

Universitatea din Oradea	PROCEDURA pentru inițierea, aprobarea, monitorizarea și evaluarea periodică a programelor de studii	COD: SEAQ PE – U. 01						
			4	5	6	7	8	9
			Aprobat în ședința de Senat din data: -- 03.03.2014					

Anexa 6

COURSE SYLLABUS

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	ENGINEERING OF BIOTECHNICAL AND ECOLOGY SYSTEMS

2. Information on the discipline

2.1 Name of discipline	ENVIRONMENTAL CHEMISTRY						
2.2 Course coordinator	Lecturer PhD.GHERGHELEȘ CARMEN GEORGETA						
2.3 Laboratory/Project coordinator	Lecturer PhD.GHERGHELEȘ CARMEN GEORGETA						
2.4 Year of study	II	2.5 Semester	III	2.6 Type of evaluation	C	2.7 Regime of discipline	O

(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	28	out of which 3.3 seminar/laboratory/project	28
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					15
Additional documentation in the library/ on specialised electronic platforms and in the field					20
Preparation of seminars/laboratories/ topics/reports, portfolios and essays					15
Tutorship					2
Examinations					4
Other activities.....					0
3.7 Total hours of individual study	56				
3.9 Total hours per semester	112				
3.10 Number of credits	3				

Universitatea din Oradea	PROCEDURA pentru inițierea, aprobarea, monitorizarea și evaluarea periodică a programelor de studii	COD: SEAQ PE – U. 01						
			4	5	6	7	8	9
			Aprobat în ședința de Senat din data: -- 03.03.2014					

4. Prerequisites (where appropriate)

4.1 Curriculum	Chemistry
4.2 Competences	Cognitive skills: concepts related to chemistry and biology related to environmental factors Action skills: information and documentation skills, group work, information technology use and data-processing skills; putting into practice the knowledge accumulated

5. Conditions (where appropriate)

5.1. related to course	Video Projector, computer
5.2. related to seminar/laboratory/ project	Equipment and laboratory reagents specific to laboratory work, computer

6. Specific competences acquired

Professional competences	<ul style="list-style-type: none"> C1. Management and resolution of specific environmental issues for sustainable development C2. Identifying the best technical and technological solutions for implementing professional projects for engineering and environmental protection C3. Analysis of technical solutions necessary to prevent, mitigate and eliminate adverse environmental phenomena
Transversal competences	<p>0. CT1. Identifying roles and responsibilities in a multidisciplinary team and application techniques and effective work relationships within the team</p> <p>1. CT2. Effective use of information sources and communication resources and training aided (portals, Internet, specialized software, databases, online courses, etc.) both in Romanian and in an international language</p>

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

7.1 General objective	Acquiring fundamental notions of analytical chemistry, chemical equilibrium and classical methodological principles of analysis: titrimetry and gravimetry. Learning the principles of optical methods of analysis in order to form a solid theoretical basis that allows students correct interpretations in determining major, minor components or traces of complex materials.
7.2 Specific objectives	The student will acquire skills to be able to perform an objective and rigorous review in environmental protection domain, to be able to conduct a technological process and correct interpretation of laboratory tests so that the technological process is more efficient.

Universitatea din Oradea	PROCEDURA pentru inițierea, aprobarea, monitorizarea și evaluarea periodică a programelor de studii	COD: SEAQ PE – U. 01						
			4	5	6	7	8	9
			Aprobat în ședința de Senat din data: -- 03.03.2014					

8. Content*/

8.1 Course	Methods of teaching	No. of hours/Remarks
1. Introduction. Definition, purpose, role and classifications of analytical chemistry. Field of operation. Chemical equilibria. Reactions used in analytical chemistry. Ionic reactions, molecular reactions. Selectivity and sensitivity of analytical reactions. Chemical analysis. Systematics of qualitative analysis. Stages of quantitative analysis	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works. The fraud during examination implies to exclude the student from examination and proposal for expulsion
2. Solutions. Electrolytic dissociation. The theory of strong electrolytes. Activity and activity coefficient; ionic strength. Dissociation of weak electrolytes. Dissociation constants.	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works. The fraud during examination implies to exclude the student from examination and proposal for expulsion
3. Acid-base equilibria. Calculation of $[H_3O^+]$ in solutions of strong acids and bases, weak acids and bases, hydrolysis salts, mixtures of acids and mixtures of bases. Calculation of the equilibrium concentration of other species at known pH. Buffer solutions.	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works. The fraud during examination implies to exclude the student from examination and proposal for expulsion
4. Acid-base titrimetry. Acid-base titration curves. Indicators. Titration errors. Applications.	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works. The fraud during examination implies to exclude the student from examination and proposal for expulsion
5. Redox balances. Redox potential. Normal potential, seemingly normal. Calculation of the equilibrium constant, potential and ratio of concentrations to the equivalence point. Redox titrations. Redox titration curves. Indicators. Titration errors. Applications.	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works

Universitatea din Oradea	PROCEDURA pentru inițierea, aprobarea, monitorizarea și evaluarea periodică a programelor de studii	COD: SEAQ PE – U. 01						
			4	5	6	7	8	9
			Aprobat în ședința de Senat din data: -- 03.03.2014					

		The fraud during examination implies to exclude the student from examination and proposal for expulsion
6. Complexation balances. Stability constant, instability. Apparent formation constant. Titrimetry by complex formation reactions. Titration curves. Complexometric indicators. Titration error. Applications.	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works. The fraud during examination implies to exclude the student from examination and proposal for expulsion
7. Precipitation equilibria. Solubility product. Solubility. Factors influencing precipitation. Fractional precipitation. Titrimetry by precipitation reactions. Titration curves. Indicators. Titration error. Applications.	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works. The fraud during examination implies to exclude the student from examination and proposal for expulsion
8. Gravimetric analysis. Precipitation formation and processing in gravimetric analysis	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works. The fraud during examination implies to exclude the student from examination and proposal for expulsion
9. Inorganic and organic precipitating reagents. Precipitation contamination. Precipitation in homogeneous solutions	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works. The fraud during examination implies to exclude the student from examination and proposal for expulsion
10. Optical methods of analysis. Classifications, spectral domains. Atomic absorption spectroscopy. Theoretical bases of the method. Equipment. Applications	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works

Universitatea din Oradea	PROCEDURA pentru inițierea, aprobarea, monitorizarea și evaluarea periodică a programelor de studii	COD: SEAQ PE – U. 01						
			4	5	6	7	8	9
			Aprobat în ședința de Senat din data: -- 03.03.2014					

		The fraud during examination implies to exclude the student from examination and proposal for expulsion
11. Molecular absorptionspectroscopy. Classifications. The law of lightabsorption. Molecular emissionmethods. The theory of chemiluminescence, fluorescence, phosphorescence, variablesthataffectphotoluminescence. Equipment. Applications.	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works The fraud during examination implies to exclude the student from examination and proposal for expulsion
12. Atomic emissionspectroscopy. Spectral sources, qualitativeandquantitativeanalysis. Equipment. Applications. X-rayspectroscopy. Obtaining X-rays, X-rayspectrum. X-rayanalysismethods. Applications.	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works The fraud during examination implies to exclude the student from examination and proposal for expulsion
13. Nephelometryandturbidimetry. Theoreticalbases. Equipment. Applications.	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works The fraud during examination implies to exclude the student from examination and proposal for expulsion
14. Refractometry, polarimetry, rotary opticalscattering, circular dichroism. Generalities. Equipment. Applications	Interactive lecture, logic presentation, deductive explanation, and constructive conversation	2 The student's presence during the course is optional but recommended. The presence of the student in the examination is conditioned by participation in the laboratory works The fraud during examination implies to exclude the student from examination and proposal for expulsion
Bibliography		
<ol style="list-style-type: none"> 1. R. Kellner, J.M. Mermet, M. Otto și Widmer, H.M., eds., Analyticalchemistry, Wiley-VCH, Verlag, Germany, 1998. 2. D. Harvey, Modern analyticalchemistry, Mac Graw Hill, 2000. 3. D. Barcelo (ed.), Comprehensive analyticalchemistry, Modern instrumental analysis (vol. 47), Ahuja, 		

Universitatea din Oradea	PROCEDURA pentru inițierea, aprobarea, monitorizarea și evaluarea periodică a programelor de studii	COD: SEAQ PE – U. 01						
			4	5	6	7	8	9
			Aprobat în ședința de Senat din data: -- 03.03.2014					

<p>S., Jespersen, N., eds., Elsevier, 2006.</p> <p>4. R. A. Meyers (ed.), Encyclopaedia of analytical chemistry, John Wiley – Sons, Chicester, 2000.</p> <p>5. D. Harvey, Modern analytical chemistry, Mac Graw Hill, 2000.</p> <p>6. T. Onofrei, Probleme de analiză titrimetrică, Ed. Tehnopress, Iași, 2004.</p> <p>7. D.A. Skoog, Principles of Instrumental Analysis 4th Ed., Sounders College Publishing, New York, 1992.</p> <p>8. Al. Nacu, R. Mocanu, T. Onofrei, Chimie analitică și analiză instrumentală, Manual de lucrări practice, vol. II, I.P. Iași , 1980.</p>		
8.2 Seminar	of teaching	No. of hours/ Remarks
1.Labor protection. Introductory notions in qualitative chemical analysis.y	-	-
2. Separation of cations by analytical groups (eg HCl group). Identification reactions for cations.	Problem-solving, explanation, modeling	2
3. Identification reactions for anions. Introductory notions in quantitative analysis. Analytical balance	Problem-solving, explanation, modeling	2
4.Titrimetric analysis. Acid-base titrations. Alkalimetry. Preparation and standardization of NaOH solution ~ 0.1N.	Problem-solving, explanation, modeling	2
5.Acid-base titrations. Acidimetry. Preparation and standardization of ~ 0.1N HCl solution. Problems	Problem-solving, explanation, modeling	2
6. Titrimetric determination of a sodium carbonate / sodium bicarbonate solution or titrimetric analysis of a mixture of NaOH and sodium carbonate	Problem-solving, explanation, modeling	2
7. Titrimetry by redox reactions. Permanganometric titrations. Preparation and standardization of KMnO4 ~ 0.05N solution. Direct permanganometric determinations. Determination of iron.	Problem-solving, explanation, modeling	2
8.Titrations by precipitate formation reactions. Argentometric titrations. Determination of chlorides in water.	Problem-solving, explanation, modeling	2
9. Complexometric titrations. Direct complexometric determinations. Determination of Ca / Mg ions.	Problem-solving, explanation, modeling	2
10 Gravimetric methods of analysis. Gravimetric determination of iron. Processing the results of gravimetric analysis.	Problem-solving, explanation, modeling	2
11. Spectrophotometric titrations. Determination of Cu (II) with Complexon III solution	Problem-solving, explanation, modeling	2
12 Plotting an absorption spectrum in VIZ (determination of λ_{max} and ϵ_{max})	Problem-solving, explanation, modeling	2
13. Spectrophotometric determination of phosphorus in the form of molybdenum blue. (Addition method)	Conversation	4
14. Applications	-	4
<p>Bibliography</p> <p>1. Alfa Xenia Lupea, Mirabela Padure, Carmen Ionescu – Elemente de biochimie și analiză a unor produse alimentare, Editura Universității din Oradea.</p>		

Universitatea din Oradea	PROCEDURA pentru inițierea, aprobarea, monitorizarea și evaluarea periodică a programelor de studii	COD: SEAQ PE – U. 01						
			4	5	6	7	8	9
			Aprobat în ședința de Senat din data: -- 03.03.2014					

* 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

<ul style="list-style-type: none"> ▪ The content of the discipline is in line with what is done in other university centers in the country and abroad. ▪ The content of the discipline is found in the curriculum of the Biotechnical and Technological Systems Engineering specialization 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 Share in the final grade
10.4 Course	Evaluation of theoretical knowledge acquired	Exam - oral test	100%
10.5 Seminar	-	-	-
10.6 Laboratory	-	-	-
10.7 Project	project evaluation	Project presentation	100%
10.8 Minimum standard of performance			
<ul style="list-style-type: none"> • Minimum 7 - the project evaluation • Minimum 5 - exam 			

Issuing date

Signature of course coordinator
lecturer PhD. **Ghergheles Carmen**
Carmen(i_carmen_g@yahoo.com)

Signature of laboratory coordinator
lecturer PhD. **Ghergheles**
(i_carmen_g@yahoo.com)

Date of approval in the department

Director of Department Signature
Assistant professor PhD.eng. **Laslo Vasile**
(vasilelaslo@yahoo.com)

Dean signature
Prof. PhD.eng. **CHEREJI IOAN**