COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	University POLITEHNICA Bucharest
1.2 Faculty	Electronics, Telecommunications and Information Technology
1.3 Department	Department of applied electronics and information engineering
1.4 Domain of studies	Electronic Engineering, Telecommunications and Informational Technologies
1.5 Cycle of studies	License
1.6 Program of studies/Qualification	Applied Electronics

2. Course identification information

2.1 Name of the course				Computer aided analysis of power electronics circuits			
2.2 Lecturer				Asist.prof. PhD. Mihail Teodorescu			
2.3 Instructor for practical activities				Asist.prof. PhD. Mihail Teodorescu			
2.4 Year of studies	IV	2.5 Semester	II	2.6 Evaluation type	Verification	2.7 Course choice type	Optional

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week, out of which	4	3.2 course	2	3.3 practical activities	2
3.4 Total hours in the curricula, out of which	56	3.5 course	28	3.6 practical activities	28

Distribution of time	hours
Study according to the manual, course support, bibliography and hand notes	28
Supplemental documentation (library, electronic access resources, in the field, etc)	10
Preparation for practical activities, homeworks, essays, portfolios, etc.	5
Tutoring	0
Examinations	5
Other activities	0

3.7 Total hours of individual study	48
3.9 Total hours per semester	104
3. 10 Number of ECTS credit points	4

4. Prerequisites (if applicable)

4.1 curricular	Industrial electronics Signal processing
4.2 competence-based	Knowledge about power electronic converters, control systems

5. Requisites (if applicable)

5.1 for running the course	-
5.2 for running of the applications	Mandatory presence at laboratory (accordiong to UPB studies regulations)

6. Specific competences

Professional competences	C5 Applying of basic knowledge, concepts and methods regarding ; power electronics, automated systems, electrical energy management, electromagnetical compatibility Use of simulation platforms (PSpice, PSIM, MatLab) for solving power electronics specific problems.
Transversal competences	Methodical analysis of the encountered problems.

7. Course objectives (as implied by the grid of specific competences)

7.1 General objective of the course	The course familiarizes students with analysis and design techniques and methods, using simulation tools. The specific applicability of different simulation platforms for power electronic converters and systems are studied, generally and detailed.
4.2 Specific objectives	- Simulation of power electronic converters - Simulation of drivers - Simulation of control systems - Simulation of power loads - Simulation of renewable energy generation - Simulation of power electronics systems

8. Content

8.1 Lectures	Teaching techniques	Remarks
Power electronics system components and their interaction	Teaching is aided by use of videoprojector, covering the demonstrative and communication function. The oral methods used are the expositive and problematisation methods applied directly. Course	2 hours
Simulation methods for a power electronics system		4 hours
Numerical methods for differential equations solving		4 hours
Component simulation and		10 hours

analysis of power electronics systems with specific simulation software. Comparative study.	materials are course notes and materials and proposed problems.	
Co-simulation methods.		4 hours
Typical applications.		4 hours
Bibliography 1) Muhammad H. Rashid, Hasan M. Rashid, SPICE for Power Electronics and Electric Power, 2006 by Taylor & Francis Group, LLC. 2) Christophe P. Basso, Switch-Mode Power Supplies, Spice Simulations and Practical Designs - 2008 The McGraw-Hill Companies 3) Luis Castan˜er and Santiago Silvestre: Modelling Photovoltaic Systems using PSpice 2002 John Wiley & Sons Ltd, Spain 4) PSIM® User's Guide, 2001-2014 Powersim Inc.		
8.2 Practical applications	Teaching techniques	Remarks
L1. Introduction in computer aided analysis. ORCAD platform	Teaching is aided by use of videoprojector, covering the demonstrative and communication function. The oral methods used are the expositive and problematisation methods applied directly. The students simulate, test and evaluate independently the same problem by using the computer and specific software. Didactical materials are laboratory platforms.	4 hours
L2. PSpice modeling of power electronic switches. Parameters and switching characteristics.		4 hours
L3. Creation of new models in PSpice and applications.		4 hours
L4. Analyais of power electronics circuits with PSIM		4 hours
L5. Switching power supplies controlled with specialized circuit MC34063		4 hours
L6. Subcircuit simulation in PSIM. Compoarative study PSIM-PSpice.		4 hours
L7. Matlab-SIMULINK for power electronics. MatLab-PSIM co-simulation.		4 hours
Bibliography 1) Muhammad H. Rashid, Hasan M. Rashid, SPICE for Power Electronics and Electric Power, 2006 by Taylor & Francis Group, LLC. 2) Christophe P. Basso, Switch-Mode Power Supplies, Spice Simulations and Practical Designs - 2008 The McGraw-Hill Companies 3) Luis Castan˜er and Santiago Silvestre: Modelling Photovoltaic Systems using PSpice 2002 John Wiley & Sons Ltd, Spain 4) PSIM® User's Guide, 2001-2014 Powersim Inc.		

9. Bridging the course content with the expectations of the epistemic community representatives, professional associations and employers representatives for the domain of the program

The design and implementation power electronic systems implies nowadays the mandatory stage of simulation. The available simulation platforms are different, being specialized on certain components of the power system, but working together of the platforms is beginning to be implemented by means of co-simulation.
The course covers the simulation of the entire power electronics system, including electrical energy transmission, renewable generators, power energy conversion, electrical energy storage, different power loads, control of power electronic convertors, data acquisition, power quality, smart metering.
Adequate competences are thus ensured for the students, compatible with today`s qualification requirements, together with a modern technical and scientific preparation, which allows employment after graduation. This suits perfectly the UPB policy, regarding both structure and contents and also aptitudes and competence offered to the students

10. Evaluation

Type of activity	10.1 Evaluation criteria	10.2 Evaluation methods	10.3 Weight in the final mark
10.4 Lectures	- knowledge of basic theoretical notions -knowledge of applying the thory to specific problems - knowledge of the simulation platforms	Two written tesats, equally pondered, during the semester, at fixed dates; the subjects cover the whole lecture, realizing a synthesis between the theoretical comparative learning and applications. One homework, with an extensive application.	25%+25%+25%
10.5 Practical applications		The evaluation is carried out at the end of each laboratory, testing the assimilation of the studied notions.	
10.6 Minimal performance standard			

Passing of a test regarding the simulation of a equipment of applied electronics: power electronics, automated systems, electrical energy management.

Date	Lecturer	Instructor for practical activities
22.11.2013	Asist.prof. PhD.. Teodorescu Mihail	Asist.prof. PhD.. Teodorescu Mihail
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Date of department approval
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Director of Department,
Prof. PhD. Sever Pasca