BIOTEHNOLOGII VEGETALE şi aplicaţiile lor, Ed. Univ. din Oradea, 12. Raicu, P, E. Bades, 1990. Biotehnologii moderne, Ed. Tehnică Bucureşti.		
8.2 Seminar	Methods of teaching	No. of hours/ Remarks
1. The plant biotechnology laboratory. Space management. Features	The teacher organizes and monitors the experiments with the students	4
2. Preparation of culture media.	The teacher organizes and monitors the experiments with the students	4
3. Explant. Types and techniques of sterilization.	The teacher organizes and monitors the experiments with the students	4
4. Micro-multiplication of rare species.	The teacher organizes and monitors the experiments with the students	4
5. Preparation and inoculation of culture media in order to obtain the callus.	The teacher organizes and monitors the experiments with the students	4
6. Cell culture.	The teacher organizes and monitors the experiments with the students	4
7. Obtaining and culturing protoplasts.	The teacher organizes and monitors the experiments with the students	4
Bibliography 1. Agud, E., 2008, Utilizarea culturilor in vitro în multiplicarea şi ameliorarea cartofului (Solanum tuberosum L), Teză de doctorat, USAMV; Cluj-Napoca ; 2. Cachiţă, D., 1984, tehnica culturilor in vitro a celulelor şi ţesuturilor vegetale în: Culturi de ţesuturi şi celule vegetale – aplicaţii în agricultură, Ed. CERES, Bucureşti; 3. Cachiţă, D., 1987, Metode in vitro la plantele de cultură – baze teoretice şi practice- Ed. Ceres, Bucureşti, 4. Laslo V., 2010 Îndrumător de lucrări practice la biotehnologie Ed. Univ. Oradea, 5. Zăpârţan M., 2001, Conservarea florei spontane prin înmulţire in vitro, Ed. ALC MEDA GROUP, Cluj.		

* The content, respectively the number of hours allocated to each course / seminar / laboratory / project will be detailed during the 14 weeks of each semester of the academic year.

9. Corroboration of discipline content with the expectations of the epistemic community, professional associations and representative employers from the field corresponding to the study programme

The content of the discipline is found in the curriculum of the specialization of Environmental Engineering and from other university centers that have accredited these specializations.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Percentage of the final grade
10.4 Course	Learning and understanding the notions taught	Written exam	**70%**
10.5 Seminar			
10.6 Laboratory	Presence in the laboratory and training of skills necessary for specific activities	Practical test	**30%**
10.7 Project			
10.8 Minimum standard of performance			
-Knowing 50% of the information contained in the course - Knowledge of 60% of the information from the laboratory			

Date of completion

Signature of course holder**

Lecturer PhD. eng **AGUD ELIZA**
(eliza_agud@yahoo.com)

Signature of seminar laboratory/project holder **

Lecturer PhD. eng **AGUD ELIZA**
(eliza_agud@yahoo.com)

Date of approval in the department

Signature of the Head of Department

Conf.univ. PhD. eng. **LASLO VASILE**

Dean signature

Prof. PhD. Eng. **CHEREJI IOAN**

** - Name, first name, academic degree and contact details (e-mail, web page, etc) will be specified.
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