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	Passive components and circuits				Course code	5.00
2.2 Course coordinator	*Lect. Alexandra FODOR, Ph.D. – alexandra.fodor@ael.utcluj.ro*					
2.3 Seminar/ laboratory/ project/ practical activity coordinator	*Lect. Vlad BANDE, Ph.D. – vlad.bande@ael.utcluj.ro*					
2.4 Year of study	I	2.5 Semester	1	2.6 Type of assessment		E
2.7 Course status	Formative category					DF
	Optionality					DOB

3. Estimated total time

3.1 Hours per week	4	of which:	3.2 Lecture	2	3.3 Seminar	0	3.3 Laboratory	2	3.3 Project	0	3.3 Practical training	0
3.4 Hours per semester	56	of which:	3.5 Lecture	28	3.6 Seminar	0	3.6 Laboratory	28	3.6 Project	0	3.3 Practical training	0

3.7 Time distribution (hours per semester) for individual study and assessment:	
(a) Assessment	6
(b) Study using textbook, course materials, bibliography, and notes	30
(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	30
(e) Tutoring	2
(f) Other activities	
3.8 Total hours of individual study and assessment (sum of (3.7(a)...3.7(f))	69
3.9 Total hours per semester (3.4+3.8)	125
3.10 Number of credits	5.0

4. Prerequisites (where applicable)

4.1 curriculum	
4.2 competencies	

5. Requirements (where applicable)

5.1. for the development of the lecture	Attendance at the scheduled classes
5.2. for the development of the seminar/ laboratory/ project	Attendance at the scheduled classes

6. Specific competencies acquired

Professional competencies	C1. Use of the fundamental elements related to devices, circuits, systems, instrumentation and electronic technology C1.1 Description of the functioning of electronic devices and circuits and of the fundamental methods of measuring electrical parameters C1.2 Analysis of electronic circuits and systems of low/ medium complexity, for the purpose of designing and measuring them C1.3 Diagnosis/ troubleshooting of electronic circuits, equipment and systems C1.4 Use of electronic tools and specific methods to characterize and evaluate the performance of electronic circuits and systems C1.5 Design and implementation of electronic circuits of low/ medium complexity using CADCAM technologies and standards in the field C4 Design and use of low-complexity hardware and software applications specific to applied electronics C4.3 Identification and optimization of hardware and software solutions for problems related to industrial electronics, medical electronics, automotive electronics, automation, robotics, and consumer goods production. C4.4 Use of appropriate performance criteria to evaluate, including by simulation, the hardware and software of dedicated systems or service activities that use microcontrollers or computing systems of low or medium complexity. C4.5 Design of dedicated equipment in the fields of applied electronics, using microcontrollers, programmable circuits, or computing systems with simple architecture, including the related software. C6 Solving technological problems in the fields of applied electronics C6.1 Definition of the principles and methods that underline the manufacturing, adjustment, testing, and troubleshooting of devices and equipment in the fields of applied electronics. C6.2 Explanation and interpretation of production processes and maintenance activities for electronic equipment, identifying test points and the electrical quantities to be measured. C6.5 Design of manufacturing and maintenance technology (specifying the necessary components and operations) for low- and medium-complexity products in the fields of applied electronics.

Transversal competencie	

7. Expected learning outcomes

Knowledge	- 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.
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	To develop abilities and skills in the passive electronic components and circuits domain.
8.2 Specific objectives	To acquire theoretical knowledge involving the passive electronic components and circuits behavior. To obtain practical skills with the help of which the student will be able to analyze any electronic circuit that contains passive components.

9. Contents

9.1 Lecture	**No. of hours**	**Teaching methods**	**Remarks**
1. PCC Lecture Presentation. Introduction – part I.	2	PowerPoint interactive presentation	video-projector, blackboard
2. Introduction – part II.	2		
3. Electrical Circuits Analysis Methods.	2		
4. Circuit Parameters.	2		
5. The Capacitance – DC and AC Regime Behavior.	2		
6. The Capacitance – Transient Regime Behavior.	2		
7. The Inductance – DC and AC Regime Behavior.	2		
8. The Inductance – Transient Regime Behavior.	2		

9.1 Lecture	No. of hours	Teaching methods	Remarks
9. Resistors.	2		
10. Capacitors.	2		
11. Coils (Inductors).	2		
12. Quartz Resonators. Passive Electronic Components with Non-Linear Behavior.	2		
13. PCB Design Overview.	2		
14. Final Review.	2		

Bibliography

Bibliography:

1. Dan Pitică, Vlad Bande – *Passive Electronic Components and Circuits – Part I – Circuit Elements,* UTPRESS, 2016.
2. P. Svasta, Al. Vasile, V. Columbeanu, C. Ionescu, D. Moraru, A. Fleschiu, N.D. Codreanu, I. Plotog, D. Leonescu – *Rezistoare, Condensatoare, Inductoare. Probleme,* Cavallioti, 2012.
3. P. Svasta, Golumbeanu V. et al., - *Passive electronic components – applications,* Cavallioti, 2007.
4. Digital lecture notes – available on Teams

9.2 Seminar /laboratory /project /practical training	No. of hours	Teaching methods	Remarks
1. Basics about Labor Protection, Prevention and Firefighting inside the PCC Laboratory.	2	Explanations. Problem solving from the thematic of the current application. Practical experiments.	PC, electronic board for passive components connectivity, command and control equipment and software interface.
2. Series and Parallel Connections. Ohm's Law.	2		
3. Resistive Voltage and Current Dividers.	2		
4. Electrical Signals.	2		
5. The Superposition Principle.	2		
6. Thevenin's Theorem. Norton's Theorem.	2		
7. 1st Theoretical Test (Electrical Circuits Analysis Methods)	2		
8. Experimental Characterization of Practical Passive Components and Their Parameters	2		
9. Analiza circuitelor RC și RL în regim de curent alternativ. Filtru trece jos. Filtru trece sus.	2		
10. Potentiometers. Impact of Resistance Variation on Circuit Operation.	2		
11. Experimental Characterization of RLC Circuits in the Frequency Domain	2		
12. RC and RL Circuits' Behavior in the Transient Regime.	2		
13. Practical Test - Designing and Analyzing a Circuit Built with Passive Components.	2		
14. Final review – problem solving.	2		

Bibliography

9.2 Seminar /laboratory /project /practical training	No. of hours	Teaching methods	Remarks
1. Dan Pitică, Vlad Bande – *Passive Electronic Components and Circuits – Part I – Circuit Elements,* UTPRESS, 2016. 2. P. Svasta, Al. Vasile, V. Columbeanu, C. Ionescu, D. Moraru, A. Fleschiu, N.D. Codreanu, I. Plotog, D. Leonescu – *Rezistoare, Condensatoare, Inductoare. Probleme,* Cavallioti, 2012. 3. P. Svasta, Golumbeanu V. et al., - *Passive electronic components – applications,* Cavallioti, 2007. 4. Digital lecture notes – available on Teams. 5. Applications - digital format – available on Teams.			

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	Theoretical subjects. Problem solving.	Written Exam	50%
11.5 Seminar/ Laboratory/ Project /Practical activity	Circuit design and analysis. Experimental data analysis.	Theoretical Test I – 50% Practical Test – 50%	50%

11.6 Minimum performance standard

- Correct application of the most important analysis methods to a low-complexity circuit (voltage/current dividers, superposition principle, Thevenin/Norton theorems).
- Knowledge and understanding of the electrical properties of resistors, capacitors, and inductors.

Final grade calculation for the PCC course:

- Laboratory grade (NL): arithmetic mean – NL $= 0.5 \times T1 + 0.5 \times TP$. The laboratory is considered passed if a minimum grade of 5 out of 10 is obtained.
  - T1 – grade obtained in Theoretical Test I.
  - TP – grade obtained in the Practical Test.
- Exam grade (NE): The exam is considered passed if a minimum grade of 5 out of 10 is obtained.
- Course grade (NF): arithmetic mean – NF $= 0.5 \times NL + 0.5 \times NE$ (it is calculated only if NL ≥ 5 and NE ≥ 5).

Completion date:	**Course coordinators**	**teaching rank, title First name LAST NAME**	**Signature**
23.06.2026	Lecture	Lect. Alexandra FODOR, Ph.D.	
	Applications	Lect. Vlad BANDE, 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.