Annex 6

DISCIPLINE DESCRIPTION

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	**BACHELOR**
1.6 Study programme/Qualification	**BIOTECHNICAL ENGINEERING AND ECOLOGICAL SYSTEM /ENGINEER**

2. Information on the discipline

2.1 Name of discipline			**ENVIRONMENT MICROBIOLOGY II**				
2.2 Course holder			Lecturer PhD eng. Oneț Aurelia				
2.3 Seminar/Laboratory/Project holder			Lecturer PhD eng. Oneț Aurelia				
2.4 Year of study	II	2.5 Semester	III	2.6 Type of evaluation	Ex	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	2	out of which 3.3 seminar/laboratory/project	2
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	hours
Study assisted by manual, course support, bibliography and notes	17
Additional documentation in the library/ on specialised electronic platforms and in the field	10
Preparation of seminars/laboratories/ topics/reports, portfolios and essays	15
Tutorship	0
Examinations	2
Other activities.....	0

3.7 Total hours of individual study	**44**
3.9 Total hours per semester	**100**
3.10 Number of credits	4

4. Prerequisites (where appropriate)

4.1 curriculum	Biochemistry, General ecology, English
4.2 competences	Action ability: information capacity and documentation, group work, utilisation of informatics tehnologies and data processing; ability to apply knowledge actively and practically.

5. Conditions (where appropriate)

5.1. related to course	Using modern means of presentation and projection – video projector and computer
5.2. related to seminar/laboratory/ project	Equipment of the laboratory with specific devices for microbiological techniques..

6. Specific competences acquired	
Professional competences	**C1. Explaining the mechanisms, processes and effects of anthropogenic or natural origin that determine and influence environmental pollution** **C3. Analysis of the technical solutions needed to prevent, reduce and eliminate negative environmental phenomena** **C3.1 Identification and use of instrumental instruments and instruments necessary to monitor environmental factors**
Transversal competences	**CT2. Identifying roles and responsibilities in a multidisciplinary team and applying effective relationship and work techniques within the team**

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

7.1 General objective	Knowledge of the morphological and physiological characteristics of the microorganisms present in air, water, soil and food.
7.2 Specific objectives	Knowledge of ecological factors that influence the spread and distribution of microorganisms in nature. Knowledge of the interdependent relationships between microorganisms and between them and the superior plants

8. Content*/

8.1 Course	Methods of teaching	No. of hours/Remarks
1. Influence of the ecological factors on the microorganisms	Lecture and video projector exposure	2
2. Ecological relationships between soil microorganisms	Lecture and video projector exposure	2
3. Relationships between microorganisms and higher plants from soil	Lecture and video projector exposure	2
4. Nitrogen cycle.	Lecture and video projector exposure	4
5. The symbiotic fixation of molecular nitrogen in soil	Lecture and video projector exposure	4
6. Cycle of sulfur and carbon	Lecture and video	2

	projector exposure	
7. Soil microorganisms and iron cycle	Lecture and video projector exposure	2
8. Phosphorus and potassium cycle	Lecture and video projector exposure	2
9. Microbial transformations of the microelements	Lecture and video projector exposure	2
Microbial bioproducts used to increase productivity and protect crops	Lecture and video projector exposure	2
10.Microbial degradation in nature	Lecture and video projector exposure	2
11.Geological activity of the microorganisms	Lecture and video projector exposure	2

Bibliography

1. Barton, Larry L., Northup, Diana E., 2011, *Microbial Ecology*. Wiley-Blackwell. Oxford: John Wiley & Sons. p. 22. ISBN978-1-118-01582-7;
2. Bowler, Chris, Karl, David M., Colwell, Rita R., 2009, "Microbial oceanography in a sea of opportunity". *Nature*459 (7244);
3. Fenchel, Tom et al., 2012, *Bacterial Biogeochemistry: The Ecophysiology of Mineral Cycling* (3 ed.). Boston, Mass.: Academic Press/Elsevier. p. 3;
4. Hugenholtz, P., 2002, "Exploring prokaryotic diversity in the genomic era"*Genome Biology;*
5. Konopka, Allan, 2009, "What is microbial community ecology?"*The ISME Journal***3** (11);
6. Konopka, A., 2009, "Encyclopedia of Microbiology". pp. 91–106;
7. Lupp, Claudia, 2009, "Microbial oceanography". *Nature*459 (7244): 179;
8. Ott, J. (2005). "Marine Microbial Thiotrophic Ectosymbioses". *Oceanography and marine biology*42: 95–118. ISBN9780203507810;
9. Verstraete, Willy, 2007, "Microbial ecology and environmental biotechnology". *The ISME Journal;*
10. Whitman, W. B., Coleman, DC, Wiebe, WJ, 1998, "Prokaryotes: The unseen majority". *Proceedings of the National Academy of Sciences*95;
11. Zarnea Gh. – *Compendium of general microbiology*, Romanian Academy Publishing House, Bucharest, Vol. I - 1983, Vol. II - 1984, Vol. III - 1986, Vol. IV - 1990,Vol.V - 1994.

8.3 Laboratory		
1. Evaluation of total number of microorganisms with the Koch method (plate count method)	Practical methods	2
2. Determination of total number of microorganisms on liquid medium	Practical methods	4
3. Determination of total number of microorganisms from air	Practical methods	2
4. Determination of total number of microorganisms from water. Membrane filtration method	Practical methods	2
5. Identification of coliforms (*Escherichia coli*).	Practical methods	2
6. Identification of faecal enterococcus	Practical methods	2
7. Determination of total number of microorganisms from soil	Practical methods	2
8. Determination of total number of fungi from	Practical methods	2

soil		
9. Isolation of *Actinomycetes* from soil	Practical methods	2
10. Isolation of non-symbiotic nitrogen fixing bacteria from genus *Azotobacter*.	Practical methods	2
11. Isolation of symbiotic nitrogen fixing bacteria from genus *Rhizobium*.	Practical methods	4
12. Laboratory practical evaluation		2

Bibliography

1. Barton, Larry L., Northup, Diana E., 2011, *Microbial Ecology*. Wiley-Blackwell. Oxford: John Wiley & Sons. p. 22. ISBN978-1-118-01582-7;
2. Bowler, Chris, Karl, David M., Colwell, Rita R., 2009, "Microbial oceanography in a sea of opportunity". *Nature*459 (7244);
3. Fenchel, Tom et al., 2012, *Bacterial Biogeochemistry: The Ecophysiology of Mineral Cycling* (3 ed.). Boston, Mass.: Academic Press/Elsevier. p. 3;
4. Hugenholtz, P., 2002, "Exploring prokaryotic diversity in the genomic era"*Genome Biology;*
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* 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

By acquiring knowledge about microorganisms' ecology, students acquire complex knowledge in accordance with the partial competencies required for the possible occupations provided by RNCIS.
The content of the course is adapted to the requirements of the epistemic community, professional associations and employers in the field of Environmental Engineering, as it addresses the main techniques for investigating the activity of microorganisms within the natural and anthropic ecosystems in order to conserve biodiversity.
The course acquires useful knowledge both for environmental protection representatives from local authorities, industry and companies with activities in the field.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the final grade
10.4 Course	Presence at courses and knowledge of matter	Examen oral	70%
10.6 Laboratory	Attendance at seminars	Evaluare	30%

	and active participation in seminars		
10.8 Minimum standard of performance. Abilitatea de a răspunde corect la 50% din întrebările adresate.			

Date of completion | Signature of course holder** | Signature of seminar laboratory/project holder **

Lecturer PhD eng. Oneț Aurelia
e-mail: aurelia_onet@yahoo.com

Lecturer PhD eng. Oneț Aurelia
e-mail: **aurelia_onet@yahoo.com**

Date of approval in the department

Signature of the Head of Department

Assistant professor PhD eng. Laslo Vasile
laslovasile@yahoo.com

Dean signature
Professor PhD eng. Chereji Ioan
ichereji@uoradea.ro

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