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/EA
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]			Technological Fundamentals of Microelectronics/DS				
2.2 Coordinator (holder) of course activities			Jivet Ioan				
2.3 Coordinator (holder) of applied activities[5]			Jivet Ioan				
2.4 Year of study[6]	4	**2.5** Semester	7	**2.6** Type of evaluation	E	**2.7** Regime of discipline[7]	DO

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	0 of which:	**3.5** training	0	**3.6** hours for diploma project elaboration	0
3.4* Total number of hours partially assisted / semester	0 of which:	**3.5*** training	0	**3.6*** hours for diploma project elaboration	0
3.7 Number of hours of unassisted activities / week	4.93 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			2.5
		hours of individual study after manual, course support, bibliography and notes			1.2
		training seminars / laboratories, homework and papers, portfolios and essays			1.23
3.7* Number of hours of unassisted activities / semester	69 of which:	additional documentary hours in the library, on the specialized electronic platforms and on the field			35
		hours of individual study after manual, course support, bibliography and notes			16.8
		training seminars / laboratories, homework and papers, portfolios and essays			17.2
3.8 Total hours / week [9]	8.93				
3.8* Total hours /semester	125				
3.9 Number of credits	5				

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	• Introductory Electronic Circuits, Basic Digital Circuits ,
4.2 Competencies	• -

5. Conditions (where applicable)

5.1 of the course	• Videoprojector, Internet conection
5.2 to conduct practical activities	• PC's, CMOS Layout Software Tools,

6. Specific competencies acquired through this discipline

Specific competencies	• Understanding of the basic CMOS manufacturing techniques
Professional competencies ascribed to the specific competencies	• Application of knowledge, concepts and basic methods related to computer system architecture, microprocessors, microcontrolers, programming languages and techniques.
Transversal competencies ascribed to the specific competencies	• 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	• Understand the concepts behind high performance computing architectures required for the processing of the high volume of data in intelligent systems. Understand the concepts for data protection in complex architecture that ensure the safety requirements for automotive software design
7.2 Specific objectives	• Good understanding of high performance computing cores. Good understanding of Multi-processor system and on-chip communication infrastructure. Good understanding of memory organization and protection. Good understanding of GPUs and data parallel processing.

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
L1. CMOS Processing Technology Basics (intranet.etc.upt.ro/~VHDL_ENG/lectures)	2	Slides, discussion
L2. Electrical Behavior of CMOS Tranzistor (intranet.etc.upt.ro/~VHDL_ENG/lectures)	2	
L3. Characteristics of CMOS Tranzistors	2	

[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.).

(intranet.etc.upt.ro/~VHDL_ENG/lectures)		
L4. Scaling in CMOS Technology. Moore's Law (intranet.etc.upt.ro/~VHDL_ENG/lectures)	2	
L5. In Silicon Layout for Basic CMOS Gates (intranet.etc.upt.ro/~VHDL_ENG/lectures)	2	
L6. Standard Cells and Design Rule Check (intranet.etc.upt.ro/~VHDL_ENGlectures)	2	
L7. Dynamic Operation of the CMOS Inverter (intranet.etc.upt.ro/~VHDL_ENG/lectures)	2	
L8. Special Digital Gates (Transmission Gate) (intranet.etc.upt.ro/~VHDL_ENG/lectures)	2	
L9. Memories for Digital Circuits (intranet.etc.upt.ro/~VHDL_ENG/lectures))	2	
L10. Clocking Issieus and Power in Digital Circuits (intranet.etc.upt.ro/~VHDL_ENG/lectures)	2	
L11. Basic Building Blocks for Analong IC's (intranet.etc.upt.ro/~VHDL_ENG/lectures)	2	
L12. Basics of FDSOI MOS Technology (intranet.etc.upt.ro/~VHDL_ENG/lectures	2	
Bibliography [12] 1. CMOS VLSI Design: A Circuits and Systems Perspective 4th Edition by Neil Weste , David Harris, 2011 Addison & Wesley 2. John P. Uyemura, CMOS Logic Circuit Design, 2001 Springer		
8.2 Applied activities [13]	Number of hours	Teaching methods
Lab1. Layout Layers of CMOS Technology.	2	Exercises
Lab2. Microwind Layout Tool Basics	2	
Lab3. Crossection and 3D Layout Visualization	2	
Lab4. Design Rules Check for CMOS Technology	2	
Lab5. Simulation of Basic Gates with Microwind	2	
Lab6. Standard Cell Characteristics for Digital Circuits	2	
Lab7. Deep submicron Technologies Tranzistors	2	
Lab8. Basic Digital Gates in Layout	2	
Lab9. Decoders for CMOS Memories Lab10. Power of Switching Digital Tranzistor/Gates Lab 11. Tranzistor W/L for Analog Circuits Lab 12. First Experience with Profesional Layout Tools	8	

[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".

Bibliography [14] Microwind User Manual

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

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10. Evaluation

Type of activity	**10.1** Evaluation criteria [15]	**10.2** Evaluation methods	**10.3** Share of the final grade
10.4 Course		Exam	66%
10.5 Applied activities	**S:**		
	L:	Activity	34%
	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])			
• 5 for course exam			

Date of completion	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
10.07.2023		
Head of Department (signature)	**Date of approval in the Faculty Council [18]**	**Dean (signature)**
	14.09.2023	

[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.
[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.