SYLLABUS

1. Information regarding the programme

1.1 Higher education institution	„Babes-Bolyai" University, Cluj-Napoca
1.2 Faculty	Chemistry and chemical engineering
1.3 Department	Department of chemical engineering
1.4 Field of study	Chemical engineering
1.5 Study cycle	Master degree
1.6 Study programme / Qualification	Advanced chemical process engineering/ chimical engineer master's degreet

2. Information regarding the discipline

2.1 Name of the discipline	**"Smart" materials with biomedical, technology and environmental protection applications - CMX6136**						
2.2 Course coordinator	Assist.prof.Phd.eng.Graziella TURDEAN						
2.3 Seminar coordinator	Assist.prof.Phd.eng.Graziella TURDEAN						
2.4. Year of study	I	2.5 Semester	1	2.6. Type of evaluation	C	2.7 Type of discipline	Op

3. Total estimated time (hours/semester of didactic activities)

3.1 Hours per week	3	Of which: 3.2 course	2	3.3 seminar/laboratory	1
3.4 Total hours in the curriculum	42	Of which: 3.5 course	28	3.6 seminar/laboratory	14

Time allotment:	hours
Learning using manual, course support, bibliography, course notes	56
Additional documentation (in libraries, on electronic platforms, field documentation)	26
Preparation for seminars/labs, homework, papers, portfolios and essays	20
Tutorship	3
Evaluations	3
Other activities:	-

3.7 Total individual study hours	108
3.8 Total hours per semester	150
3.9 Number of ECTS credits	6

4. Prerequisites (if necessary)

4.1. curriculum	• No request
4.2. competencies	• No request

5. Conditions (if necessary)

5.1. for the course	• Students will switch off the mobile phones during classes. • Students will be present at the beginning of the training program, late will not be

	accepted
5.2. for the seminar /lab activities	• Students will switch off mobile phones during the seminary / laboratory. • Students will use their self laboratory equipment (gown, gloves, cloth). • The students come at meetings with both the report summary and theoretical knowledge necessary to carry out the work itself and also the necessary supplies (calculators, pencils, and ruler). • The students may not leave the experiment. • The terms for presenting the reports (interpretation of experimental data) are chose with students. We do not accept requests for postponement. • In general, the laboratory reports presentation will be next week at the latest effective work. The late is penalized by 0.5 points / day. • It is forbidden to eat inside the laboratory.

6. Specific competencies acquired

Professional competencies	• Use methods, equipment and technologies for measuring activities and environmental monitoring. • Use of the conceptual and methodological framework for solving problems and defined situations • The ability to conduct research • The ability to communicate ideas and arguments and their opinions clearly and concisely, using various modes of written and oral communication; • The ability to understand and use information technology and adaptation (in short) the new software • The ability to establish positive interpersonal relationships in the teamwork. • The ability to current use of a foreign language of wide circulation • The ability to apply detailed knowledge of: analytical chemistry, inorganic chemistry, physical chemistry, organic chemistry, biochemistry to describe chemical processes. • The ability to formulate and implement creative solutions to problems: design of chemical synthesis strategies, design strategies of structural analysis, using theoretical methods (computational) for explaining chemical reactivity. • The ability to design, to conduct and to manage practical experiments at laboratory scale using specific equipment and to explain the significance of the data obtained; • The ability to propose, develop and support a project / scientific study of chemistry through presentation and practical demonstration; • The ability to develop and write scientific papers for publication in journals.
Transversal competencies	• Execution of complex professional tasks, to conduct independence and autonomous research and design, using computer-assisted techniques and respecting the rules of professional ethics and moral conduct. • Planning, monitoring and assuming professional duties. Demonstrate the ability to coordinate the work, to have an analytical thinking, the adaptability and flexibility, the ability to collaborate with team members. • Self-assessment of their professional performance and determining training needs, information and documentation in its current activity and related fields, in accordance with labor market needs.

7. Objectives of the discipline (outcome of the acquired competencies)

7.1 General objective of the discipline	• to acquire theoretical and practical knowledge about "smart" materials with biomedical, biotechnology and environmental protection applications.
7.2 Specific objective of the discipline	• training skills for dealing experimental, characterization and use studies of various "smart" materials.

8. Content

8.1 Course	Teaching methods	Remarks
8.1.1. "Smart" Materials from nano- to macroscale and their structure. Introduction.	Lecture, Explanation; Conversation, Description, Problem-solving; Debate.	
8.1.2. "Smart" Materials having piezoelectric properties.	Lecture, Explanation; Conversation, Description, Problem	
8.1.3. Electrostrictive and magnetostrictive materials	Lecture, Explanation; Conversation, Description, Problem	
8.1.4 Electrorheological and magnetorheological materials	Lecture, Explanation; Conversation, Description, Problem	
8.1.5. Shape memory materials	Lecture, Explanation; Conversation, Description, Problem	
8.1.6. Electro-, photo-and thermochromic materials. Polymers, polymer gels	Lecture, Explanation; Conversation, Description, Problem	
8.1.7. "Smart" materials based on carbon: from fullerenes to carbon nanofibers and nanotubes.	Lecture, Explanation; Conversation, Description, Problem	
8.1.8. "Smart" bio / materials for medical applications: from diagnosis to treatment.	Lecture, Explanation; Conversation, Description, Problem	

Bibliography

1. Schwarts M., **Encyclopedia of „smart" materials**, John Wiley and Sons, Inc, **2002**, vol 1-3.
2. Bard A. J., **Integrated chemical systems. A chemical approach to nanotechnology**, John Wiley and Sons, Inc., **1994**.
3. Fendler J. H., **Nanoparticles and nanostructured films. Preparation, charcterization and applications**, John Wiley and Sons, Inc., **1998**.
4. Gardner J. W., Bartlett P.N., **Electronic noses. Principles and applications**, Oxford University Press, **1999**.
5. Frasner D. M., **Biosensors in the body. Continuous in vivo monitoring**, John Wiley and Sons Inc., **1997**.
6. Ramsay G., **Commercial biosensors**, John Wiley and Sons Inc., **1998**.

8.2 Seminar / laboratory	Teaching methods	Remarks
8.2.1. Safety instructions. Presentation of laboratory (electroanalytical equipment and apparatus). Numerical methods for processing experimental results (graphics, error statistics, regression and numerical methods for calculating parameters).	Experiment, explanation, conversation, description, Problematization.	Required References: Specific security rules for work in physical, chemical analysis and mechanical laboratories (Order no. 339/16.08.1996).
8.2.2. Investigation by cyclic voltammetry of electrode materials based on carbon	Experiment, explanation, conversation, description, Problematization.	keywords: dissolved redox system, cyclic voltammetry, voltammetry parameters.
8.2.3. Investigation of electrode materials based on noble metals gold and platinum.	Experiment, explanation, conversation, description, Problematization.	keywords: dissolved redox system, cyclic voltammetry, voltammetry parameters.
8.2.4. Synthesis and characterization of polymeric materials obtained by electropolimerization.	Experiment, explanation, conversation, description, Problematization.	keywords: dissolved redox system, cyclic voltammetry, voltammetry parameters.
8.2.5. Final seminar. Correlation of obtained results with different techniques, highlighting the advantages and disadvantages of various investigated materials.	Experiment, explanation, conversation, description, Problematization.	

Bibliography

1. Turdean G. L., Sarmiza S.E., Popescu I. C., **Biosenzori amperometrici. Teorie si aplicatii**, Presa universitara clujana, Cluj-Napoca, **2005**.
2. Popescu I.C., Turdean G., Nicoara A., Ilea P., Muresan L., **Lucrari practice pentru Ciclul de studii aprofundate în Electrochimie Aplicata**, Lito UBB, Cluj-Napoca, **1998**.

9. Corroborating the content of the discipline with the expectations of the epistemic community, professional associations and representative employers within the field of the program

By acquiring theoretical and methodological concepts and practical aspects included in ""Smart" materials with biomedical applications, technology and environmental protection" course, students will have a lot of knowledge, in accordance with required competencies for possible works listed in Grid 2 - RNCIS.

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Share in the grade (%)
10.4 Course	Correct answers – that means learning and understanding of treated concepts	Bibliographic essay. Access to final examination is conditioned by the presentation of partial reports with the results of laboratory experiments. Intention to fraud the examination is punishable. Examination fraud is punishable by expulsion, according to ECST rules of UBB.	80%
	Correctly solving problems		
10.5 Seminar/lab activities	Correct answers, that means learning and understanding the treated concepts	Laboratory reports having the interpretation of the results of actually laboratory experiments will be present in the next week of effective work done.	20%
	Quality of the prepared reports		
	Activity in laboratory		
10.6 Minimum performance standards			
➢ Note 5 (five) both to colloquium seminar / laboratory and the bibliographic essay. ➢ Presentation of bibliographic essay containing information about a class of "smart" materials.			

Date

30.03.2015

Signature of course coordinator ..... Signature of seminar coordinator .....

Date of approval

.....

Signature of the head of department .....