SYLLABUS

1. Program information

1.1 Higher education institution	Technical University of Cluj-Napoca
1.2 Faculty	Faculty of Electronics, Telecommunications and Information Technology
1.3 Department	Bases of Electronics
1.4 Field of study	Electronic engineering, telecommunications and information technologies
1.5 Cycle of study	Bachelor of Science
1.6 Study program / Qualification	Electronic engineering, telecommunications and information technologies/ Engineer
1.7 Form of education	IF – full-time education

2. Course information

2.1 Course title	CAD Tehniques				Course code	28.00
2.2 Course coordinator	*Lect. Raul FIZEȘAN, Ph.D. - Raul.FIZESAN@ael.utcluj.ro*					
2.3 Seminar/ laboratory/ project/ practical activity coordinator	*Lect. Raul FIZEȘAN, Ph.D - Raul.FIZESAN@ael.utcluj.ro*					
2.4 Year of study	II	2.5 Semester	2	2.6 Type of assessment		V
2.7 Course status	Formative category					DD
	Optionality					DOB

3. Estimated total time

3.1 Hours per week	4	of which:	3.2 Lecture	2	3.3 Seminar		3.3 Laboratory	2	3.3 Project		3.3 Practical training	
3.4 Hours per semester	56	of which:	3.5 Lecture	28	3.6 Seminar		3.6 Laboratory	28	3.6 Project		3.3 Practical training	

3.7 Time distribution (hours per semester) for individual study and assessment:	
(a) Assessment	3
(b) Study using textbook, course materials, bibliography, and notes	14
(c) Additional documentation in the library, on specialized electronic platforms, and in the field	4
(d) Preparation for seminars/laboratories, assignments, reports, portfolios and essays	21
(e) Tutoring	2
(f) Other activities	
3.8 Total hours of individual study and assessment (sum of (3.7(a)...3.7(f))	44
3.9 Total hours per semester (3.4+3.8)	100
3.10 Number of credits	4.0

4. Prerequisites (where applicable)

4.1 curriculum	
4.2 competencies	

5. Requirements (where applicable)

5.1. for the development of the lecture	UTCN
5.2. for the development of the seminar/ laboratory/ project	UTCN

6. Specific competencies acquired

Professional competencies	C1 Use of fundamental elements related to electronic devices, circuits, systems, instrumentation and technology C1.1 Description of the operation of electronic devices and circuits and of the fundamental methods for measuring electrical quantities C1.2 Analysis of low-/medium-complexity electronic circuits and systems for their design and measurement C1.3 Diagnosis/troubleshooting of electronic circuits, equipment and systems C1.5 Design and implementation of low-/medium-complexity electronic circuits using CAD-CAM technologies and standards in the field C2 Application of basic methods for signal acquisition and processing C2.3 Use of simulation environments for signal analysis and processing C2.5 Design of elementary functional blocks for digital signal processing with hardware and software implementation C3 Application of basic knowledge, concepts and methods related to computer-system architecture, microprocessors, microcontrollers, programming languages and techniques C3.1 Description of the operation of a computer system, of the basic principles of general-purpose microprocessor and microcontroller architecture, and of the general principles of structured programming C3.5 Implementation of projects involving hardware components (processors) and software (programming) C4 Design and use of low-complexity hardware and software applications specific to applied electronics C4.1 Definition of the concepts, principles and methods used in: computer programming, high-level and specific languages, CAD techniques for creating electronic modules, microcontrollers, computer-system architecture, programmable electronic systems, graphics and reconfigurable hardware architectures C4.2 Explanation and interpretation of the requirements specific to hardware and software structures in the fields of: computer programming, high-level and specific languages, CAD techniques for creating electronic modules, microcontrollers, computer-system architecture, programmable electronic systems, graphics and reconfigurable hardware architectures C4.4 Use of appropriate performance criteria to evaluate, including by simulation, the hardware and software of dedicated systems or service activities using microcontrollers or low-/medium-complexity computer systems

Transversal competencie	

7. Expected learning outcomes

Knowledge	- The student/graduate explains and interprets theoretical and experimental results in mathematics, physics, chemistry, economics, technical drawing and computer science. - The student/graduate describes, identifies and summarizes elementary concepts and methods related to electronic devices, circuits and instrumentation, as well as their application in concrete problems
Skills	- The student/graduate uses fundamental methods for measuring electrical quantities and assesses electronic devices and circuits, as well as linear and digital integrated circuits of low/medium complexity. - The student/graduate designs, measures, evaluates performance, diagnoses and troubleshoots functional blocks composed of low/medium-complexity electronic devices and/or circuits. - The student/graduate designs low/medium-complexity electronic circuits and implements them using CAD techniques
Responsibility and autonomy	- The student/graduate carries out project management processes in electronics, telecommunications and information technologies, taking on different team roles and clearly and concisely describing the results, both orally and in writing.

8. Course objectives (based on the grid of specific competencies acquired)

8.1 General objective of the course	Development of skills in the field of simulation and modeling of electronic circuits
8.2 Specific objectives	1. Assimilation of theoretical knowledge regarding the simulation of electronic circuits 2. Obtaining skills for using electronic circuit simulation programs

9. Contents

9.1 Lecture	**No. of hours**	**Teaching methods**	**Remarks**
1. Introduction in circuit simulation techniques	2	Exposition, discussions	
2. DC Analysis	2		
3. AC Analysis	2		
4. Time domain Analysis	2		
5. Parametric and Performance Analysis	2		
6. Statistical Analysis	2		
7. Behavioral modeling and hierarchical simulation	2		

9.1 Lecture	No. of hours	Teaching methods	Remarks
8. Standard simulation algorithms for electrical and electronic circuits	2		
9. Introduction in modeling of electronic devices	2		
10. Semiconductor diode modeling	2		
11. Modeling of bipolar transistor	2		
12. Modeling of JFET transistors	2		
13. Modeling of MOS transistors	2		
14. Modeling of operational amplifiers	2		

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

9.2 Seminar /laboratory /project /practical training	No. of hours	Teaching methods	Remarks
1. Introduction in PSPICE simulation	2	Exposition, discussions	
2. DC Analysis	2		
3. AC Analysis	2		
4. Time Domain Analysis	2		
5. Parametric and Optimization Analysis	2		
6. Performance and Statistical Analysis	2		
7. Analog behavior modeling	2		
8. Modeling of systems with ABM circuits	2		
9. PSPICE modeling of semiconductor diodes	2		
10. PSPICE modeling of bipolar transistor	2		
11. PSPICE modeling of JFET and MOS transistors	2		
12. PSPICE modeling of sub-circuits	2		
13. PSPICE of modeling of operational amplifiers	2		
14. Reschedule missed laboratory sessions. Project Examinations	2		

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

10. Alignment of the course contents with the expectations of the epistemic community, professional associations, and representative employers in the field related to the program

The course content and the teaching-learning-assessment methods are aligned with the current requirements of the Electronics, Telecommunications, and Information Technology Engineering field, considering the expectations of the academic and professional community, representative employers, as well as the national quality assurance standards in higher education. The course helps prepare students in line with employer expectations and the quality requirements set for engineering study programs.

11. Assessment

Activity type	**11.1 Assessment criteria**	**11.2 Assessment methods** (and type of assessment: continuous/ summative)	**11.3 Weight in final grade**
11.4 Lecture	The level of acquired theoretical knowledge	Written test	40%
11.5 Seminar/ Laboratory/ Project /Practical activity	The level of acquired knowledge and abilities	Practical test/project	60%

11.6 Minimum performance standard

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 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: 0.4 * Exam score + 0.6 * Laboratory score

Completion date:	**Course coordinators**	**teaching rank, title First name LAST NAME**	**Signature**
23.06.2026	Lecture	Lect. Raul FIZEȘAN, Ph.D.	
	Applications	Lect. Raul FIZEȘAN, Ph.D.	

Approval of the Head of the Department coordinating the course, only if this differs from the department organizing the study program	Head of the Applied Electronics Department Prof. Dorin PETREUȘ, Ph.D.

Date of approval by the Council of the Department of Bases of Electronics 26.06.2026	Head of the Bases of Electronics Department Prof. Sorin HINTEA, Ph.D.
Date of approval by the Council of the Faculty of Electronics, Telecommunications and Information Technology 30.06.2026	Dean, Prof. Ovidiu-Aurel POP, Ph.D.