SYLLABUS

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Electronics, Telecommunications and information Technology
1.3 Department	Applied Electronics
1.4 Field of study	Electronic Engineering, Telecommunications and Information Technologies
1.5 Cycle of study	Bachelor of Science
1.6 Program of study / Qualification	Applied Electronics / Engineer
1.7 Form of education	Full time
1.8 Subject code	28.00

2. Data about the subject

2.1 Subject name	CAD Techniques						
2.2 Subject area	Theoretical area Methodological area Analytic area						
2.3 Course responsible	Assist. Prof. Raul Fizeșan, PhD Eng. - Raul.FIZESAN@ael.utcluj.ro						
2.4 Teacher in charge with seminar / laboratory / project	Assist. Prof. Raul Fizeșan, PhD Eng. - Raul.FIZESAN@ael.utcluj.ro						
2.5 Year of study	II	2.6 Semester	2	2.7 Assessment	V	2.8 Subject category	DD/DI

3. Estimated total time

3.1 Number of hours per week	4	of which: 3.2 course	2	3.3 seminar / laboratory	2
3.4 To Total hours in the curriculum	56	of which: 3.5 course	28	3.6 seminar / laboratory	28

Distribution of time	hours
Manual, lecture material and notes, bibliography	14
Supplementary study in the library, online specialized platforms and in the field	4
Preparation for seminars / laboratories, homework, reports, portfolios and essays	22
Tutoring	2
Exams and tests	2
Other activities:	

3.7 Total hours of individual study	44
3.8 Total hours per semester	100
3.9 Number of credit points	4

4. Pre-requisites (where appropriate)

4.1 curriculum	Circuits Analysis and Synthesis
4.2 competence	

5. Requirements (where appropriate)

5.1. for the course	Amphitheatre, Cluj-Napoca

5.2. for the seminars / laboratories / projects	Laboratory (with computers and blackboard), Cluj-Napoca

6. Specific competences

Professional competences	C1. Use of the fundamental elements related to the electronic devices, circuits, systems, instrumentation and technology • C1.5 Design and implementation of low / medium complexity electronic circuits using CAD-CAM technologies and standards • C1.2Analysis of electronic circuits and systems of low / medium complexity, for the purpose of designing and measuring them C2. Application of basic methods for the signals acquisition and processing • C2.1 Temporal, spectral and statistical characterization of signals • C2.2 Explaining and interpreting the methods of acquisition and processing of signals • C2.3 Use of simulation environments for signal analysis and processing • C2.4 Use of the specific method and tools for signal analysis C3 Application of the basic knowledge, concepts and methods regarding the architecture of computing systems, microprocessors, microcontrollers, programming languages and techniques • C3.4 Development of programs for a general and / or specific programming language, starting from the specification of the requirements and until the execution, debugging and interpretation of the results in correlation with the processor used • C3.5 Projects involving hardware (processors) and software (programming) components C4. Design and use of low complexity hardware and software applications specific to the applied electronics • C4.1 Defining the concepts, principles and methods used in the fields: computer programming, high-level and specific languages, CAD techniques for making electronic modules, microcontrollers, computer systems architecture, programmable electronic systems, graphics, reconfigurable hardware architectures • C4.2 Explanation and interpretation of the specific requirements of the hardware and software structures in the fields: computer programming, high-level and specific languages, CAD techniques for making electronic modules, microcontrollers, computer systems architecture, programmable electronic systems, graphics, reconfigurable hardware architectures
Cross competences	N.A.

7. Discipline objectives (as results from the key competences gained)

7.1 General objective	Development of skills in the field of simulation and modeling of electronic circuits
7.2 Specific objectives	1. Assimilation of theoretical knowledge regarding the simulation of electronic circuits

	2. Obtaining skills for using electronic circuit simulation programs

8. Contents

8.1 Lecture (syllabus)	Teaching methods	Notes
1. Introduction in circuit simulation techniques	Exposition, discussions	Video projector
2. DC Analysis		
3. AC Analysis		
4. Time domain Analysis		
5. Parametric and Performance Analysis		
6. Statistical Analysis		
7. Behavioral modeling and hierarchical simulation		
8. Standard simulation algorithms for electrical and electronic circuits		
9. Introduction in modeling of electronic devices		
10. Semiconductor diode modeling		
11. Modeling of bipolar transistor		
12. Modeling of JFET transistors		
13. Modeling of MOS transistors		
14. Modeling of operational amplifiers		

Bibliography

1. Ovidiu Pop, Raul Fizeşan, Computer Aided Design. Editura U.T. Press, Cluj-Napoca, 2016.
2. Ovidiu Pop, Proiectare asistata de calculator, Ed. Mediamira, Cluj-Napoca, 2007
3. Ana Rusu -Proiectare asistata de calculator,Editura Dacia, Cluj, 1994
4. G.Chindris, A.Rusu-Proiectarea asistata de calculator a circuitelor electronice, Ed. Casa Cartii de Stiinta, 1999
5. G.Chindris, O. Pop, G.Deak-Simularea si modelarea avansata a circuitelor electronice, Ed. Casa Cartii de Stiinta, 2002

8.2 Laboratory	Teaching methods	Notes
1. Introduction in PSPICE simulation	Exposition, discussions	Laboratory platforms
2. DC Analysis		
3. AC Analysis		
4. Time Domain Analysis		
5. Parametric and Optimization Analysis		
6. Performance and Statistical Analysis		
7. Analog behavior modeling		
8. Modeling of systems with ABM circuits		
9. PSPICE modeling of semiconductor diodes		
10. PSPICE modeling of bipolar transistor		
11. PSPICE modeling of JFET and MOS transistors		
12. PSPICE modeling of sub-circuits		
13. PSPICE of modeling of operational amplifiers		

Bibliography

1. Raul Fizeşan, Ovidiu Pop, Gabriel Chindriş, Computer Aided Design: laboratory applications, Editura U.T. Press, Cluj-Napoca, 2015
2. Ovidiu Pop, Raul Fizeşan, Gabriel Chindriş, Proiectare asistată de calculator: aplicaţii, Editura U.T. Press, Cluj-Napoca, 2013, ISBN 978-973-662-856-6

9. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

The discipline content and the acquired skills are in agreement with the expectations of the professional organizations and the employers in the field, where the students carry out the internship stages and/or occupy a job (in the field of engineers, electronic designer engineers, simulation and testing digital system), and the expectations of the national organization for quality assurance (ARACIS).

10. Evaluation

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in the final grade
10.4 Course	The level of acquired theoretical knowledge and practical skills	Written test	20%
10.5 Seminar/ Laboratory	The level of acquired knowledge and abilities	Project	80%

10.6 Minimum standard of performance

Quality level:

Minimum knowledge:

- ✓ Knowledge of methods of analysis of electronic circuits.
- ✓ Knowledge of the means of simulation and modeling of electronic circuits.
- ✓ Area Evaluation and interpretation of data obtained from electronic circuit simulation.

Minimum competences:

- ✓ Be able to identify the main types of analysis.
- ✓ To use standard simulation algorithms for electrical and electronic circuits.
- ✓ To perform the simulation of electronic circuits.
- ✓ To perform behavioral modeling and hierarchical simulation of a circuit
- ✓ To display and interpret the simulation results.
- ✓ To design electronic devices and circuits.

Quantitative level:

- ✓ Perform all laboratory work
- ✓ The exam and laboratory notes must be at least 5.
- ✓ The mark for the subject is calculated with the relation: 0.2 * Exam score + 0.8 * Laboratory score

Date of filling in:	Responsible	Title Surname NAME	Signature
23.06.2023	Course	Assist. Prof. Raul Fizeșan, PhD Eng.	
	Applications	Assist. Prof. Raul Fizeșan, PhD Eng.	

Date of approval in the Department of Applied Electronics ____30.06.2023_____	Head of Department Prof. Dorin PETREUS, PhD Eng.
Date of approval in the Council of Faculty of Electronics, Telecommunications and Information Technology ____12.07.2023_____	Dean Prof. Ovidiu Aurel POP, PhD Eng.