SYLLABUS

1. Information about the program

1.1 Higher education institution	UNIVERSITY POLITEHNICA OF TIMISOARA
1.2 Faculty[1]/ Department [2]	ELECTRONICS, TELECOMUNICATON AND INFORMATION TECHNOLOGIES/EA
1.3 Field of study (name/code[3])	ELECTRONIC ENGINEERING, TELECOMUNICATION AND INFORMATION TECHNOLOGIES
1.4 Study cycle	License
1.5 Study program (name/code/qualification)	TST-ENG/20/20/10/100/10/TST-ENG

2. Information about the discipline

2.1 Name of discipline/ formative category[4]			Power Electronics /DD				
2.2 Coordinator (holder) of course activities			Dan Lascu				
2.3 Coordinator (holder) of applied activities[5]			Dan Lascu, Ioana-Monica Pop-Calimanu				
2.4 Year of study[6]	3	**2.5** Semester	6	**2.6** Type of evaluation	E	**2.7** Regime of discipline[7]	DI

3. Total estimated time – hours / semester: direct teaching activities (fully assisted or partly assisted) and individual training activities (unassisted) [8]

3.1 Number of fully assisted hours / week	4 of which:	**3.2** course	2	**3.3** seminar / laboratory / project	0/1/1
3.1* Total number of fully assisted hours / semester	56 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	0/14/14
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	1.36 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			0.22
		hours of individual study after manual, course support, bibliography and notes			0.57
		training seminars / laboratories, homework and papers, portfolios and essays			0.57
3.7* Number of hours of unassisted activities / semester	19 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			3
		hours of individual study after manual, course support, bibliography and notes			8
		training seminars / laboratories, homework and papers, portfolios and essays			8
3.8 Total hours / week [9]	5.36				
3.8* Total hours /semester	75				
3.9 Number of credits	3				

4. **Prerequisites** (where applicable)

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[1] The name of the faculty which manages the educational curriculum to which the discipline belongs
[2] The name of the department entrusted with the discipline, and to which the course coordinator/holder belongs.
[3] The code provided in HG - on the approval of the Nomenclature of fields and specializations / study programs, annually updated.
[4] 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).
[5] Application activities refer to: seminar (S) / laboratory (L) / project (P) / practice/training (Pr).
[6] Year of studies in which the discipline is provided in the curriculum.
[7] Discipline may have one of the following regimes: imposed discipline (DI) or compulsory discipline (DOb)-for the other fundamental fields of studies offered by UPT, optional discipline (DO) or optional discipline (Df).
[8] 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.
[9] 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	• Linear electrical circuits, fundamentals of periodic signals
4.2 Competencies	•

5. Conditions (where applicable)

5.1 of the course	• videoprojector
5.2 to conduct practical activities	• Laboratory class with basic measurement equipment, Matlab package and Caspoc dedicated simulator

6. Specific competencies acquired through this discipline

Specific competencies	• Acquiring the power electronics basic principles and the merit parameters • Abilities for analysis and design of main nonisolated and isolated power converters topologies • Getting familiar to the main semiconductor devices used in power electronics and to the way they are used in power systems • Power converters computer aided design and analysis (CAD, CAE) • Typical equipment used in power electronics
Professional competencies ascribed to the specific competencies	• Use of fundamentals in terms of devices, circuits, systems, instrumentation and electronics technology. • Solving technological problems in fields of applied electronics
Transversal competencies ascribed to the specific competencies	• Methodical analysis of field-related problems aimed at identifying acknowledged solutions, thus ensuring the accomplishment of professional tasks • Adaptation to new technologies, professional and personal development through continuous training, using printed documentation sources, specialized software and electronic resources in Romanian and at least one foreign language.

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

7.1 The general objective of the discipline	• Getting competences in understanding power devices operation, power quality merit parameters, power switching circuits operation and the ability of designing simple switching power converters
7.2 Specific objectives	• Getting familiar to main power devices characteristics · Getting familiar to power quality main merit parameters · Analysis, design and usage of main non isolated switching converters · Analysis, design and usage of main switching converters with isolation · Getting familiar to main modulation methods and control techniques of switching converters

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
Power devices	2	Course by the aid of a videoprojector, delivering explanations and performing calculations on the board,
Power quality and merit parameters	2	
DC-DC switching converters analysis. Synchronous rectifier	4	
Non isolated switching converters synthesis	2	
Converters with isolation	6	
Analog and digital modulation techniques	3	

[10] 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 "(*)".
[11] Presentation of the teaching methods will include the use of new technologies (e-mail, personalized web page, electronic resources etc.).

Current mode control and other control techniques	4	accompanied by simulations presented at the course classes. Interactive teaching, making use of stimulating course homeworks with the solutions uploaded on the Virtual Campus
Converter modelling. Small-signal transfer functions of power converters. Controller design	5	

Bibliography [12] 1. R. W. Erickson, D. Maksimovic, Fundamentals of Power Electronics, 2nd edition, Springer, 2001
2. S. Ang, A. Oliva, Power Switching Converters, 2nd edition, CRC Press, 2005
3. D. Lascu, Tehnici şi circuite de corecţie activă a factorului de putere, Editura de Vest, 2004,
4. J. Kassakian, M. Schlecht and G. Verghese, Principles of Power Electronics, 1st ed. Addison-Wesley, 1991

8.2 Applied activities [13]	Number of hours	Teaching methods
Merit parameters of power quality	2	
Integrated circuits for switching converters control	2	
Basic non isolated switching converters	2	
Non isolated flyback and forward converters	2	
Control to output and audiosusceptibility transfer functions of a forward converter. Controller design	2	
Current mode controlled buck converter	4	
Design of a switched mode regulator employing current mode control	14	

Bibliography [14] 1. D. Lascu, s.a., Short Manuals for Distance Laboratories of PEMC WebLab, Academické Nakladatelstvi Cerm, 2008, ISBN 978-80-7204-625-6,
2. Viorel Popescu, Dan Lascu, Electronică Industrială -îndrumător de laborator- Centrul de multiplicare al Universităţii Politehnica Timişoara, 1996
3. Dan Lascu, Tehnici şi circuite de corecţie activă a factorului de putere, Editura de Vest, 2004
4. R. W. Erickson, D. Maksimovic, Fundamentals of Power Electronics, 2nd edition, Springer, 2001

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

- After several meetings, the content of the discipline was agreed by the local economic partners, the most important being Continental Timisoara, Hella Romania and Flextronics

10. Evaluation

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	The ability to apply the acquired knowledge on 22 short theoretical questions and to solve 2-3 more complex problems	Written exam	66%
10.5 Applied activities	**S:**		
	L: Proving of being familiar to the operation of power devices and power circuits, ability to carry out simulations of these converters, to fix minor	Supervising the practical activities and check the reports	16%

[12] 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.
[13] 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".
[14] At least one title must belong to the discipline team.
[15] 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.)

	design errors, to manipulate the equipment and to explain the results obtaine		
	P[16]**:** The ability to solve non ideal converters, efficiency and individual losses calculation, identifying CCM and DCM operation, design of a dc-dc converter starting from specifications, converter simulation and practical experimentation	Presentation of the project by all team members, revealing its practical functionality, followed by a session of questions	17%
	Pr:		

10.6 Minimum performance standard (minimum amount of knowledge necessary to pass the discipline and the way in which this knowledge is verified [17])

- Basic knowledge regarding ideal and non ideal dc-dc converters operation, both non isolated and isolated.
- · The ability to provide correct dc analysis of a dc-dc lossy converter
- · Verification is performed through the requirements regarding minimal 50% correct answers at the exam, applied to both theory and
- problems and also to laboratory tests and reports and project defense.

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
25.06.2023		

Head of Department (signature)	**Date of approval in the Faculty Council** [18]	**Dean (signature)**
	14.09.2023	

[16] 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.
[17] It will not explain how the promotion mark is awarded.
[18] The endorsement is preceded by the discussion of the board's view of the study program on the discipline record.