Universitatea Naţională de Ştiinţă şi Tehnologie Politehnica Bucureşti
Facultatea de Electronică, Telecomunicaţii şi
Tehnologia Informaţiei

COURSE DESCRIPTION

1. Program identification information

1.1 Higher education institution	**National University of Science and Technology Politehnica Bucharest**
1.2 Faculty	**Electronics, Telecommunications and Information Technology**
1.3 Department	**Telecommunications**
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of studies	Bachelor/Undergraduate
1.6 Programme of studies	Technologies and Telecommunications Systems

2. Date despre disciplină

2.1 Course name (ro) (en)				Grafică asistată de calculator - Proiect CAD pentru electronică Computer Aided Graphics - CAD Project for Electronics			
2.2 Course Lecturer							
2.3 Instructor for practical activities				Assoc. prof. Mihaela Pantazică, Ph.D.			
2.4 Year of studies	2	2.5 Semester	1	2.6. Evaluation type	V	2.7 Course regime	Op
2.8 Course type		F	2.9 Course code	04.F.03.A.011		2.10 Tipul de notare	Nota

3. Total estimated time (hours per semester for academic activities)

3.1 Number of hours per week	1	Out of which: 3.2 course	0.00	3.3 seminary/laboratory	1
3.4 Total hours in the curricula	14	Out of which: 3.5 course	0	3.6 seminary/laboratory	14
Distribution of time:					hours
Study according to the manual, course support, bibliography and hand notes Supplemental documentation (library, electronic access resources, in the field, etc) Preparation for practical activities, homework, essays, portfolios, etc.					9
Tutoring					0
Examinations					2
Other activities (if any):					0

3.7 Total hours of individual study	11.00
3.8 Total hours per semester	25
3.9 Number of ECTS credit points	1

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	Passing the following disciplines: • Basics of Electrical Engineering; • Physics; • Measurements in Electronics and Telecommunications; • other courses from the 1st year curriculum.
4.2 Results of learning	- general knowledge of analog and digital electronics, electronic technology, signals, circuits and electronic systems.

5. Necessary conditions for the optimal development of teaching activities (where applicable)

5.1 Course	-
5.2 Seminary/ Laboratory/Project	Room with video projector, screen and whiteboard. Specific equipment for an electronics laboratory and a computer-aided design room in electronics: computers/laptops, video projector, screen and whiteboard or flip chart.

6. General objective *(Reffering to the teachers' intentions for students and to what the students will be thought during the course. It offers an idea on the position of course in the scientific domain, as well as the role it has for the study programme. The course topics, the justification of including the course in the currcula of the study programme, etc. will be described in a general manner)*

The general objective of the discipline is to provide students with the opportunity to achieve an appropriate level of theoretical and practical knowledge in the field of electronic design automation, EDA (Electronic Design Automation), technological engineering, electronic packaging and electronic module manufacturing through an applied technological electronics project.

7. Competences *(Proven capacity to use knowledge, aptitudes and personal, social and/or methodological abilities in work or study situations and for personal and proffesional growth. They refflect the empolyers requirements.)*

Specific Competences	Demonstrates fundamental knowledge in the field of electronic design automation (EDA), computer-aided design in electronics and technological electronics (electronic packaging). Correlates the acquired knowledge. Applies knowledge in practice. Applies standardized methods and tools, specific to the field, to carry out the process of evaluating and diagnosing a situation, depending on the identified/reported problems, and identifies engineering solutions. Oral and written communication in Romanian: uses the scientific vocabulary specific to the field, in order to communicate effectively, in writing and orally. Oral and written communication in a foreign language of international circulation (English): demonstrates understanding of the vocabulary related to the field, in a foreign language of international circulation.
Transversal (General) Competences	Works in a team and communicates effectively, coordinating efforts with others to solve problems of medium complexity. Capacity for analysis and synthesis: presents the knowledge acquired in a synthetic manner, as a result of a systematic analysis process. Respects the principles of academic ethics: in the documentation activity, correctly cites the bibliographic sources used and respects intellectual property.

8. Learning outcomes *(Synthetic descriptions for what a student will be capable of doing or showing at the completion of a course. The learning outcomes reflect the student's acomplishments and to a lesser extent the teachers' intentions. The learning outcomes inform the students of what is expected from them with respect to performance and to obtain the desired grades and ECTS points. They are defined in concise terms, using verbs similar to the examples below and indicate what will be required for evaluation. The learning outcomes will be formulated so that the correlation with the competences defined in section 7 is highlighted.)*

Knowledge	*The result of knowledge aquisition through learning. The knowledge represents the totality of facts, priciples, theories and practices for a given work or study field. They can be theoretical and/or factual.* Presents the most important stages of the computer-aided design flow of electronic modules. Defines specific notions in the field of technological electronics and computer-aided design of electronic modules. Describes and classifies the CAE-CAD-CAM processes. Highlights the consequences and relationships between the various design stages and the importance of successfully completing all stages.
Skills	*The capacity to apply the knowledge and use the know-how for completing tasks and solving problems. The skills are described as being cognitive (requiring the use of logical, intuitive and creative thinking) or practical (implying manual dexterity and the use of methods, materials, tools and intrumentation).* Selects and groups relevant information in the field of computer-aided design of electronic modules. Works productively in a team through assigned laboratory tasks/projects. Verifies the engineering solutions found using virtual methods (DRC – Design Rules Check). Solves low-complexity application projects. Identifies solutions to solve proposed projects. Formulates conclusions on completed projects. Argues for the identified solutions and the methods of solving them.
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* Selects and analyzes bibliographic sources in the field of electronic packaging. Respects the principles of academic ethics, correctly citing the bibliographic sources used. Demonstrates receptivity to new learning contexts. Demonstrates collaboration with other colleagues and teachers in carrying out teaching activities. Demonstrates autonomy in organizing the learning situation/context in the field of electronic packaging and computer-aided design of electronic modules. Promotes/contributes through new solutions related to the field of electronic packaging to improve the quality of social life. Apply principles of professional ethics/deontology in analyzing the technological impact of proposed solutions in the field of electronic packaging.

9. Teaching techniques *(Student centric techniques will be considered. The means for students to participate in defining their own study path, the identification of eventual fallbacks and the remedial measures that will be adopted in those cases will be described.)*

The teaching of engineering elements within the project is based on expository (lecture, exposition) and conversational-interactive methods, based on discovery learning models facilitated by direct and indirect exploration of reality (experiment, demonstration, modeling). In addition, teaching also uses action-based methods (exercises, applicative activities and solving specific problems in the field of computer-aided design of electronic modules). Lectures based on Power Point presentations are used in the teaching activity.

The presentations use images, video clips and diagrams, so that the information provided to students is easy to understand and assimilate.

This discipline, which includes only project activities, covers engineering information and activities intended to support students in their learning efforts and in developing optimal collaborative and communication relationships in a climate favorable to discovery learning in the field of computer-aided design of electronic modules. The project leader aims to practice active listening and assertive communication skills, as well as deepen the mechanisms for building feedback, as ways to regulate behavior in various situations and adapt the pedagogical approach to the learning needs of students.

10. Contents

PROJECT		
Crt. no.	**Content**	**No. hours**
1	Presentation and fixing of the elements corresponding to the CAE-CAD-CAM design activities. Creation of the list of electronic components of the project.	2
2	Operations with virtual component libraries (parts). Creation and editing of project components in accordance with manufacturer data and design requirements.	2
3	CAD development of the electronic schematic within the project.	2
4	Schematic design post-processing. SCM/SCH-PCB transfer, transfer verification and optimization.	2
5	Design of PCB footprints according to manufacturer data, project requirements and real electronic components. Technological criteria related to the design of THT and SMT components. Configurations of the PCB design environment in order to correctly carry out the CAD design.	2
6	Component placement. Manual, interactive and automatic routing of power and signal paths. Optimization of the virtual electronic module and its post-processing for sending to manufacturing.	2
7	Presenting, defending and evaluation the project.	2
	Total:	14

Bibliography:

1. https://curs.upb.ro/2025/course/view.php?id=2033;
2. Norocel Codreanu, Ciprian Ionescu, Mihaela Pantazică, Alina Marcu, "Tehnici CAD de realizare a modulelor electronice", Editura Cavallioti-Editura Pim, Bucureşti-Iaşi, 2017, 147 p., ISBN 978-606-551 092-0, ISBN 978-606-13-4164-1;
3. Ciprian Ionescu, "Tehnici CAD de realizare a modulelor electronice", 274 p., 2013, ISBN 978-606-551 042-5, ISBN 978-606-13-1670-0, Editura Cavallioti, Bucureşti, Editura PIM Iaşi, editură recunoscută CNCSIS, cod CNCSIS 66;
4. Codreanu N. D., „Metode avansate de investigaţie a structurilor PCB”, Editura Cavallioti, Bucureşti, 263 p., 2009, ISBN 978-973-7622-89-1;
5. Jin Y., Wang Z., Chen J., „Introduction to Microsystem Packaging Technology”, CRC Press, Boca Raton, 218 p., 2011, ISBN 978-143981910-4;
6. Harper C. A., „Electronic packaging and interconnection handbook”, McGraw-Hill, 2000;
7. Coombs C. F., Jr., „Printed circuits handbook” – ediţia a VI-a, McGraw Hill Professional, 1000 p., 2007, ISBN 978-0071510790;
8. Svasta P., Codreanu N. D. ş. a., “Proiectarea asistată de calculator a modulelor electronice”, Editura Tehnică, Bucureşti, 1998;
9. J. Lau, C.P.Wong, J. L. Prince, W. Nakayama, „Electronic Packaging – Design, Materials, Process and Reliability”, McGraw-Hill, 1998;
10. Johnson H., Graham M., „High-speed digital design, a handbook of black magic”, Prentice Hall PTR, New Jersey, 1993;
11. www.cetti.ro.

11. Evaluation

Activity type	11.1 Evaluation criteria	11.2 Evaluation methods	11.3 Percentage of final grade
11.4 Course			
11.5 Seminary/laboratory/project	- knowledge of how to design and post-process a low-complexity circuit using CAD; - knowledge of how to design and post-process a low-complexity printed circuit using CAD; - knowledge of how to work with electronic component catalogs and create an advanced bill of materials (BOM), similar to the component lists produced by companies in the electronics industry.	Defending the project before the teacher, which will also involve verifying the student's implementation of the technological development project of a low-complexity electronic module.	100%
11.6 Passing conditions			

Attendance at least at 50% of the project meetings. Handing in and defending the project, obtaining a minimum of 50% of the project score.

12. Corroborate the content of the course with the expectations of representatives of employers and representative professional associations in the field of the program, as well as with the current state of knowledge in the scientific field approached and practices in higher education institutions in the European Higher Education Area (EHEA)

The discipline, by its applied nature, is fully correlated with the expectations of employers and professional associations in the field of electronics in general, and with technological electronics in particular. The discipline is also correlated with the current state of knowledge in the scientific field addressed and the practices in higher education institutions in the European Higher Education Area (EHEA) through the topic that is very similar to that of European universities with which the National University of Science and Technology POLITEHNICA Bucharest has official collaborations.

Date	Course lecturer	Instructor(s) for practical activities
21.09.2026		Assoc. prof. Mihaela Pantazică, Ph.D.

Date of department approval	Head of department
22.09.2026	Conf. Dr. Serban Georgica Obreja

Date of approval in the Faculty Council	Dean
22.09.2026	Prof. Dr. Mihnea Udrea