SYLLABUS[1]

1. Information about the program

1.1 Higher education institution	University Politehnica Timisoara
1.2 Faculty[2] / Department[3]	Faculty of Industrial Chemistry and Environmental Engineering / CAICAM
1.3 Chair	–
1.4 Field of study (name/code[4])	Chemical engineering / DL 50
1.5 Study cycle	Master
1.6 Study program (name/code)/Qualification	Energy Resources Management / S 20 / Environmental Enineering and Management in Industry

2. Information about the discipline

2.1 Name of discipline			Energy Resources Management				
2.2 Coordinator (holder) of course activities			Lecturer.dr.chem. Narcis Duteanu				
2.3 Coordinator (holder) of applied activities [5]			Lecturer.dr.chem. Narcis Duteanu				
2.4 Year of study[6]	VI	**2.5** Semester	XI	**2.6** Type of evaluation	Ex	**2.7** Type of discipline	Optional

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

3.1 No. of hrs. / week	4 , of which:	**3.2** course	2	**3.3** seminar/laboratory/ project/training	2
3.4 Total no. of hrs. in the education curricula	49 , of which:	**3.5** course	28	**3.6** applied activities	21
3.7 Distribution of time for individual activities related to the discipline					hrs.
Study using a manual, course materials, bibliography and lecture notes					25
Additional documentation in the library, on specialized electronic platforms and on the field					7
Preparation for seminars / laboratories, homeworks, assignments, portfolios, and essays					7
Tutoring					2
Examinations					3
Other activities					-
Total hrs. of individual activities					44
3.8 Total hrs. / semester[7]	100				
3.9 No. of credits	8				

4. Prerequisites (where applicable)

[1] The form corresponds to the Syllabus promoted by OMECTS 5703/18.12.2011 (Annex3).
[2] The name of the faculty which manages the educational curriculum to which the discipline belongs.
[3] The name of the department entrusted with the discipline, and to which the course coordinator / holder belongs.
[4] Fill in the code provided in GD no. 493/17.07.2013.
[5] The applied activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[6] The year of study to which the discipline is provided in the curriculum.
[7] It is obtained by summing up the number of hrs. from 3.4 and 3.7.

4.1 Curriculum	• Algebra, calculus, inorganic chemistry, physics, physical chemistry, electrochemistry, technology of organic substances
4.2 Competencies	• Description, analysis and application of the basic concepts and theories from engineering science

5. **Conditions** (where applicable)

5.1 of the course	• Properly equipped lecture room
5.2 to conduct practical activities	• Specialized laboratory properly equipped

6. **Specific competencies acquired**

Professional competencies[8]	• Description, analysis and application of the basic concepts and theories from engineering science • Processes and systems operation applying the knowledge from chemical engineering field • Description, analysis and use of the basic concepts on structure and reactivity of organic compounds • Operation of the plant equipment and analytical methods specific for organic chemical technologies •
Transversal competencies	•

7. **Objectives of the discipline** (based on the grid of specific competencies acquired)

7.1 General objective of the discipline	• Acquiring knowledge about the mechanism of energy production, monitoring energy production, knowledge on management of energy resources.
7.2 Specific objectives	• Defining the basic notions, concepts, theories and models of fundamental science and and their appropriate use in professional communication • Use the basic knowledge of fundamental sciences to explain and interpret engineering phenomena • Identify and apply the concepts, methods and theories needed to solve engineering problems under qualified assistance • Critical analysis and use of principles, methods and work techniques for the qualitative and quantitative evaluation of processes • Theoretical substantiation in solving specific problems using established principles and methods • Description of basic concepts, theories and methods for the operation of electrochemical

[8] The professional competencies and the transversal competencies will be treated according to the Methodology of OMECTS 5703/18.12.2011. The competencies listed in the National Register of Qualifications in Higher Education [Registrul Naţional al Calificărilor din Învăţământul Superior RNCIS] (http://www.rncis.ro/portal/page?_pageid=117,70218&_dad=portal&_schema=PORTAL) will be used for the field of study from 1.4 and the program of study from 1.6 of this form, involving the discipline.

	power sources • Explanation and interpretation of principles and methods used in the operation of electrochemical power sources • Development of professional projects for electrochemical power sources technologies • Use basic concepts specific for electrochemical power sources to achieve mass and energy balance • Evaluation on an engineering basis and comparison criteria for the performance of electrochemical power sources • Acquiring knowledge regarding the management of energy resources • Skills training for management of energy resources • Use of programing knowledge gained in the design of simple mathematical models to explain the specific processses of electrochemical power sources • Interpretation of data derived form the operation of electrochemical power sources • Performance benchmarking of electrochemical power sources.

8. Content

8.1 Course	No. of hours	Teaching methods
1. Energy – theoretical notions 1.1. Energy concept in classical and also relativistic mechanics 1.2. Energy types, energy conservation principle 1.3. The principles of thermodynamics and energy units	 2 2 2	Interactive lecture with students, Explanation
2. Energy production 2.1. Primary fules 2.2. Classical systems used for electricity production 2.3. Renewable electricity generation	 4 4 8	Interactive lecture with students, Explanation
3. Consumption and energy reserves	2	Interactive lecture with students, Explanation
4. Monitoring of energy consumption and elimination of losses	2	Interactive lecture with students, Explanation

Bibliography[9]

1. N. Vaszilcsin, Introducere in electrochimie, Editura Politehnica Timisoara, 2009.

2. C. Hamann, A. Hamnett, W. Vielstich, Electrochemistry, Wiley-VCH, Weinheim, 2007.

3. L.Oniciu, E.M.Rus, Surse electrochimice de putere, Editura Dacia, Cluj Napoca, 1987.

4. Sorensen, B., Renewable energy - its physics, engineering, use, environmental impacts, economy and planning aspects. 3 ed. 2004: Elsevier Academic Press.

5. Duteanu N., Pile de combustie directa a metanolului echipate cu electrolit polimer solid, 2008, Editura "Politehnica" din Timisoara, 162, 978-973-625-780-3.

8.2 Applied activities[10]	No. of hours	Teaching methods
Laboratory works	28	
1. Introduction to electrochemistry lab. Working safety rules. Electrical measurements – current, voltage.	1.5	Experiment, explanation, conversation
2. Construction of Daniell galvanic cell.	1.5	Experiment, explanation, conversation
3. Dependence of the electromotive force of galvanic elements versus temperature.	2 * 1.5	Experiment, explanation, conversation
4. Study of the solar energy conversion into electricity.	1.5	Experiment, explanation, conversation
5. Photovoltaic cell – drawing the photovoltaic cell characteristics	1.5	Experiment, explanation, conversation
6. Determination of energy efficiency for the hydrogen production.	2 *1.5	Experiment, explanation, conversation
7. Study of H_2 / O_2 fuel cell. 8. Determination of the maximum power delivered by a galvanic cell	1.5 1.5	Experiment, explanation, conversation
9. Project – energy consumption monitoring .	4 * 1.5	Experiment, explanation, conversation

Bibliography [11]

1. R. Holze, Experimental electrochemistry: a laboratory textbook, Wiley-VCH, Weinheim, 2009.

2. M. Nemes, N.Vaszilcsin, A. Kellenberger, Electrochimie. Principii si experiente, Editura Politehnica Timisoara, 2009.

9. Corroboration of the content of the discipline with the expectations of the main representatives of the epistemic community, professional associations and employers in the field afferent to the program

[9] At least one title must belong to the department staff teaching the discipline, and at least 3 titles must refer to national and international works relevant for the discipline, and which can be found in the Politehnica University Library.
[10] The types of applied activities are those specified in footnote 5. If the discipline contains several types of applied activities, then these will be written consecutively in the lines of the table below. The type of activity will be written in a distinct line, as „Seminar:", „Laboratory:", „Project:" and/or „Practice/Training:".
[11] At least one title must belong to the staff teaching the discipline.

• The course content was developed following discussions in the Board of Chemical Engineering, according to market labor needs.

10. Evaluation

Type of activity	**10.1** Evaluation criteria	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Evaluation of the capacity to analyze corrosion processes and mechanisms and corrosion protection methods	Evaluation by one written exam scheduled during the evaluation period	2/3
10.5 Applied activities	**S:**		
	L: Involvement in experimental work, presentation of results, accuracy of data interpretation.	Discussions with students, follow-up of practical works, lab reports and laboratory tests	1/3
	P:		
	Pr:		
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified)			
• **Obtaining grade 5 at both written examinations. The practical activity can be completed with a minimum grade of 5 provided that all laboratory works have been accomplished and all laboratory reports have been submitted.**			

Date of completion

29.11.2015

Course coordinator

(signature)

.....

Coordinator of applied activities

(signature)

.....

Head of Department

(signature)

.....

Date of approval in the Faculty Council[12]

Dean

(signature)

.....

[12] Avizarea este precedată de discutarea punctului de vedere al board-ului de care aparţine programul de studiu cu privire la fişa disciplinei.