

# SYLLABUS <sup>1</sup>

**THIS COURSE UNIT IS TAUGHT IN ROMANIAN LANGUAGE**

## 1. Information about the program

1.1 Higher education institution	POLITEHNICA UNIVERSITY TIMIȘOARA
1.2 Faculty <sup>2</sup> / Department <sup>3</sup>	ELECTRICAL AND POWER ENGINEERING
1.3 Chair	—
1.4 Field of study (name/code <sup>4</sup> )	ELECTRICAL ENGINEERING / 90
1.5 Study cycle	Master
1.6 Study program (name/code/qualification)	ELECTROTECHNICS AND POWER ELECTRONICS /20.20.10.10.90.10

## 2. Information about discipline

2.1 Name of discipline/The educational classe <sup>5</sup>	ADVANCED CONTROL SYSTEMS IN POWER ELECTRONICS/DD						
2.2 Coordinator (holder) of course activities	Assoc. Prof. Dr. Eng. Alin ARGESEANU						
2.3 Coordinator (holder) of applied activities <sup>6</sup>	Assoc. Prof. Dr. Eng. Alin ARGESEANU						
2.4 Year of study <sup>7</sup>	1	2.5 Semester	2	2.6 Type of evaluation	E	2.7 Type of discipline <sup>8</sup>	DA

## 3. Total estimated time (direct activities (fully assisted), partially assisted activities and unassisted activities<sup>9</sup>)

3.1 Number of hours fully assisted/week	3.5 ,of which:	3.2 course	2	3.3 seminar/laboratory/project	1.5
3.1* Total number of hours fully assisted/sem.	49 ,of which:	3.2* course	28	3.3* seminar/laboratory/project	21
3.4 Number of hours partially assisted/week	,of which:	3.5 project, research		3.6 training	3.7 hours designing M.A. dizertation
3.4* Number of hours pasrtially assisted/ semester	,of which:	3.5* project of research		3.6* training	3.7* hours designing M.A. dizertation
3.8 Number of hours of unassisted activities/ week	3 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field			1
		Study using a manual, course materials, bibliography and lecture notes			1
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays			1
3.8* Total number of hours of unasssited asctivities/ semester	42 ,of which:	Additional documentation in the library, on specialized electronic platforms, and on the field			14
		Study using a manual, course materials, bibliography and lecture notes			14
		Preparation of seminars/ laboratories, homework, assignments, portfolios, and essays			14
3.9 Total hrs./week <sup>10</sup>	6.5				
3.9* Total hrs./semester	91				
3.10 No. of credits	8				

## 4. Prerequisites (where applicable)

4.1 Curriculum	<ul style="list-style-type: none"> <li>Graduation of a bachelor's degree in electrical engineering</li> </ul>
4.2 Competencies	<ul style="list-style-type: none"> <li>Capability of solving practical problems/ modeling and simulating specific processes and equipment/ formulating the appropriate theme for technical</li> </ul>

<sup>1</sup> The form corresponds to the Syllabus promoted by OMECTS 5703/18.12.2011 (Annex 3), updated based on the Specific Standards ARACIS of December 2016.

<sup>2</sup> The name of the faculty which manages the educational curriculum to which the discipline belongs

<sup>3</sup> The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.

<sup>4</sup> Fill in the code provided in HG no. 376/18.05.2016 or in HG similars annually updated.

<sup>5</sup> The educational classes of disciplines (ARACIS – specific standards, art./paragraph 4.1.2.a) are: fundamental disciplines, field disciplines, majoring/specialization disciplines.

<sup>6</sup> The applied activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).

<sup>7</sup> The year of study to which the discipline is provided in the curriculum .

<sup>8</sup> The types of disciplines (ARACIS – specific standards, art./paragraph 4.1.2.a) are: extended knowledge discipline / advanced knowledge discipline and synthetic discipline (DA / DCAV and DS) or art./paragraph 4.1.2 b) complementary discipline (DC)).

<sup>9</sup> Within UPT, the number of hours from 3.1\*, 3.2\*,...,3.9\* are obtained by multiplying by 14 (weeks) the number of hours from 3.1, 3.2,...., 3.9.

<sup>10</sup> The total number of hours/week is obtained by summing up the number of hours from 3.1, 3.4 și 3.8.

	applications
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**5. Conditions** (where applicable)

<b>5.1</b> of the course	<ul style="list-style-type: none"> <li>Room with video projector and Internet access</li> </ul>
<b>5.2</b> to conduct practical activities	<ul style="list-style-type: none"> <li>Desktop and matlab/simulink</li> </ul>

**6. Specific competencies** acquired through this discipline

Specific competencies	<ul style="list-style-type: none"> <li>CS1: Development and deepening of theoretical and practical knowledge on the implementation of power electronics equipment and control, accumulated in the license cycle;</li> <li>CS2: Developing the skills of creative synthesis of the basic knowledge acquired within the license cycle;</li> <li>CS3: Development of skills/capabilities to address design, advanced design, execution, operation and maintenance for electric equipment;</li> <li>CS4: Development of skills/skills to use measuring equipment/research in electrical engineering;</li> <li>CS5: Development of skills/abilities for creative use of professional software specific to the field of electrical engineering with applications</li> </ul>
Professional competencies ascribed to the specific competencies	<ul style="list-style-type: none"> <li>CP1: In-depth knowledge of the area of specialization, as well as theoretical, methodological and practical developments specific to power electronics, to increase process control, productivity and reduce energy consumption at reasonable costs;</li> <li>CP2: The ability to design and characterize complex systems, as well as to develop professional projects and/or research with digital adjustment in electronic power, using a wide range of quantitative and qualitative methods;</li> <li>CP3: Use of specialized knowledge to develop the ability to use cutting-edge software and design new ones to explain and interpret new situations;</li> <li>CP4: Development of conceptual and methodological baggage for solving new theoretical and practical problems in the specific field.</li> </ul>
Transversal competencies ascribed to the specific competencies	<ul style="list-style-type: none"> <li>CT1: Execution of complex professional tasks, under conditions of autonomy and professional independence;</li> <li>CT2: Taking on roles/management functions of the activities of professional groups or organizations/institutions;</li> <li>CT3: Self-control of the learning process, diagnosis of training needs, reflexive analysis of one's own professional activity.</li> </ul>

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

<b>7.1</b> The general objective of the discipline	<ul style="list-style-type: none"> <li></li> </ul>
<b>7.2</b> Specific objectives	<ul style="list-style-type: none"> <li></li> </ul>

**8. Content**

8.1 Course	Number of hours	Teaching methods
Bref review of the deterministic control	4	
Nonlinear systems. Mathematical models. Linearization techniques.	4	
Dynamic systems stability. Stability criteria in control systems	4	
Classical Nonlinear Systems Control. Lyapunov's Direct Method.	12	
Fuzzy Logic Control Methods	6	
Predictive Control Strategy	2	
Adaptive Control Methods	2	

Bibliography<sup>11</sup> 1.K. Ogata „Modern Control Engineering”, 3rd ed, 1997 Prentice Hall  
 2. B.C.Kuo „Automatic Control Systems”, 8th ed, 2003, John Wiley  
 3.SB Vukosavic, „Digital Control of Rlectric Drives”, 2007 Springer  
 4.J.Rodriguez, P. Cortes, „Predictive Control of Power Converters and Electric Drives” 2012 Wiley  
 5.G.Chen, T.T.Pham, „Fuzzy sets, Fuzzy Logic and Fuzzy Control” 2001 CRC Press

**8.2 Applied activities<sup>12</sup>**

	Number of hours	Teaching methods
1.Dinamic model of gearing systems. Nonlinear model of friction.	4	
2.Controlability and observability of the dinamic systems.	2	
3.Stability of dinamic systems	5	
4.Linearization methods of dinamic systems	3	
5.Fuzzification/defuzzifivations metods	4	
6.Fuzzy controllers models	3	

Bibliography<sup>13</sup> 1.K. Ogata „Modern Control Engineering”, 3rd ed, 1997 Prentice Hall  
 2. B.C.Kuo „Automatic Control Systems”, 8th ed, 2003, John Wiley  
 3.SB Vukosavic, „Digital Control of Rlectric Drives”, 2007 Springer  
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**9. Coroboration 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**

- Most existing multinational companies on the local market have performance indicators that cannot be achieved without using the concept of modern control

**10. Evaluation**

Type of activity	10.1 Evaluation criteria <sup>14</sup>	10.2 Evaluation methods	10.3 Share of the final grade
10.4 Course	Application of control models and metods in power electronic design		40%
10.5 Applied activities	<b>S:</b> di		
	<b>L:</b>		
	<b>P:</b>		
	<b>Pr:</b> discussing the studied concepts		60%
	<b>Tc-R<sup>15</sup>:</b>		
<b>10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge</b>			

<sup>11</sup> At least one title must belong to the department staff teaching the discipline, and at least one title must refer to a relevant work for the discipline, a national and international work that can be found in the UPT Library.

<sup>12</sup> The types of applied activities are those mentioned in 5. If the discipline contains more types of applied activities then they are marked, consecutively, in the table below. The type of activity will be marked distinctively under the form: „Seminar:”, „Laboratory:”, „Project:” and/or „Practice/Training:”.

<sup>13</sup> At least one title must belong to the staff teaching the discipline.

<sup>14</sup> The Syllabus must contain the evaluation method of the discipline, specifying the criteria, the metods and the forms of evaluation, as well as mentioning the share attached to these within the final mark. The evaluation criteria must correspond to all activities stipulated in the curriculum (course, seminar, laboratory, project), as well as to the methods of continuous assessment (homework, essays etc.)

<sup>15</sup> Tc-R= Homework-Reports

is verified<sup>16</sup>

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**Date of completion**

29.11.2020

**Course coordinator  
(signature)**

**Coordinator of applied activities  
(signature)**

**Head of Department  
(signature)**

**Date of approval in the Faculty  
Council <sup>17</sup>**

**Dean  
(signature)**

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<sup>16</sup> For this point turn to "Ghid de completare a Fișei disciplinei" found at: [http://univagora.ro/m/filer\\_public/2012/10/21/ghid\\_de\\_completare\\_fisa\\_disciplinei.pdf](http://univagora.ro/m/filer_public/2012/10/21/ghid_de_completare_fisa_disciplinei.pdf)

<sup>17</sup> The approval is preceded by discussing the study program's board's point of view with redgards to the syllabus.