SYLLABUS [1]

THIS COURSE UNIT IS TAUGHT IN ROMANIAN LANGUAGE

1. Information about the program

1.1 Higher education institution	POLITEHNICA UNIVERSITY TIMISOARA
1.2 Faculty[2]/ Department [3]	FACULTY OF ELECTRICAL AND POWER ENGINEERING/ELECTRICAL ENGINEERING
1.3 Chair	—
1.4 Field of study (name/code[4])	ELECTRICAL ENGINEERING/90
1.5 Study cycle	BACHELOR
1.6 Study program (name/code/qualification)	ELECTROTECHNIC/30

2. Information about the discipline

2.1 Name of discipline/ formative category[5]	CONVERSION AND STORAGE OF RENEWABLE ENERGY/DD						
2.2 Coordinator (holder) of course activities	Conf. dr.ing. Alin Argeseanu						
2.3 Coordinator (holder) of applied activities[6]	Conf. dr.ing. Alin Argeseanu						
2.4 Year of study[7]	III	**2.5** Semester	1	**2.6** Type of evaluation	E	**2.7** Type of discipline[8]	DI

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) [9]

3.1 Number of fully assisted hours / week	4.5 of which:	**3.2** course	2.5	**3.3** seminar / laboratory / project	2
3.1* Total number of fully assisted hours / semester	63 of which:	**3.2*** course	35	**3.3*** seminar / laboratory / project	28
3.4 Number of hours partially assisted / week	of which:	**3.5** training		**3.6** hours for diploma project elaboration	
3.4* Total number of hours partially assisted / semester	of which:	**3.5*** training		**3.6*** hours for diploma project elaboration	
3.7 Number of hours of unassisted activities / week	of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			1
		hours of individual study after manual, course support, bibliography and notes			1.5
		training seminars / laboratories, homework and papers, portfolios and essays			2
3.7* Number of hours of unassisted activities / semester	of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			14
		hours of individual study after manual, course support, bibliography and notes			21
		training seminars / laboratories, homework and papers, portfolios and essays			28
3.8 Total hours / week [10]	9				
3.8* Total hours /semester	126				
3.9 Number of credits	5				

4. Prerequisites (where applicable)

---

[1] The form corresponds to the Discipline File promoted by OMECTS 5703 / 18.12.2011 and to the requirements of the ARACIS Specific Standards valid from 01.10.2017.
[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] The code provided in HG no.140 / 16.03.2017 or similar HGs updated annually shall be entered.
[5] Discipline falls under the educational curriculum in one of the following formative disciplines: Basic Discipline (DF), Domain Discipline (DD), Specialist Discipline (DS) or Complementary Discipline (DC).
[6] Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[7] Year of studies in which the discipline is provided in the curriculum.
[8] Discipline may have one of the following regimes: imposed discipline (DI), optional discipline (DO) or optional discipline (Df).
[9] The number of hours in the headings 3.1 *, 3.2 *, ..., 3.8 * is obtained by multiplying by 14 (weeks) the number of hours in headings 3.1, 3.2, ..., 3.8. The information in sections 3.1, 3.4 and 3.7 is the verification keys used by ARACIS as: (3.1) + (3.4) ≥ 28 hours / wk. and (3.8) ≤ 40 hours / wk.
[10] The total number of hours / week is obtained by summing up the number of hours in points 3.1, 3.4 and 3.7.

4.1 Curriculum	• General elements of physics, electrical circuits, measurement of electrical quantities, simulation of electromechanical systems
4.2 Competencies	• Fundamental knowledge of mathematics and physics, electrical engineering, operation with fundamental concepts in information science and computers

5. Conditions (where applicable)

5.1 of the course	•
5.2 to conduct practical activities	•

6. Specific competencies acquired through this discipline

Specific competencies	• C1: Adequate application of basic knowledge of mathematics, physics and chemistry in the field of electrical engineering • C2: Operating with fundamental concepts in computer science and information technology • C3: Operation with fundamental concepts in electrical engineering • C4: Analysis, modeling and simulation of electrical systems • C5: Use of techniques for measuring electrical and non-electrical quantities and data acquisition systems in electrical systems
Professional competencies ascribed to the specific competencies	• C1: Adequate application of basic knowledge of mathematics, physics and chemistry in the field of electrical engineering = 20%; • C2: Operating with fundamental concepts in computer science and information technology = 25%; • C3: Operation with fundamental concepts in electrical engineering = 20%; • •C4: Analysis, modeling and simulation of electrical systems = 25%; • C5: Use of techniques for measuring electrical and non-electrical quantities and data acquisition systems in electrical systems 10%
Transversal competencies ascribed to the specific competencies	• CT1: Identification of objectives to be achieved, available resources, conditions for their completion, working stages, working times, deadlines and related risks ; • CT2: Identification of roles and responsibilities in a multidisciplinary team and application of relationship techniques and efficient work within the team • CT3: Efficient use of information sources and resources of communication and assisted professional training (Internet portals, specialized software applications, databases, online courses, etc.) both in Romanian and in a language of international circulation

7. Objectives of the discipline (based on the grid of specific competencies acquired - pct.6)

7.1 The general objective of the discipline	• Adequate application of basic knowledge of physics in the field of electrical engineering;
7.2 Specific objectives	• Analysis, modeling, simulation and design of energy conversion and storage systems.

8. Content [11]

8.1 Course	Number of hours	Teaching methods [12]
1.Energy global market. Thermal, hydro and nuclear plants.	2	Projector.laptop
2.Solar energy. Photovoltaic conversion. Types of PV panels. Tracking systems and MPP.	4	
3.Thermal solar collectors. Solar Thermal plants systems. Stirling solar systems.	4	
4.Eolian energy. Types of rotors.	2	
5.Geothermal energy. Types of geothermal plants. Heat pumps	4	
6.Harvesting energies. Solar, Thermal, Vibration, electromagnetic fields sources	2	

[11] It details all the didactic activities foreseen in the curriculum (lectures and seminar themes, the list of laboratory works, the content of the stages of project preparation, the theme of each practice stage). The titles of the laboratory work carried out on the stands shall be accompanied by the notation "(*)".
[12] Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

7.Tidal and wave energy. Conventional and new plants concepts	2	
8.Efficiency of wind energy conversion.	2	
9.Efficiency of solar energy conversion, electrical and thermal conversion	2	
10. Storage energy systems. Storage of mechanical energy, thermal energy, electrical energy	2	
11. System of industrial storage energy. Hydro pump plants, Compressed Air, Fly Wheel Systems. Efficiency and costs	2	
12. Thermal energy storage systems. Efficiency and costs.	2	
13. Electrical battery. Historical evolution, types, electrical models, parameters, efficiency, SOC and SOH, management systems, smart battery systems	5	

Commented [AA1]:

Bibliography [13]
1. R. Teodorescu, M. Lisiere, P. Rodriguez *GRID CONVERTERS FOR PHOTOVOLTAIC AND WIND POWER SYSTEMS,* Editura „Wiley", 2011
2. M.Steiner "Handbook of Energy Storage", 2019 Springer
3.A.Rufer, "Energy Storage. Systems and Components", 2018 CCR Press
4.B. Sorensen "Renewable Energy Conversion Transmission and Storage", 2007 Academic Press
5. F.Kreith, DYGoswami, "Energy Efficiency and Renewable Energy", 2007 CRC Press
6.B Serensen, P Breeze, T Storvick, ST Yang "Renewable Energy Focus Handbook", 2009 Focus

8.2 Applied activities [14]	Number of hours	Teaching methods
Pr1. Solar energy for heating system of a vacation house	14	Analytical approaches, through numerical and experimental simulation of renewable energy conversion and storage systems
Pr.2 Solar heating system for greenhouses	14	
Pr.3.PV system for isolated irrigation systems	14	
Pr.4 Solar thermal solution for outdoor or indoor pool	14	
Pr.5 PV systems for isolated surveillance systems	14	
Pr.6 Second Life of wind plats	14	

Bibliography [15]

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

- The discipline describes the physical principles of conversion and storage of renewable energies, the component of conversion systems and control methods, aiming at acquiring basic skills in this field, useful for their further development in the industrial environment.

10. Evaluation

Type of activity	**10.1** Evaluation criteria [16]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	Mastering the descriptive elements and the ability to understand the phenomena and applications in the field	Written ex	40%
10.5 Applied activities	**S:**		

[13] At least one title must belong to the discipline team and at least one title should refer to a reference work for discipline, national and international circulation, existing in the UPT library.
[14] Types of application activities are those specified in footnote 5. If the discipline contains several types of applicative activities then they are sequentially in the lines of the table below. The type of activity will be in a distinct line as: "Seminar:", "Laboratory:", "Project:" and / or "Practice/training".
[15] At least one title must belong to the discipline team.
[16] Syllabus must contain the procedure for assessing the discipline, specifying the criteria, methods and forms of assessment, as well as specifying the weightings assigned to them in the final grade. The evaluation criteria shall be formulated separately for each activity foreseen in the curriculum (course, seminar, laboratory, project). They will also refer to the forms of verification (homework, papers, etc.)

	L:		
	P[17]**:**		
	Pr: Testing practical skills regarding the principles of conversion and storage of renewable energies	Discussion of 2 projects	60%
10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [18])			
•			

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
29.11.2020	……	……
Head of Department (signature)	**Date of approval in the Faculty Council** [19]	**Dean (signature)**
……		……

[17] In the case where the project is not a distinct discipline, this section also specifies how the outcome of the project evaluation makes the admission of the student conditional on the final assessment within the discipline.
[18] It will not explain how the promotion mark is awarded.
[19] The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.