

## COMPUTER-AIDED DESIGN

<b>Course code</b>	<i>MNG212</i>
<b>Course title</b>	<i>Computer-Aided Design</i>
<b>Type of course</b>	<i>Main</i>
<b>Stage of study</b>	<i>Undergraduate</i>
<b>Department in charge</b>	<i>Undergraduate school</i>
<b>Year of study</b>	<i>3<sup>rd</sup></i>
<b>ECTS</b>	<i>6; 54 class hours, 92 hours of self-study, 4 hours of consultations</i>
<b>Coordinating lecturer</b>	<i>Prof. Dr. Vytautas Bučinskas, Doc. Dr. Sigitas Petkevičius</i>
<b>Studies form</b>	<i>Full-time classes</i>
<b>Prerequisites</b>	-
<b>Language of instruction</b>	<i>English</i>

### Course description

Overview of computer aided design and manufacturing. Computer aided design (CAD) and computer aided manufacturing (CAM) components, hardware and software. Concept of CAD: three-dimensional (3D) modeling, virtual modeling, integrated quality control. Interface between CAM and CAD. Fundamentals of CAM. Computer aided engineering.

### Course aim

Implementation of modern 3D systems for geometric form generation, construction parameters analysis and preparation of computer aided manufacturing.

<b>Course learning outcomes (CLO)</b>	<b>Study methods</b>	<b>Assessment methods</b>
CLO1 Acquired knowledge of technological sciences about design and analysis of mechanism.	Lectures, individual literature analysis.	Midterm and final exam.
CLO2 Acquired knowledge about computer aided design of machines.	Lectures, individual literature analysis.	Midterm and final exam assessment, group homework assessment
CLO3 Theoretically able to investigate and assess design peculiarities and properties according their specific working conditions.	Lectures, practical works, individual literature analysis.	Practice lectures, evaluation of homeworker.
CLO4 Students are able to plan and carry out engineering analysis using SolidWorks software: to apply one's knowledge and understanding for the formulation and analysis of mechanical engineering problems, ability to critically evaluate and present the obtained results.	Lectures, practical works, individual literature analysis.	Practice lectures, evaluation of homeworker.
CLO5 Able to use software intended to for the design of new machines (for example SolidWorks).	Lectures, practical works, individual literature analysis.	Practice lectures, evaluation of homeworker.
CLO6 Able to design and analyze of machine and mechanism systems using CAD/CAM and (or) other special software, to analyze the production process and select the necessary equipment, to carry out engineering calculations of mechanical systems.	Lectures, practical works, individual literature analysis.	Practice lectures, evaluation of homeworker.

### Quality management

Diverse teaching methods – lectures, discussion, self-study and homework are applied. All the material is available for students on the e-learning platform.

### Cheating prevention

The ISM regulations on academic ethics, including cheating (see: *ISM regulations*) are fully applied in the course during the entire module. A combination of evaluation methods, including student self-evaluation (of teamwork on the project), will be employed to minimize the opportunity for cheating and free-riding.

### List of independent work topics

No.	Topic	Number of hours
1	Creation of 3D models of various parts	6
2	Creation of assembly drawings	10
3	Creation of working drawings	10

### List of the Course lecture topics

No.	Topic	Class hours
		Theory
1	The basic concepts and terms of CAD	1
2	Down-top and top-down design principles	1
3	Significance of the concept design	1
4	Project progress of classical design	1
5	Technical equipment used in the automated design and manufacture	1
6	The concept of software. Operating systems. Consumer programs	1
7	CAD/CAM/CAE software	1
8	Computer graphics of CAD	1
9	Coordinates in the CAD system	1
10	Geometry creation, parametric projections, compounds, spatial transformation	2
11	Parts and collections	2
12	Automatic engineering analysis	2
13	Strength, stiffness and stability, determination of natural frequencies of FEM	2
14	Virtual simulation. Software of virtual simulation	2
15	Automated production. Software of automated production	2
16	Machine with programmed control. Machining centers.	2
17	The main features of automated manufacturing	2
18	CNC programs and their creation	2
19	The main cutting scheme used in the CNC machine tools	1
20	Robots and their management	2
	<b>Total</b>	<b>30</b>

### List of the Course exercise topics

No.	Topic	Class hours
		Practice
1	Inspection of menu of solidwork software	2
2	Design of simple geometric forms	2
3	Creation of assembly form earlier created parts	2
4	Creation of drawings	2
5	Creation of complex surfaces	2
6	Creation of parametric bodies	2
7	Connections, welded connections	2
8	Animation	2
9	Presentation demountable models	2
10	Simulation of motion	2
11	Discussions about final results, presentation of homework	4
	<b>Total</b>	<b>24</b>

### Individual work and evaluation

Task	Total hours	Final grade, %
Homework	27	20
Midterm (intermediate) exam	20	20
Final written exam	45	60
<b>Total:</b>	<b>92</b>	<b>100</b>

### Assessment methods

Final (session) exam, midterm (intermediate) exams, homework. Evaluation method: problematic questions, oral questions, tests, blitz-questions, questions for an answer with literature references.

### Literature

1. Rao P.N. CAD/CAM. Principles and applications. 3 Edition. Tata: McGraw Hill, 2010
2. Mikell P. Groover, Emory W. Zimmers CAD/CAM: computer-aided design and manufacturing. Prentice-Hall, 1984
3. V. Bučinskis. Computer aided design in mechanical engineering. Study guide. Vilnius: Technika, 2006 (el. book)

### Additional

1. By Andrew D. Dimarogonas Machine Design: A CAD Approach Published, Wiley-IEEE Machine design/ Computer - aided design, 2001 ,ISBN:0471315281
2. Geoffrey Boothroyd, Peter Dewhurst , Winston Knight Contributor Peter Dewhurst, Winston Knight. Product Design for Manufacture and Assembly. CRC Press, 2002, ISBN:082470584X
3. V S. Bargelis. Integruota gamyba. Kaunas: Technologija, 2000
4. Pere Brunet , Christoph M. Hoffmann , Dieter Roller. CAD Tools and Algorithms for Product Design. Berlin: Springer, 2000, ISBN:3540662049