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]			Electronic circuits computer assisted analysis**/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)

4.1 Curriculum	• Basic electronic circuits computer assisted analysis concepts. Continuous-time systems, discrete-time systems, the mathematical model, modeling and simulation

[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.

	approaches, correspondence between electrical and other physical systems, State space models: introduction, state space model calculations, practical examples involving filters, correspondence with the mathematical model. Using the Laplace transform: introduction, poles and zeros, transfer functions models, program implementation of transfer functions, conversion between state space models and transfer functions. Circuit transformations: Conversion between time and frequency domains, examples and results comparison, eigenvalues, zeros-poles models and stability analysis. Frequency and time response analysis: program implementation of power gain, amplitude gain and phase calculations, filter characteristics, general form of Bode plots, step response, impulse response.
4.2 Competencies	• Electronics, Circuits, Measurements & Instrumentation. Methodical analysis of activity related problems. Using specialized software and electronic resources written in English. Using fundamental elements related to devices, circuits, systems and electronic instrumentation and technology.

5. Conditions (where applicable)

5.1 of the course	• Video projector, board
5.2 to conduct practical activities	• Video projector, board, electronic components, Boundary Scan Test hardware

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	• Problem solving using dedicated software platforms. State space model calculations. Implementation using graphical and text programming. Comparison between graphical and text programming implementation possibilities. State space to transfer function transformations. Rotational antenna dish positioning system example. Transfer Function models. Zero – Pole – Gain models. State – Space models. Conversion between model forms. Conversion between continuous and discrete models. • Building of filtering circuits and testing them using signal generators and oscilloscopes. Performance analysis and conclusions. The project includes circuit description, functionality, schematics, mathematical calculations and the stability study
7.2 Specific objectives	• Good understanding of concepts and basic methods related to circuits and electronic instrumentation, programming techniques and languages. Basic electronic circuits computer assisted analysis concepts. Continuous-time systems, discrete-time systems, the mathematical model, modelling and simulation approaches, correspondence between electrical and physical systems, dedicated software platforms introduction. State space

	models: introduction, state space model calculations, practical examples involving filters, correspondence with the mathematical model. Using the Laplace transform: introduction, poles and zeros, transfer functions models, program implementation of transfer functions, conversion between state space models and transfer functions. Circuit transformations: Conversion between time and frequency domains, examples and results comparison, eigenvalues, zeros-poles models and stability analysis. Frequency and time response analysis: program implementation of power gain, amplitude gain and phase calculations, filter characteristics, general form of Bode plots, step response, impulse response.

8. Content [10]

8.1 Course	Number of hours	Teaching methods [11]
Introduction – Computer-Aided Analysis of Electronic Circuits: Algorithms and Computational Techniques concepts	3	Slides/Discussion/ Theory/ Examples
The mathematical model in electronic circuits computer assisted analysis	3	
State space models	3	
Using the Laplace transform	3	
Poles and zeros, transfer functions models	3	
Circuit transformations	3	
Frequency and time response analysis	3	

Bibliography [12]

1. R. Ionel, *Modelare si Simulare. Experimente si Aplicatii*, "Politehnica" Publisher, ISBN 978-606-554-315-7, Timisoara, 116 pages, 2011.
2. Gary W. Johnson, R. Jennings, *LabVIEW Graphical Programming*, McGraw – Hill Professional, 2006.
3. Jim Ledin, *Simulation Engineering*, CMP Books, R & D Developer Series, 2001, ISBN 1-57820-080-6.
4. Bernard Ziegler, Herbert Praehofer, Tag Gon Kim, *Theory of Modelling and Simulation*, Academic Press, 2000.
5. Leon O. Chua, Pen-Min Lin, *Computer-aided analysis of electronic circuits: algorithms and computational techniques*, Prentice-Hall, ISBN 0131654152, 1975.
6. William J. McCalla, *Fundamentals of Computer-Aided Circuit Simulation*, Springer, ISBN 978-1-4613-2011-1, 1988.

8.2 Applied activities [13]	Number of hours	Teaching methods
Applications using dedicated software platforms	3	Exercises/ Hands On Activity
Applications using dedicated software platforms	3	
Applications using dedicated software platforms	3	
Applications using dedicated software platforms	3	
Applications using dedicated software platforms	3	Exercises/ Hands On Activity
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[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.).

[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] 1. R. Ionel, *Modelare si Simulare. Experimente si Aplicatii*, "Politehnica" Publisher, ISBN 978-606-554-315-7, Timisoara, 116 pages, 2011.

2. Gary W. Johnson, R. Jennings, *LabVIEW Graphical Programming*, McGraw – Hill Professional, 2006.

3. Jim Ledin, *Simulation Engineering*, CMP Books, R & D Developer Series, 2001, ISBN 1-57820-080-6.

4. Bernard Ziegler, Herbert Praehofer, Tag Gon Kim, *Theory of Modelling and Simulation*, Academic Press, 2000.

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

- A study by National Instruments and Tektronix entitled Integrating Design and Test, shows that all "best in class" companies use simulation before design implementation. The study confirms that simulation usage increases productivity by 29%. Other factors which have been discussed in this study and influence productivity increase are: design verification (40% influence), components evaluation (22% influence) and nets placement (8% influence).
- Institute for Printed Circuits shows that 75% of total costs for PCB construction are influenced by choices made during design stages. Important details about circuit functionality can be tested using electronic circuits computer assisted analysis, without actual implementation.

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 concepts	Exam	66%
10.5 Applied activities	**S:**		
	L: Application development	Presentation	33%
	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 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	**Course coordinator (signature)**	**Coordinator of applied activities (signature)**
15.06.2023		
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.