Syllabus

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Automation and Computers
1.3 Department	Automation
1.4 Field of study	Automation, Applied Informatics and intelligent Systems
1.5 Cycle of study	License
1.6 Program of study / Qualification	Automation and Applied Informatics
1.7 Form of education	IF – part-time education

2. Data about the subject

2.1 Subject name	**CAD in Automation**			Code of Subject	**11.00**
2.2 Course responsible/lecturer	*Prof. Dr. Eng. Miclea Liviu, liviu.miclea @aut.utcluj.ro*				
2.3 Head of seminar / laboratory / project / internship activities	*Asist. Dr. Eng. Marius Misaros, Marius.Misaros@aut.utcluj.ro*				
2.4 Year of study	1	2.5 Semester	2	2.6 Assessment (E/C/V)	E
2.7 Discipline regime	*Formative category: DF – fundamental, DS – specialty, DC – complementary*				DS
	Optional: DOB – compulsory, DOP – elective, DFA – optional				DI

3. Estimated total time

3.1 Number of hours per week	4	of which	3.2 Course	2	3.3Seminar	0	3.3 Laboratory	2	3.3 Project	0	3.3 Practice	0
3.4 Number of hours per semester	56	of which	3.5 Course	28	3.6 Seminar	0	3.6 Laboratory	28	3.6 Project	0	3.3 Practice	0

3.7 Distribution of time (hours per semester) for individual study and assessment:	
(a) Evaluation	18
(b) Studying according to the textbook, course material, bibliography and notes	18
(c) Additional documentation in the library, on specialized electronic platforms and in the field	27
(d) Preparation of seminars/laboratories, assignments, papers, portfolios and essays	3
(e) Tutoring	3
(f) Other activities	0
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

4. Pre-requisites (where appropriate)

4.1 curriculum	Not the case
4.2 competences	• Notions of computational geometry. • The ability to use and program a computer. • Knowledge of some elements of electrical and mechanical engineering. • Knowledge of basic elements specific to the field of Systems Engineering.

5. Requirements (where appropriate)

5.1. course delivery	N/A
5.2. of the seminar / laboratory / project	C3. Use of the fundamentals of automation, methods of modeling, simulation, identification and analysis of processes, and computer-aided design techniques.

6. Specific competence

Professional skills	C1. Use of knowledge of mathematics, physics , technology measurement, graphics technique, engineering mechanical, chemical, electrical and ELECTRONIC in engineering systems.
Transversal skills	CT3. Identifying continuing education opportunities and effectively utilizing learning resources and techniques for one's own development.

7. Expected learning outcomes

Knowledge	The student/graduate identifies and describes basic concepts, principles and methods in mathematics, physics, chemistry, technical drawing, economics and computer science; explains and interprets theoretical and experimental results in mathematics, physics, chemistry, economics, technical drawing and computer science; describes, identifies, summarizes concepts and methods related to systems in general, as well as to measurement techniques, graphics, mechanical, chemical, electrical and electronic engineering and their application in concrete problems, using specific mathematical and physical tools;
Skills	The student/graduate operates with basic concepts, principles and methods from mathematics, physics, chemistry, technical drawing, economics and computer science
Responsibility and autonomy	The student/graduate applies the values of ethics and deontology of the engineering profession; practices logical reasoning, evaluation and self-evaluation in decision-making. The student/graduate communicates effectively about engineering activities with a wide range of audiences; is engaged in lifelong learning to acquire and implement knowledge, as needed, using appropriate learning strategies; works effectively as a team member or team leader; carries out processes in systems engineering project management, taking on different roles in the team and describing the results clearly and concisely, verbally and in writing; shows a spirit of initiative and action to update professional, economic and organizational culture knowledge;

8. Discipline objective (as results from the key competences gained)

8.1 General objective of the discipline	The use in professional communication of the concepts, theories and methods of fundamental sciences used in the field of systems engineering with the use of dedicated software in computer-aided design, as well as the adaptation and extension of tools belonging to information theory for the presentation of knowledge in the field.
8.2 Specific objectives	After completing the course, students will be able to: • Know the role and place of CAD in a CIM (Computer Integrated Manufacturing) system. • To know elements of computer management of graphic information. • To know the main rules of computer-aided drawing (CAD – Computer Aided Drawing) in general and in particular for the field of Automation. • To know computer-aided design (CAD) techniques, usable in CAD-CAM (Computer Integrated Manufacturing) integration. After completing the course, students will be able to: • Understand and execute an industrial technical drawing. • Know how to write graphic information management applications. • Know how to prepare and manage the execution of industrial projects, with an emphasis on the field of Automation. After completing the course, students will be able to: • Know how to use graphics function libraries (e.g. OpenGL). • Know how to use CAD tools for industrial technical drawings (e.g. AutoCAD); in particular, use standard elements from the field of Automation. To know how to manage the graphic information produced by a CAD using specialized languages (e.g. AutoLISP), for the purpose of CAD-CAM integration.

9. Contents

9.1 Course	No. hours	Teaching methods	Notes
The role of CAD in a computer-integrated manufacturing (CIM) system.	2	Didactic presentation, didactic conversation, Problem	
Elements of computational mathematics.	2		
Architecture and functions of a CAD system. Graphic standards (e.g. GKS).	2		
General rules for industrial graphic representations.	2		
Rules for the representation of symbols and the identification of tools specific to the field of Automation.	2		
Graphic information processing. Function libraries I (e.g. OpenGL).	2		
Graphic information processing. Function libraries II (e.g. OpenGL).	2		
Graphic information management environments (I).	2		
Graphic information management environments (II).	2		
The design process. Concurrent engineering.	2		
CAD-CAM integration.	2		
CAD data transfer.	2		
Using features as elements of CAD-CAM integration.	2		
The use of expert systems in CAD.	2		

Bibliography *(minimum bibliography of the discipline containing at least one bibliographic reference work of the discipline, which is available to students in an appropriate number of copies)*

Bibliography

1. L. Miclea, , Lecture notes, Department of Automatic Control, UT Cluj-Napoca (web).
2. L. Miclea, Computer Aided Graphics, Laboratory work, Department of Automation, UT Cluj-Napoca (web).
3. ***, ANSI/ISA–5.1–1984 (R1992), Instrumentation Symbols and Identification, American National Standard, ISBN 0-87664-844-8.
4. ***, *ANSI/ISA_5.2, Binary Logic Diagrams for Process Operations* , American National Standard, ISBN 0-87664-331-4.
5. ***, *ANSI/ISA_5.3, Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic and Computer Systems* , American National Standard, ISBN 0-87664-707-7 ,.
6. ****, ANSI/ISA_5.4, Instrument Loop Diagrams* American National Standard, ISBN 1-55617-227-3.
7. ***, *ANSI/ISA_5.5, Graphic Symbols for Process Displays* , American National Standard, ISBN 0-87664-935-5.
8. P. Kopacek, Einfuhrung in CIM, Wien, 1993
9. ***, AutoCAD Reference Manual, Autodesk, 2011.
10. ***, OpenGL 4 Documentation, http://www.opengl.org/sdk/docs/man/
11. AutoCAD®, DXF Reference http://images.autodesk.com/adsk/files/autocad_2012_pdf_dxf-reference_enu.pdf

http://www.iges5x.org/matica seminars, laboratory work, project topics and stages.

9.2 Seminar / laboratory / project / practice	No. hours	Teaching methods	Notes
AutoCAD presentation. Data Management & Sharing in AutoCAD	2	Modeling, learning through discovery, the exercise	
General rules for industrial drawing: dimensioning, scaling, hatching types, notations, drawing characteristics	2		
CAD environments: utility commands, drawing, editing and information entities, display in two-dimensional space	2		
CAD environments: graphic aids, blocks and attributes in two-dimensional space	2		
Interface components : IGES and DXF standards (standard formats for graphic information)	2		
AutoCAD P&ID	2		
Graphical information management – AutoLISP language (I): AutoLISP objects, data types, user-defined functions, variable types, programming in AutoLISP, data flow control	2		
Graphical information management – AutoLISP language (II): list manipulation, geometric functions	2		
Graphical information management I – AutoLISP language (III): CAD entity manipulation (group codes), selection sets	2		
CAD-CAM integration using design features. Data transfer.	2		

9.2 Seminar / laboratory / project / practice	No. hours	Teaching methods	Notes
Graphical Information Management - OpenGL (I): introduction to OpenGL, command syntax, data types, vertex operations, basic 2D functions	2		
Graphical information management - OpenGL(II): drawing three-dimensional objects, visualization, text, texture and lighting in three-dimensional space	2		
CAD environments: basic commands for 3D surface generation , visualization , texture, plotting (1)	2		
CAD environments: basic commands for 3D surface generation , visualization , texture, plotting (2)	2		

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1. L. Miclea, , Course notes, Department of Automatic Control, UT Cluj-Napoca (web).
2. L. Miclea, Computer Aided Graphics, Laboratory work, Department of Automation, UT Cluj-Napoca (web).
3. ***, ANSI/ISA–5.1–1984 (R1992), Instrumentation Symbols and Identification, American National Standard, ISBN 0-87664-844-8.
4. P. Kopacek, Einfuhrung in CIM, Wien, 1993
5. ***, AutoCAD Reference Manual, Autodesk, 2011.
6. ***, OpenGL 4 Documentation, http://www.opengl.org/sdk/docs/man/
7. AutoCAD, DXF Reference http://images.autodesk.com/adsk/files/autocad_2012_pdf_dxf-reference_enu.pdf

http://www.iges5x.org/matica seminars, laboratory work, project topics and stages.

10. Bridging course contents with the expectations of the representatives of the community, professional associations and employers in the field

Students in the department can carry out automation projects (using dedicated CAD software tools), develop their own Visual C++ animations and create post-processing applications (CNC machines).

11. Evaluation

On-site

Activity type	Evaluation criteria	Evaluation methods	Weight of final grade
Course	Knowledge Evaluation	Written exam (E)	0.5
Seminar	-	-	-
Laboratory	Solving exercises , evaluation practical knowledge and projects	Colloquium (C) and OVERVIEW SOME project	0.5
Design	-	-	-

Minimum performance standard :
Grade=0.5*E+0.5*C, P attendance at classes
Promotion condition : E≥5 and C≥5 and N≥5 .

Online

Activity type	Evaluation criteria	Evaluation methods	Weight of final grade
Course	Knowledge Evaluation	Online quiz exam with Moodle (E)	0.5
Seminar	-	-	-
Laboratory	Solving exercises , evaluation practical knowledge and projects	Colloquium (C) and OVERVIEW SOME projects , online, with teams	0.5
Design	-	-	-

Minimum performance standard :
Grade=0.5*E+0.5*C,
Promotion condition : E≥5 and C≥5 and N≥5 .

Date of completion:	titular	teaching degree, title First name SURNAME	Signature
29.06.2026	course	*Prof. Dr. Eng. Liviu Miclea*	
	Applications	Asist.Dr.Eng. Marius Misaros	

Date of approval in the Department Council of Automation _____	Automation Department Director Prof.Dr.Eng Honoriu VĂLEAN
Date of approval in the Council of the Faculty of Automatic Control and Computers _____	Dean, Prof.Dr.Eng. Vlad MUREȘAN