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]			CAD TECHNIQUES IN ELECTRONIC MODULES MANUFACTURING/DD				
2.2 Coordinator (holder) of course activities			Lecturer Adrian Avram, Ph.D				
2.3 Coordinator (holder) of applied activities[5]			Lecturer Adrian Avram, Ph.D				
2.4 Year of study[6]	2	**2.5** Semester	3	**2.6** Type of evaluation	D	**2.7** Regime of discipline[7]	DII

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	0/2/0
3.1* Total number of fully assisted hours / semester	56 of which:	**3.2*** course	28	**3.3*** seminar / laboratory / project	0/28/0
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	3,14 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
		training seminars / laboratories, homework and papers, portfolios and essays			1,14
3.7* Number of hours of unassisted activities / semester	44 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			14
		training seminars / laboratories, homework and papers, portfolios and essays			16
3.8 Total hours / week [9]	7,14				
3.8* Total hours /semester	100				
3.9 Number of credits	4				

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	• Technical drawing
4.2 Competencies	• Working with concept from fundamental disciplines

5. Conditions (where applicable)

5.1 of the course	• Classroom with a minimum 100 seats equipped with projector
5.2 to conduct practical activities	• Laboratory equipped with working station on witch simulation environments and computer assisted design can be run

6. Specific competencies acquired through this discipline

Specific competencies	• The use of principles and graphical, electrical and analysis tools for the description and design of systems based on electronic circuits. • Application of design methods and analysis of electronic devices and circuits
Professional competencies ascribed to the specific competencies	• Use of fundamentals related to devices, circuits, systems, instrumentation and electronic technology • Application of basic methods for signal acquisition and processing • Solving technological problems in the fields of applied electronics • Application of basic knowledge, concepts and methods regarding the architecture of computing systems, microprocessors, microcontrollers, programming languages and techniques •
Transversal competencies ascribed to the specific competencies	• Defining the activities by stages and assigning them to subordinates with a complete explanation of the duties, depending on the hierarchical levels, ensuring the efficient exchange of information and interpersonal communication • 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, in one language of international circulation • Methodical analysis of the problems encountered in the activity, identifying the elements for which there are established solutions, thus ensuring the fulfillment of professional tasks

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

7.1 The general objective of the discipline	• Studying computer-aided design/engineering (CAD/CAE) systems
7.2 Specific objectives	• Description of CAD/CAE tools and algorithms for simulation and analysis of electronic circuits • Acquiring knowledge and training skills regarding: describing electronic circuits, verifying and optimizing their operation through simulation, designing printed wiring and generating files for computer-aided manufacturing

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
1. Structure of computer-aided design systems. Capture programs. Standard circuit simulators. Programs for layout design	2	Presentation of slides using a projector, lecture based on the presented materials, conversation, explanation, example, demonstration, comparative analysis.
2. Capture Programs – Requirements, Structure, Work tools, Graphical symbols, Symbol libraries, Graphical symbol editor, Placement and editing of components, Interconnection methods, Hierarchically structured projects – ensuring connectivity, Report files: generation, interpretation, use	6	
3. Simulation programs – The objectives of standard circuit	10	

[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.).

simulators. Simulation algorithms. Modeling concepts, Modeling of passive components and semiconductor devices, Subcircuits. Direct current analyses, Alternating current analyses, Time domain analysis, Performance analyzes - optimization of circuit parameters. Digital Simulation: Types of digital devices. Modeling digital devices. Analysis of digital and mixed analog-digital circuits		Case Study
4. Design programs for Printed Wiring - Layout. Structure, Work Tools, Component Fingerprints: Fingerprint Libraries, Fingerprint Editor, Fingerprint – graphic symbol association. Technological parameters and design rules for wiring, Placement of components - methods. Drawing techniques. Schema – Layout synchronization. Generation of CAM files for the manufacture of printed wiring	10	
Bibliography [12] 1. Câmpeanu, A., Jivet, I. OrCAD. Bucuresti, Editura Teora, 1995. 2. Tudor Marin, SPICE. Editura Teora, Bucuresti 1996 3. Istvan Sztojanov, Sever Pasca, Analiza asistata de calculator a circuitelor electronice. Ghid practic Pspice. Editura Teora, Bucuresti1997 4. I. LIE, Grafica si Dezvoltarea Circuitelor Electronice – note de curs, 2020, https://cv.upt.ro/course/view.php?id=3723. 5. K. MITZNER, Complete PCB Design using ORCAD Capture and PCB Editor, 2009, Elsevier Inc		
8.2 Applied activities [13]	Number of hours	Teaching methods
PADS – Mentor Graphics, the electronic scheme capture and layout design environment. Interconnections between system modules. Knowledge of the facilities and work tools in PADS Logic. Placement and interconnection of components in PADS Logic. The use of labels and buses. Managing component libraries. Creating graphic symbols	4	Comparative analysis, demonstration, simulation, project method
Schematic verification using DRC and Report files. Associating wiring footprints. Generating Connections File – Netlist. Transfer to PADS Layout	2	
PADS Layout: Working tools, Definition of technological parameters and design rules. Importing the connections file. Placement of components – optimization techniques Realization of routes (Tracing/Routing). Using manual, dynamic or automatic plotting. Advantages of using DRC during routing. Post routing checks and changes	4	
Checking the layout project – Clearance and Connectivity. Generating CAM files in PADS Layout. The ECO mechanism. Exemplifying Bidirectional Synchronization PADS Logic – Layout	2	
Test 1 – Drawing an electronic scheme and designing the wiring printed in PADS	2	
OrCAD-PSpice environment: Knowledge of CAD/CAE system facilities for simulation, analysis, modeling and design of electronic circuits. Interconnections between system modules. Edit schematics of analog, digital, mixed circuits to be analyzed: Introduction of special elements required for analysis. Editing of all types of analog stimuli	4	Comparative analysis, demonstration, simulation, project method
Study of some fundamental analog circuits using DC analysis: Using different types of DC analysis. Using alternating current analyses. Ways to use AC analyses. Interpretation of simulation results. The study of the time behavior of analog circuits: Ways	4	Comparative analysis, demonstration, simulation, project method

[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".

of using the time analysis depending on the circuit. Setting initial conditions. The use of the Fourier transform and the spectral decomposition to determine the performance of the circuits		
Analysis of digital circuits: Types of digital stimuli. Description and editing of digital stimuli. Using specific analyzes to study the behavior of digital circuits. Interpretation of digital simulation results. Analysis of analog-digital mixed circuits. Types of projects. Modular and hierarchical design. Functional simulation. Report files	4	Comparative analysis, demonstration, simulation, project method
Test 2 - Drawing and simulating an electronic circuit in Pspice	2	
Bibliography [14] 1. I. LIE, Grafica si Dezvoltarea Circuitelor Electronice – lucrări de laborator, 2020, https://cv.upt.ro/course/view.php?id=3723. 2. I. LIE, B. MARINCA, A. AVRAM, Introducere in Electronica, Ed. Politehnica 2012.		

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

- As part of the POSDRU OVDIP project, the content of the discipline was the subject of discussions with the representatives of the following companies: Continental Automotive Romania, Hella Romania, Yazaki Srl, Flex and Huf Timișoara. Based on the companies' proposals and suggestions, the content of the course and application activities were defined following an iterative process, resulting in a final form agreed by the employers' representatives

10. Evaluation

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course	- Knowledge of the facilities of CAD/CAE systems for simulation, analysis, modeling and design of electronic circuits. - Understanding the features of electronic circuit diagram editors - The ability to properly use the concepts taught to simulate, analyze and optimize various types of circuits. - Understanding how to use an assisted design program for the design of printed circuit.	The theoretical knowledge is verified by marking two written papers (distributed assessment) with a duration of 1.5 hours each, which can be redone under the conditions provided by the regulation. The arithmetic mean of the grades from the two papers represents the "exam" grade. The subjects consist of theoretical questions combined with grid-type questions and short applications	50%
10.5 Applied activities	**S:**		
	L: Acquiring knowledge and training skills regarding the operation of computer-aided design environments for: a. Description/Capture of electronic schematics, b. Verification and optimization of their operation through simulation, c. Printed wiring design and file generation for computer-aided manufacturing	The evaluation of practical knowledge, skills and abilities is carried out through two laboratory tests in which students must solve a simulation problem and a layout design problem respectively in a given time interval (1.5 hours). The results of these two tests constitute the grade for the activity along the way.	50%
	P[16]**:**		
	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])			

[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.)
[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.

- The composition of the exam subjects considers that half of them refer to elementary aspects: drawing schemes, interconnection methods, generating transfer files, setting elementary analyses, operating the graphics processor, configuring templates, importing connections and fingerprints, placing components and drawing manual. Dealing with the mentioned issues ensures the minimum level for promotion.

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
18.06.2023		

Head of Department (signature)	**Date of approval in the Faculty Council** [18]	**Dean (signature)**
	14.09.23	

[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.