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 Departament	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 Codul disciplinei	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.prof.dr.eng. Dan Goța, Dan.Gota@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 Individual study										
(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 Competence	Computational geometry concepts Ability to use a computer and programming Knowledge of electrical engineering and mechanical elements Knowledge of basic elements specific to the Automatic Control	

5. Requirements (where appropriate)

5.1. For the course	N/A
5.2. For the applications	Seminars' attendance is compulsory, under the Technical University of Cluj-Napoca regulations

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 specific concepts, theory and scientific fundamentals methods usage in professional field activities of the system engineering area by dedicated software usage for Computer Aided Design and the tools and software development and enhancement from Information Theory to present associated filed knowledge.
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 environnements (I).	2		
9. Graphical information management environnements (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, *CAD în Automatică*, Curs, Catedra de Automatică, U.T. Cluj-Napoca (web).
2. I. Ștefan, L. Miclea, *CAD în Automatică*, Îndrumător de lucrări, Catedra de Automatică, U.T. Cluj-Napoca (web).
3. V. Baltac, s.a., *Calculatoare numerice, grafica interactivă şi prelucrarea imaginilor*, Ed. Tehnică, 1985
4. D. Roman, s.a., *Algoritmi de automatizare a proiectării*, Ed. Militară, 1988.
5. H. Valean, L. Miclea, M. Damian, *Visual C++. Programarea Interfetelor Utilizator*, Ed. Dacia, 2004, 243 pag., ISBN 973-35-1808-5.
6. BĂDUŢ, Mircea, *AutoCAD-ul în trei timpi : iniţiere, utilizare, performanţă* , Polirom, 2011, p. 263, ISBN 978-973 46-1477-6
7. ***, *Catalogul standardelor române*, 2010.
8. ***, *ANSI/ISA–5.1–1984 (R1992), Instrumentation Symbols and Identification*, American National Standard, ISBN 0-87664-844-8.

9. P. Kopacek, *Einfuhrung in CIM*, Wien, 1993
10. ***, *AutoCAD Reference Manual*, Autodesk, 2011.
11. ***, *Documentaţie OpenGL 4*, http://www.opengl.org/sdk/docs/man/
12. AutoCAD®, DXF Reference http://images.autodesk.com/adsk/files/autocad_2012_pdf_dxf-reference_enu.pdf
13. http://www.iges5x.org/

8.2 Aplications (seminar/laboratory/project)	No.hours	Teaching methods	Notes
L1. General rules for industrial design: scales, hatches, dimensioning, notations, standard characteristics for drawing templates	2	Didactic and experimental proof, didactic exercises, computers, blackboard	Use of laboratory computers, equipment, blackboard
L2. CAD environments: utilitarian commands, drawing, editing, displaying and extraction of information for entities in 2D space.	2		
L3. CAD environments: graphic aids, attributes and blocks in 2D space.	2		
L4. CAD environments, basic commands for 3D surfaces, views, textures, plot	2		
L5. Interface components: IGES and DXF (graphic format standards)	2		
L6. Graphic information management environments – AutoLISP (I): AutoLISP objects, data types, data types, user defined functions, variables types, data flux	2		
L7. Graphical information management environments – AutoLISP (II): list manipulation, geometrical functions	2		
L8. Graphical information management environments – AutoLISP (III): CAD entities manipulation(group codes), selection sets	2		
L9. Using characteristics as CAD-CAM integration elements. CAD data transfer.	2		
L10. Graphic information management - OpenGL (I): OpenGL basics(data types, syntax, vertex operations, 2D functions)	2		
L11. Graphic information management - OpenGL (II): 3D drawing, viewing, text rendering	2		
L12. Graphic information management - OpenGL(III): texture and lights in 3D	2		
L13. ObjectARX	2		
L14. Laboratory exam	2		

Bibliography

1. L. Miclea, *CAD în Automatică*, Curs, Catedra de Automatică, U.T. Cluj-Napoca (web).
2. I. Ştefan, L. Miclea, *CAD în Automatică*, Îndrumător de lucrări, Catedra de Automatică, U.T. Cluj-Napoca (web).
3. V. Baltac, s.a., *Calculatoare numerice, grafica interactivă şi prelucrarea imaginilor*, Ed. Tehnică, 1985
4. D. Roman, s.a., *Algoritmi de automatizare a proiectării*, Ed. Militară, 1988.
5. H. Valean, L. Miclea, M. Damian, *Visual C++. Programarea Interfetelor Utilizator*, Ed. Dacia, 2004, 243 pag., ISBN 973-35-1808-5.
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9. P. Kopacek, *Einfuhrung in CIM*, Wien, 1993
10. ***, *AutoCAD Reference Manual*, Autodesk, 2011.
11. ***, *Documentaţie OpenGL 4*, http://www.opengl.org/sdk/docs/man/
12. AutoCAD®, DXF Reference http://images.autodesk.com/adsk/files/autocad_2012_pdf_dxf-reference_enu.pdf
13. 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 Firstname NAME**	**Signature**
27.06.2022	Course	Prof.dr.ing. Liviu Miclea	
	Aplications	Assist.prof.dr.eng. Iulia Ștefan	
		Assist.prof.dr.eng. Dan Goța	

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. Liviu Cristian MICLEA