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 - Modelare şi design 3D Computer-aided design- 3D modeling and design			
2.2 Course Lecturer				Senior Lecturer Dr. Gheorghita Tomescu			
2.3 Instructor for practical activities				Senior Lecturer Dr. Gheorghita Tomescu			
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.008		2.10 Tipul de notare	Nota

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

3.1 Number of hours per week	2	Out of which: 3.2 course	1	3.3 seminary/laboratory	1
3.4 Total hours in the curricula	28	Out of which: 3.5 course	14	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.					22
Tutoring					0
Examinations					0
Other activities (if any):					0

3.7 Total hours of individual study	22.00
3.8 Total hours per semester	50
3.9 Number of ECTS credit points	2

4. Prerequisites (if applicable) (where applicable)

4.1 Curriculum	Not applicable
4.2 Results of learning	Not applicable

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

5.1 Course	Room with video projector

5.2 Seminary/ Laboratory/Project	Design laboratory, equipped with computers and educational license software (AutoDesk INVENTOR Professional). Mandatory attendance at laboratories (according to the undergraduate study regulations at UNSTPB).

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)*

This course aims to develop skills in the field of design, drawing, and computer-aided design of parts and mechanical assemblies that use electronic components and circuits (implemented in the automotive and aeronautics industries, robotics, consumer goods production, etc.). The vast majority of products in today's industries are the result of technological fusion:mechanics/optics–electronics–informatics. In engineering practice, this intertwining of fields makes it necessary to have a common technical language for these specializations. At present, the fields cannot exist and perform independently.

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 knowledge of CAD–CAE–CAM concepts and of 3D parametric modeling principles for parts and assemblies (2D sketches, geometric/dimensional constraints, modeling commands, sheet metal). • Applies modern computer-aided design techniques in Autodesk Inventor Professional for part modeling, assembly, and kinematic/dynamic verification of assemblies. • Prepares working drawings in accordance with technical representation standards and prepares documentation for manufacturing (including 3D printing/DFM). • Selects and uses libraries/templates and good practices for project organization (file structures, project configurations) for traceability and reuse. • Integrates and correlates mechanical design knowledge with the requirements of devices and installations that include electronic components, ensuring MCAD–ECAD compatibility at the mechanical interface level. • Oral and written communication in Romanian using the technical vocabulary specific to CAD; communication in English for documentation and software interface.
Transversal (General) Competences	• Works efficiently in a team and collaborates within applied projects (task planning, file versions, technical feedback). • Demonstrates analytical and synthetic capacity: extracts requirements, chooses constructive solutions, argues design decisions. • Respects the principles of academic ethics (properly cites sources/standards) and social responsibility regarding the technological and environmental impact of proposed solutions. • Demonstrates autonomy in documentation (standards, manuals, guides) and openness to new learning contexts and manufacturing technologies.

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.* - Understands how to model a part using CAD techniques - Understands the principles of assembling different parts using CAD techniques -Knows the applications of these CAD techniques: design, 3D printing, 3D scanning, reverse engineering Understands the principles and concepts specific to the design activity of a piece of equipment
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).* · Applies modern computer-aided design techniques (uses specialized software for 3D modeling of parts and assembling the designed equipment). · Develops skills in computer-aided design, drawing, and engineering design. · Develops the capacity to read and interpret 2D and 3D drawings Elaborates small/medium complexity projects in the fields of applied electronics Develops the capacity to read and interpret 2D and 3D drawings Elaborates small/medium complexity projects in the fields of applied electronics
Responsability and autonomy	*The student's capacity to autonomously and responsably apply their knowledge and skills.* · Informs, documents, and interprets information from bibliographic sources and standards · Demonstrates openness to new learning contexts. Communicates and collaborates with colleagues and teaching staff in carrying out didactic activities Demonstrates autonomy in organizing the learning situation/context or the problem situation to be solved Respects the principles of academic ethics, correctly citing the bibliographic sources used. Becomes aware of the value of his/her contribution in engineering to identifying viable/sustainable solutions to solve problems in social and economic life (social responsibility). Applies principles of professional ethics/deontology in analyzing the technological impact of the proposed solutions in the field on the environment

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.)*

Starting from the analysis of students' learning characteristics and their specific needs, the teaching process will explore both expository methods (lecture, presentation) and conversational-interactive methods, based on discovery learning models facilitated by direct and indirect exploration of reality (experiment, demonstration, modeling), as well as action-based methods such as exercise, practical activities, and problem solving.

In teaching activities, lectures will be used, based on PowerPoint presentations or various short videos that will be made available to students.

10. Contents

COURSE		
Chapter	**Content**	**No. hours**
1	Introduction to CAD-CAE-CAM. 3D printing. Inventor Professional – interface, modeling principles, project architecture	2
2	Sketch drawing commands, applying geometric and dimensional constraints 3D modeling commands	4
3	Using modeling commands for thin-walled parts – Sheet metal	2
4	Assembly and dynamic simulation.	4
5	Preparing working drawings. Principles of representation and standards for technical drawings.	2
	Total:	14

Bibliography:
Bibliografie:

1. *Tomescu Gheorghita, Modelare si design 3D, Note de curs, Platforma Moodle*
2. *Christopher F. Sikora- INVENTOR Introduction to CIM 2018, Vertanux, 2018*
3. *Máximo Obregón Ramos- AutoDesk INVENTOR -Nivel I- Universidad Nacional de Ingeniería Facultad de Ingeniería Mecánica, Centro de Cómputo*
4. *Sham Tickoo - Autodesk Inventor 2016 for Designers- Purdue University Calumet - CADCIM Technologies, 2015 http://ebooks.cadcim.com*
5. *Autodesk Inventor Simulation 2018(Analysis&Simulation: Getting Started), www.autodesk.com*

LABORATORY		
Crt. no.	**Content**	**No. hours**
1	3D modeling – parts with different configurations	6
2	Modeling thin-walled parts – Sheet metal	2
3	Assembly and dynamic simulation	4
4	Execution drawing – application	2
	Total:	14

Bibliography:
Bibliografie:

1. *Tomescu Gheorghita, Modelare si design 3D, Lucrari de laborator, Platforma Moodle*
2. *Christopher F. Sikora- INVENTOR Introduction to CIM 2018, Vertanux, 2018*
3. *Máximo Obregón Ramos- AutoDesk INVENTOR 2017-Nivel I- Universidad Nacional de Ingeniería Facultad de Ingeniería Mecánica, Centro de Cómputo*
5. *Sham Tickoo - Autodesk Inventor 2016 for Designers- Purdue University Calumet - CADCIM Technologies, 2015 http://ebooks.cadcim.com*
6. *Ionut Ghionea, Proiectare asistata de calculator in 3D cu AutoCAD Indrumar de laborator, Editura Bren 2005*

11. Evaluation

Activity type	11.1 Evaluation criteria	11.2 Evaluation methods	11.3 Percentage of final grade
11.4 Course	Fulfillment of the requirements specific to the final assessment activity	Final assessment	20
11.5 Seminary/laboratory/project	Fulfillment of the requirements specific to the laboratory activity, preparing the assignment for the laboratory colloquium	Continuous assessment (participation and completion of laboratory work) Homework	80
11.6 Passing conditions			
The final grade for a course results from the sum of the points allocated to each activity within the course (points whose sum is 100), and the total score is converted to a grade (from 1 to 10) by dividing by 10 and rounding (except for grade 5, which is obtained by truncation).			

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 directly addresses the needs of modern industry where mechanical and electronic design are deeply integrated (automotive, aeronautics, robotics, consumer goods), forming a common technical language between specializations and competencies applicable to design, 3D printing, 3D scanning, and reverse engineering. The use of Autodesk Inventor Professional (educational license) aligns the course with current tools used in companies and with the competencies required on the labor market.

In addition, the structure and applied orientation are consistent with practices in European universities and with the current state of knowledge, in the spirit of collaboration between academia and employers, a model already implemented in other CAD courses in the program through long-term collaborations with industry.

Date	Course lecturer	Instructor(s) for practical activities
25.09.2025	Senior Lecturer Dr. Gheorghita Tomescu	Senior Lecturer Dr. Gheorghita Tomescu

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

Universitatea Națională de Știință și Tehnologie Politehnica București

Facultatea de Electronică, Telecomunicații și

Tehnologia Informației

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