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/MEO
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]			Topology elements of electronic systems**/DS**				
2.2 Coordinator (holder) of course activities			Raul Ionel				
2.3 Coordinator (holder) of applied activities[5]			Raul Ionel, Anca Dărăbuț				
2.4 Year of study[6]	4	**2.5** Semester	8	**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	3 of which:	**3.2** course	1.5	**3.3** seminar / laboratory / project	0/1.5/0
3.1* Total number of fully assisted hours / semester	42 of which:	**3.2*** course	21	**3.3*** seminar / laboratory / project	0/21/0
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	4.14 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			1,5
		training seminars / laboratories, homework and papers, portfolios and essays			1.64
3.7* Number of hours of unassisted activities / semester	58 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			21
		training seminars / laboratories, homework and papers, portfolios and essays			23
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	• Electronics, PCB design, Measurements & Instrumentation
4.2 Competencies	• Electronics, Circuits, Measurements & Instrumentation

5. Conditions (where applicable)

5.1 of the course	• Video projector, board
5.2 to conduct practical activities	• Video projector, board, electronic components, electronic devices

6. Specific competencies acquired through this discipline

Specific competencies	• 1. Use of fundamentals in terms of devices, circuits, systems, instrumentation and electronics technology. 2. Application of knowledge, concepts and basic methods related to computer system architecture, microprocessors, microcontrollers, programming languages and techniques. 3. Solving technological problems in fields of applied electronics
Professional competencies ascribed to the specific competencies	• 1. Use of fundamentals in terms of devices, circuits, systems, instrumentation and electronics technology. 2. Application of knowledge, concepts and basic methods related to computer system architecture, microprocessors, microcontrollers, programming languages and techniques. 3. Solving technological problems in fields of applied electronics
Transversal competencies ascribed to the specific competencies	• 1. Methodical analysis of field-related problems aimed at identifying acknowledged solutions, thus ensuring the accomplishment of professional tasks. 2. Definition of activity stages and their distribution to subordinates in terms of responsibilities, providing effective exchange of information and interpersonal communication. 3. 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 topology fundamentals architectures required for quality evaluation of electronic boards destined for automotive, telecommunications and consumer systems. Understand concepts of a non-invasive testing and analysis technology for the IEEE 1149.1 standard
7.2 Specific objectives	• Good understanding of high-performance advantages offered by the IEEE 1149.1 standard. Good understanding of designing products which support implementation of Boundary Scan testing and interaction. Good understanding of Design for testability performance analysis, topology and components selection for cost and performance in automotive industry and conclusions. Boundary Scan Circuitry description, functionality, schematics, mathematical calculations, and the integration possibilities study

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
Introduction - Topology and Components selection and performance characteristics	3	Slides/Discussion/ Theory/ Examples
JTAG 1149.1 / Boundary Scan Principles of Functionality	3	
The 1149.1 Chain design considerations	3	
Boundary Scan Project - testing of JTAG enabled devices	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.).

Boundary Scan Project - testing of non JTAG devices	3	
Test Coverage Reporting Analysis	3	
Topology performance evaluation, integration options and conclusions	3	

Bibliography [12] 1. P. Kenneth, The Boundary-Scan Handbook, ISBN 978-1-4757-2142-3, DOI 10.1007/978-1-4757-2142-3, Springer US, 1992.
2. B. H. van den Eijnden, F. P. de Jong, Boundary-Scan Test - A Practical Approach, ISBN: 978-1-4613-6371-2, DOI 10.1007/978-1-4615-3132-6, Springer US, 1993.
3. Ben Bennets, Lecture Notes, Boundary Scan Tutorial, http://fiona.dmcs.pl/~cmaj/JTAG/boundaryscan_tutorial.pdf
4. https://www.xjtag.com/about-jtag/
5. XJTAG Tutorials and Case Studies, available on xjtag.com
6. A. Goldman, *Applications and Topologies for Power Electronic Systems,* In: Magnetic Components for Power Electronics. Springer, Boston, MA. https://doi.org/10.1007/978-1-4615-0871-7_1, 2002.

8.2 Applied activities [13]	Number of hours	Teaching methods
Introduction to Boundary Scan Tools	3	Exercises/ Hands On Activity
A study of XJAnalyser Features	3	
A study of XJInvestigator Features	3	
Boundary Scan Demo Application Development P1	3	
Boundary Scan Demo Application Development P2	3	Exercises/ Hands On Activity
Boundary Scan Demo Application Development P3	3	Exercises/ Hands On Activity
Integration with LabVIEW & C Examples	3	Exercises/ Hands On Activity

Bibliography [14] 1. P. Kenneth, The Boundary-Scan Handbook, ISBN 978-1-4757-2142-3, DOI 10.1007/978-1-4757-2142-3, Springer US, 1992.
2. B. H. van den Eijnden, F. P. de Jong, Boundary-Scan Test - A Practical Approach, ISBN: 978-1-4613-6371-2, DOI 10.1007/978-1-4615-3132-6, Springer US, 1993.
3. Ben Bennets, Lecture Notes, Boundary Scan Tutorial, http://fiona.dmcs.pl/~cmaj/JTAG/boundaryscan_tutorial.pdf
4. https://www.xjtag.com/about-jtag/
5. XJTAG Tutorials and Case Studies, available on xjtag.com
6. A. Goldman, *Applications and Topologies for Power Electronic Systems,* In: Magnetic Components for Power Electronics. Springer, Boston, MA. https://doi.org/10.1007/978-1-4615-0871-7_1, 2002.

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

- The content of the discipline is in line with the latest technological approaches which can be found in today's Electronics Manufacturing Industry. This subject is present in the Curricula of important higher education institutions, as well as in the recommendations formulated by leading industry partners like Continental, Hella or Flex.

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 discussed	Exam	50%

[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.)

	concepts		
10.5 Applied activities	**S:**		
	L: Application development and BST enabled design	Presentation	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])			
• 5 for couse exam and 5 for laboratory work. • Understanding of concepts which the course focuses on. Knowledge is verified by written exam, written tests and laboratory work. • Attending mandatory activities. • Discussions and contributions over the period of educational activity.			

Date of completion 15.06.2023	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
Head of Department (signature)	**Date of approval in the Faculty Council** [18] 14.09.2023	**Dean (signature)**

[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.