Syllabus

1. Data about the program of study

1.1 Institution	Technical University of Cluj-Napoca
1.2 Faculty	Automation and Computer Science
1.3 Department	Automation
1.4 Field of study	Systems Engineering
1.5 Cycle of study	Bachelor of Science
1.6 Program of study/Qualification	Automation and Applied Informatics (English)
1.7 Form of education	Full time
1.8 Code of subject	11.00

2. Data about the subject

2.1 Subject name	***Computer Aided Graphics***				
2.2 Course responsible/lecturer	Prof.dr.eng. Liviu Miclea, Liviu.Miclea@aut.utcluj.ro				
2.3 Teachers in charge of applications	Assist.prof.dr.eng. Iulia Ștefan, Iulia.Stefan@aut.utcluj.ro, Assist. 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 Type of subject	*DF – fundamental, DD – in the field, DS – specialty, DC – complementary*				DF
	DI – compulsory, DO – elective, Dfac – optional				DI

3. Estimated total time

3.1 Number of hours per week	4	of which:	Course	2	Seminar		Laboratory	2	Project	
3.2 Number of hours per semester	56	of which:	course	28	Seminar		Laboratory	28	Project	
3.3 Distribution of the time fund (hours per semester) for										
(a) Manual, lecture material and notes, bibliography										18
(b) Supplementary study in the library, online and in the field										18
(c) Preparation for seminars/laboratory works, homework, reports, portfolios, essays										27
(d) Tutoring										3
(e) Exams and tests										3
(f) Other activities:										0

3.4 Total hours of individual study (sum of (3.3(a)…3.3(f)))	69
3.5 Total hours per semester (3.2+3.4)	125
3.6 Number of credit points	5

4. Pre-requisites (where appropriate)

4.1 Curriculum	none	
4.2 Competences	Computational geometry concepts Ability to use a computer and basic programming knowledge Knowledge of electrical engineering and mechanical elements Knowledge of basic elements specific to the Systems Engineering domain	

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	Attendance at the laboratory is mandatory in compliance with the regulations of the Technical University of Cluj-Napoca

6. Specific competences

6.1 Professional competences	C3. Operating with fundamentals of control engineering, process modelling, simulation, identification and analysis methods, and computer aided design.
6.2 Cross competences	N/A

7. Course objectives

7.1 General objective	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 expansion of tools belonging to information theory for the presentation of knowledge in the field.
7.2 Specific objectives	At the end of the lecture, the students are able to know and identify: • The importance and the level associated with the Computer Aided Design (CAD) activities for a Computer Integrated Manufacturing (CIM) process • Computer related management aspects of the graphical data • The industrial design standards for technical drawing, in general and instrumentation for automation industry standards, in particular. • Design technics for CAD, available for CAD-CAM (Computer Integrated Manufacturing) integration. At the end of the seminars, the students are able: • To understand and create a technical drawing • To write specific computer programs for graphical applications • To create the specific documentation associated with the design in the Automation field. • To use specific libraries as OpenGL for graphical information data manipulation • To use specific tools for CAD (AutoCAD) To manage the graphical information generated by CAD tool using specialized programming languages (e.g. AutoLISP) for CAD-CAM integration.

8. Contents

8.1 Lecture	No.hours	Teaching methods	Notes
1. CAD role in CIM (Computer Integrated Manufacturing).	2	Presentation, heuristic conversation, exemplification, case studies, formative evaluation	Use of .ppt presentation, projector, blackboard
2. Elements of computational mathematics.	2		
3. The architecture and functions of a CAD system. Graphic standards: OpenGL, GKS.	2		
4. General rules for industrial design.	2		
5. Representation and device identification standards in the Automation field.	2		
6. Graphic information processing. Function libraries (e.g. OpenGL).	2		
7. Graphic information processing. Function libraries II (e.g. OpenGL).	2		
8. Graphical information management environments (I).	2		
9. Graphical information management environments (II).	2		
10. Designing process. Concurrent engineering.	2		
11. CAD-CAM integration.	2		
12. CAD data transfer.	2		
13. Using characteristics as CAD-CAM integration elements.	2		
14. Using CAD expert system.	2		

Bibliography

1. L. Miclea, *Computer Aided Graphics*, Course notes, Department of Automation, T.U. Cluj-Napoca (web).
2. I. Ștefan, L. Miclea, *Computer Aided Graphics*, Laboratory Works, Department of Automation, T.U. 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. ***, *Documentation OpenGL 4*, http://www.opengl.org/sdk/docs/man/
7. AutoCAD®, DXF Reference http://images.autodesk.com/adsk/files/autocad_2012_pdf_dxf-reference_enu.pdf

8. http://www.iges5x.org/			
8.2 Applications (seminar/laboratory/project)	No. hours	Teaching methods	Notes
L1. Introduction to AutoCAD. Data Management & Sharing in AutoCAD	2	Didactic and experimental proof, didactic exercises, computers, blackboard	Use of laboratory computers, equipment, blackboard
L2. General rules for industrial drawing: rating, scaling, types of hatches, notations, flat characteristics	2		
L3. CAD environments: utility commands, drawing, editing and information entities, display in two-dimensional space	2		
L4. CAD environments: graphic aids, blocks and attributes in two-dimensional space	2		
L5. Interface components: IGES and DXF (graphic format standards)	2		
L6. AutoCAD P&ID	2		
L7. Graphical information management – AutoLISP language (I): AutoLISP objects, data types, user-defined functions, variable types, programming in autolisp, data flow control	2		
L8. Graphical information management – AutoLISP (II) language: manipulation of lists, geometric functions	2		
L9. Using characteristics as CAD-CAM integration elements. CAD data transfer.	2		
L10. CAD-CAM integration using design features. Data transfer.	2		
L11. Management of graphic information - OpenGL (I): introduction to OpenGL, command syntax, data types, operations on vertices, basic 2D functions	2		
L12. Management of graphic information - OpenGL(II): drawing three-dimensional objects, visualization, text, texture and lighting in three-dimensional space	2		
L13. CAD environments: basic commands for generating 3D surfaces, visualization, texture, plotting (1)	2		
L14. CAD environments: basic commands for generating 3D surfaces, visualization, texture, plotting (2)	2		

Bibliography

1. L. Miclea, *Computer Aided Graphics*, Course notes, Department of Automation, T.U. Cluj-Napoca (web).
2. I. Ștefan, L. Miclea, *Computer Aided Graphics*, Laboratory Works, Department of Automation, T.U. 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. ***, *Documentation OpenGL 4*, http://www.opengl.org/sdk/docs/man/
7. AutoCAD®, DXF Reference http://images.autodesk.com/adsk/files/autocad_2012_pdf_dxf-reference_enu.pdf
8. http://www.iges5x.org/

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

The graduated engineers are able to develop automation projects using CAD dedicated software, to generate ta representative animation for the functionality of the designed system using free software and a post processing application for product finalization using dedicated machinery.

10. Evaluation

On-site

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Knowledge assessment	Written exam E	0.5

Seminar	N/A		
Laboratory	Solving exercises, practical skills and project evaluation	Application exam C	0.5
Project	N/A		
Minimum standard of performance: Grade=0.5*E+0.5*C, E>=5 and C>=5 and N>=5			

On-line

Activity type	Assessment criteria	Assessment methods	Weight in the final grade
Course	Knowledge assessment	Exam (E) - multiple choice test, on line, with Moodle.	0.5
Seminar	N/A		
Laboratory	Solving exercises, practical skills and project evaluation	Application exam (C), on-line, with teams	0.5
Project	N/A		
Minimum standard of performance: Grade=0.5*E+0.5*C, E>=5 and C>=5 and N>=5			

Date of filling in:		**Title First name Last Name**	**Signature**
25.06.2024	Course	Prof.dr.ing. Liviu Miclea	
	Applications	Assist.prof.dr.eng. Iulia Ștefan	
		Assist.eng. Marius Misaros	

Date of approval by the Department Board Automation _____	Head of Departament Automation Prof.dr.ing. Honoriu VĂLEAN
Date of approval by the Faculty Council Automation and Computer Science _____	Dean Prof.dr.ing. Mihaela Dinsoreanu