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	**Electronic Devices, Circuits and Architectures**
1.4 Domain of studies	Electronic Engineering, Telecommunications and Information Technology
1.5 Cycle of studies	Bachelor/Undergraduate
1.6 Programme of studies	Microelectronics, Optoelectronics and Nanotechnologies

2. Date despre disciplină

2.1 Course name (ro) (en)				Grafică asistată de calculator - Proiect CAD pentru electronică			
2.2 Course Lecturer				Prof. Dr. Norocel Codreanu			
2.3 Instructor for practical activities				Prof. Dr. Norocel Codreanu			
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	Completion of the following courses: • Fundamentals of Electrotechnics; • Physics; • Measurements in Electronics and Telecommunications; • other courses from the Year I 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 board. Equipment specific to an electronics laboratory and to a computer-aided design room in electronics: computers/laptops, video projector, screen and board 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 course is to provide students with the opportunity to reach an appropriate level of theoretical and practical knowledge in the field of Electronic Design Automation (EDA), technological engineering, electronic packaging and the manufacture of electronic modules 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 possession of fundamental knowledge in the field of Electronic Design Automation (EDA), computer-aided design in electronics and technological electronics (electronic packaging). Correlates the accumulated knowledge. Applies the knowledge in practice. Applies standardized methods and tools specific to the field to carry out the process of evaluation and diagnosis of a situation, according to the identified/reported problems, and identifies engineering solutions. Oral and written communication in Romanian:uses the scientific vocabulary specific to the field for effective written and oral communication. Oral and written communication in a foreign language of international circulation (English): demonstrates understanding of the terminology of the field in an internationally used foreign language.
Transversal (General) Competences	Works in a team and communicates effectively, coordinating efforts with others to solve situations with problems of medium complexity. Capacity for analysis and synthesis: presents in a synthetic manner the knowledge acquired as a result of a systematic analysis process. Respects the principles of academic ethics: in documentation activities 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** concepts specific to technological electronics and computer-aided design of electronic modules. · **Describes and classifies** the CAE-CAD-CAM processes. · **Highlights consequences and relationships** between the various design stages and the importance of successfully going through 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 assignments/projects given in the laboratory. · **Checks** by virtual methods (DRC – Design Rules Check) the engineering solutions found. · **Solves** applied projects of low complexity. · **Identifies solutions** for solving the proposed projects. · **Formulates conclusions** for the completed projects. · **Argues** the identified solutions and ways 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 receptiveness** to new learning contexts. · **Shows collaboration** with colleagues and teaching staff in conducting educational 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 within the field of** electronic packaging to improve the quality of social life. · **Applies principles of ethics/professional 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.)*

Teaching of the engineering elements within the project is based on expository methods (lecture, presentation) 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, applied activities and solving specific problems in the field of computer-aided design of electronic modules).

In the teaching activity, lectures are usedă based on PowerPoint presentations. The presentations use images, video clips and diagrams, so that the information provided to students is easy to understand and assimilate.

This course consisting only of project activities covers engineering information and activities designed to support students in their efforts to learn and develop optimal collaborative and communication relationships in a climate favorable to discovery learning in the field of computer-aided design of electronic modules.

The project holder takes into account the practice of active listening and assertive communication skills, as well as the deepening of feedback construction mechanisms, as ways of behavioral regulation in diverse situations and of adapting the pedagogical approach to students' learning needs.

10. Contents

PROJECT		
Crt. no.	**Content**	**No. hours**
1	Presentation and reinforcement of elements corresponding to CAE-CAD-CAM design activities. Creating the project's list of electronic components	2
2	Operations with virtual component libraries (parts). Creating and editing the project components in accordance with manufacturer data and design requirements	2
3	CAD development of the project's electronic schematic	2
4	Post-processing of the schematic project. SCM/SCH-to-PCB transfer, verification and optimization of the transfer.	2
5	Designing footprints in accordance with manufacturer data, project requirements and real electronic components. Technological criteria related to the design of THT and SMT components. PCB design environment configurations for the correct realization of the CAD project.	2
6	Component placement. Manual, interactive and automatic routing of power and signal traces. Optimization of the virtual electronic module and its post-processing for sending to manufacturing.	2
7	Submission, defense and evaluation of the project	2
	Total:	14

Bibliography:
. 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;
. 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.
. Codreanu N. D., „Metode avansate de investigaţie a structurilor PCB”, Editura Cavallioti, Bucureşti, 263 p., 2009, ISBN 978-973-7622-89-1;
. Jin Y., Wang Z., Chen J., „Introduction to Microsystem Packaging Technology”, CRC Press, Boca Raton, 218 p., 2011, ISBN 978-143981910-4;
. Harper C. A., „Electronic packaging and interconnection handbook”, McGraw-Hill, 2000;
. Coombs C. F., Jr., „Printed circuits handbook” – ediţia a VI-a, McGraw Hill Professional, 1000 p., 2007, ISBN 978-0071510790;
. Svasta P., Codreanu N. D. ş. a., “Proiectarea asistată de calculator a modulelor electronice”, Editura Tehnică, Bucureşti, 1998;
. J. Lau, C.P.Wong, J. L. Prince, W. Nakayama, „Electronic Packaging – Design, Materials, Process and Reliability”, McGraw-Hill, 1998;
. Johnson H., Graham M., „High-speed digital design, a handbook of black magic”, Prentice Hall PTR, New Jersey, 1993;
0. 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 the CAD design and post-processing of a low-complexity circuit; - knowledge of the CAD design and post-processing of a low-complexity printed circuit board; - knowledge of working with electronic component catalogs and creating an advanced bill of materials (BOM), similar to the component lists produced by companies in the electronics industry.	Defending the project before the course holder, which will also involve verifying how the student completed the technological development project of a low-complexity electronic module.	100%
11.6 Passing conditions			
Participation in at least 50% of the project sessions. Submission, defense and passing of the project, obtaining at least 50% of the course points.			

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 course, through its applied character, is fully correlated with the expectations of employer representatives and representative professional associations in the field of electronics in general, and technological electronics in particular. The course is also correlated with the current state of knowledge in the addressed scientific field and with practices in higher education institutions from the European Higher Education Area (EHEA), through a syllabus 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
25.09.2025	Prof. Dr. Norocel Codreanu	Prof. Dr. Norocel Codreanu

Date of department approval	Head of department
26.09.2025	Prof. Dr. Claudius Dan

Date of approval in the Faculty Council	Dean
26.09.2025	Prof. Dr. Mihnea Udrea