POLYTECHNIC OF MEĐIMURJE IN ČAKOVEC

COURSE SYLLABUS

ACADEMIC YEAR: 2020/2021

1. GENERAL COURSE INFORMATION				
1.1 Course name	**Computer Aided Design**			
1.2 Study program/s	Undergraduate professional study Sustainable Development			
1.3 Course status (O,E)	Obligation	**1.6 Mode of instruction (number of hours)**	**Lectures**	15
1.4 Course code			**Exercises**	30
1.5 Course abbreviation	OPR		**Seminars**	
1.6 Semester	V		**E-learning**	
1.7 ECTS	4	**1.7 Place and time of instruction**	Premises of the Polytechnic of Međimurje in Čakovec, according to the schedule published on the website	
2. TEACHING STAFF				
2.1 Course leader/s-title	prof. Sarajko Baksa, Ph.D.	**contact**	sbaksa@mev.hr	
	- - -	**contact**	- - -	
2.2 Assistant/s- title	- - -	**contact**	- - -	
	- - -	**contact**	- - -	
2.3 Instruction held by- title	- - -	**contact**	- - -	

3. COURSE DESCRIPTION	
3.1 Course goals	The aim of the course is to firmly define and adopt the basic principles and knowledge of 3D design using computers that will allow students to solve construction projects using CAD tools BIM concept.
3.2 Prerequisites	Passed courses; Technical drawing and Structural modeling.
3.3 Course outcomes	After successfully passing the course, the student will be able to: 1. Design elements of geometric model, creation techniques and display schemes of computer product models. 2. Interpret geometric modeling, parametric modeling, feature modeling. 3. Edit the modification of the model property. 4. Analyze and identify the compositions of models of boundary views, parametric, analytical and complex surfaces. 5. Create and manage complex features and define spatial model relations. 6. Identify data structures and express data exchange standards. 7. Set a hypothesis and prepare the construction of a given assembly. 8. Classify and manage the preparation of technical documentation for a given part or assembly. 9. Establish and analyze the processes of forming a family of parts. 10. Predict and valorize development trends; Rapid and Virtual prototyping.
3.4 Course content	The course presents contents related to the planning and implementation of engineering spatial 3D design and construction using computers and modern computer graphics software CAD tools.

3.5 Types of coursework

x	Lectures	x	Exercises	x	Blended e-learning	x	Individual activities		Laboratory
x	Seminars and workshops	x	Distant learning	x	Field classes	x	Multimedia and network	x	Mentorship
	Other								

3.6 Language of instruction

Croatian / English

3.7 Monitoring students' work (enter the number of ECTS credits for each activity so that the total number of ECTS credits is equal to the total ECTS value of the course, 1 ECTS = 30 hours)

0,1	Class attendance	0,1	Seminars		Essay
0,1	Class activity	0,1	Project		Report/paper
	Midterm exams	0,1	Practical task		Continuous knowledge check
1,0	Written exam	0,1	Experimental work		
0,3	Oral exam	0,1	Research		

3.8 Assessment and evaluation of students' work during classes and at the final exam

Activity specification	Percent %	Points
Assessment during instruction		
Attendance	5%	5
Class activity	5%	5
Project / Practical work	20%	20
Seminar / Colloquium I	20%	20
Seminar / Colloquium II	20%	20
Oral exam	30%	30
Exam assessment for the students who failed to fullfil all the obligatory requirements during the semester		
Written exam	*60%*	*60*
Total:	**100%**	**100**

3.9 Assessment criteria – analysis per learning outcomes

	Ways of evaluating learning outcomes						
	Atten-dance	**Activity**	**Project**	**Mid-term exam 1**	**Mid-term exam 2**	**Practic work**	**Total**
Outcome 1			2	4		3	9
Outcome 2			2	4		3	9
Outcome 3			2	4		3	9
Outcome 4			2	4		3	9
Outcome 5			2	4		3	9
Outcome 6			2		4	3	9
Outcome 7			2		4	3	9
Outcome 8			2		4	3	9
Outcome 9			2		4	3	9
Outcome 10			2		4	3	9
Outcome not-related	5	5					10
Total	**5**	**5**	**20**	**20**	**20**	**30**	**100**

The course has defined 10 learning outcomes, a system of scoring outcomes, in order to pass the exam the student must achieve at least 50% points for each learning outcome.

	The grade is calculated as follows: • 87.51-100.00 points: rating Excellent (5) • 75.01- 87.5 points: rating Very good (4) • 62.51 -75.00 points: rating Good (3) • 50.01- 62.5 points: rating Pass (2) • 00.00- 50.00 points: rating Fail (1)	
3.10 Specific features related with taking the course	If the student collects 50% of the points of each outcome, he / she directly takes the exam, provided that he / she has done practical work (seminars / project). During the exam, it is possible to orally check the knowledge from practical work (seminars / project). Once earned points for each learning outcome are no longer deleted unless the student, with the express approval of the course leader, decides to correct the result for each learning outcome, whereby the points won are deleted and newly earned points for that learning outcome are entered. The final grade is obtained on the exam period and is the sum of points earned during classes. Students who did not take the colloquium access the written part of the exam where all learning outcomes are checked, and are required to have completed practical work (seminars / project) before taking the exam.	
3.11 Students obligations	Full-time students are required to attend at least 70% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. Part-time students are required to attend at least 30% of the total number of hours of lectures and exercises in order to exercise the right to take the exam. If the student has not fulfilled all the obligations set by the course, he is obliged to attend the lectures again and meet the conditions for taking the exam. Attendance can be offset by online tuition, organised webinars and added assignments given by teachers. One lesson lasts 45 minutes, and several hours form a teaching unit. Absence from one teaching unit is counted as one absence. Delays and apologies are recorded separately. In that case, if the student missed more than 50% of classes, and has a justifiable reason/apology, the request should be submitted to the Department Council, which then decides on the justification of student absences with the obligatory opinion of the course leader.	
3.12 Written assignments	Seminars / Projects	
3.13 Required reading	1.	D. Marjanović: "Inženjerska grafika", poglavlje u Inženjerski priručnik I, Školska knjiga, Zagreb 1995.
	2.	***, "Pro/E početnica", EAG centar, Zagreb 2004. (HTML dokument)
	3.	B. Plazibat, S. Jerčić i dr.:, "Informatika 1", Sveučilišni studijski centar za stručne studije, Split 2010. (PDF dokument)
	4.	S. Baksa: Konstrukcijske metode računalnog 3D modeliranja**, MEV 2018.**[2]
3.14 Additional reading	1.	K. Lee: "Principles of CAD/CAM/CAE Systems", Addison-Wesley, Reading 1999.

	2.	R. Toogood: "Creo Parametric 2.0 Tutorial and Multimedia DVD", SDC Publications, Mission 2013.
	3.	B. Raphael, I.F.C. Smith: “Fundamentals of Computer-Aided Engineering”, John Wiley and Sons, Chichester 2003.
	4.	C. McMahon, J. Browne: “CADCAM: Principles, Practice and Manufacturing Management”, Prentice-Hall, Harlow 1998.
	5.	I. Ivanšić: "Numerička matematika", Element, Zagreb 2002.

4 ADDITIONAL COURSE INFORMATION	
4.1 Quality control	The quality of the program, teaching process, teaching skills and level of mastery of the material will be established by conducting a written evaluation based on questionnaires, and in other standardised ways and in accordance with the by-laws of the Polytechnic of Međimurje in Čakovec.
4.2 Contact the teacher	Students can contact the teacher during the office hours and during classes, while for short questions and explanations they can contact him/her any day during working hours by coming in person or by landline. It is possible to ask questions and e-mail which will be answered as soon as possible.
4.3 Information about the course	It is the obligation of each student to be regularly informed about the course. All relevant information and notices related to classes and exams, maintenance or any year, will be reported in a timely manner on the bulletin board and on the website of the Polytechnic of Međimurje in Čakovec.
4.4 Course contribution to the study program	Apply the basic postulates of computer-aided design within the engineering profession of the BIM concept of computer modeling.

5. ANALYSIS OF COURSE TOPICS (the number of hours is equal to the number of lectures and exercises of the course)

LECTURES

Hours	**Topic and description**	**Method** • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes…	**Learning outcomes**	**Course outcome**
1.	Introduce students to the lecture program, teaching conditions, literature and criteria for evaluating knowledge. Introduction to CAD / CAE systems. Computer product models, display scheme, regularized operators, formal and informal properties of display scheme, modeling methods. Elements of geometric model, creation techniques: profile extrusion, volume addition and subtraction, transitions.	Lecture, Discovery learning, Presentation	Use knowledge of the basics of the elements of spatial 3D geometric modeling	I1

2.	Geometric modeling, half-spaces, half-space elements, Euler operators, operations with Euler operators. Profile rotation, profile projection by trajectory. Geometric modeling, Parametric modeling, Feature modeling.	Lecture, Discovery learning, Presentation	Distinguish approach and organization; Geometric Modeling, Parametric Modeling and Feature Modeling.	I2
3.	Constructive body geometry, regularized Boolean operators, affiliation classification, motion representation. Modifying model properties, settings, order, regeneration, references.	Lecture, Discovery learning, Presentation	Distinguish systems and spatial modification of structural properties of 3D CAD models	I3
4.	Boundary views, parametric, analytical and complex surfaces, Hermit, Bezier, B-spline, NURBS, surfaces. Model composition (stacking, joining), Making a thin-walled model.	Lecture, Discovery learning, Presentation	Use spatial features of parametric, analytical, and complex 3D surfaces	I4
5.	Surface manipulation, surface point determination, assembly, offset, segmentation, intersection, transformation. Creating complex features, defining relationships.	Lecture, Discovery learning, Presentation	Use the principles of manipulating surfaces of complex features and defining relations	I4
6.	Features design and feature properties.	Lecture, Discovery learning, Presentation	Apply a variety of feature design models and feature properties.	I5
7.	Creating default models. Plane contour formation. Model creation and modification of model features.	Lecture, Discovery learning, Presentation	Use and explain the input and output factors of model formation and modification of model features	I5
8.	Composite features, feature taxonomy, validation and mapping. Model creation.	Lecture, Discovery learning, Presentation	Apply and distinguish the characteristics of composite features and taxonomy of creation	I5
9.	Feature recognition. Feature creation techniques.	Lecture, Discovery learning, Presentation	Apply and differentiate feature creation techniques	I5
10.	Data structures, data exchange standards.	Lecture, Discovery learning, Presentation	Apply and distinguish data structures and data exchange standards	I6
11.	Creating a default assembly.	Lecture, Discovery learning, Presentation	Apply and distinguish the characteristics of the elements of the given assembly	I7
12.	Creating technical documentation from a part or assembly model.	Lecture, Discovery learning, Presentation	Apply and distinguish features of features in 3D design and production, with the creation of technical documentation from the model of a part or	I8

			assembly	
13.	Preparation of technical documentation for a given part or assembly.	Lecture, Discovery learning, Presentation	Apply and distinguish the characteristics of the technical documentation of a given part or assembly	I8
14.	Forming a family of parts and generating model views.	Lecture, Discovery learning, Presentation	Apply and distinguish the characteristics of the parts family design elements and generate model representations	I9
15.	Development CAD / CAM trends: Rapid and Virtual prototyping.	Lecture, Discovery learning, Presentation	Apply various developmental CAD / CAM spatial 3D models	I10
EXERCISES/ SEMINARS				
Hours	**Topic and description**	**Method** • Direct teaching (lecture, instruction, pp presentation) • Discovery learning (individual, lead, discussion) • Group learning • Case study • Field classes…	**Learning outcomes**	**Course outcome**
1.	Introduce students to the lecture program, teaching conditions, literature and criteria for evaluating knowledge. Introduction to CAD / CAE systems. Computer product models, display scheme, regularized operators, formal and informal properties of display scheme, modeling methods. Elements of geometric model, creation techniques: profile extrusion, volume addition and subtraction, transitions.	Lecture, Discovery learning, Presentation	Use knowledge of the basics of the elements of spatial 3D geometric modeling	I1
2.	Geometric modeling, half-spaces, half-space elements, Euler operators, operations with Euler operators. Profile rotation, profile projection by trajectory. Geometric modeling, Parametric modeling, Feature modeling.	Lecture, Discovery learning, Presentation	Distinguish approach and organization; Geometric Modeling, Parametric Modeling and Feature Modeling.	I2
3.	Constructive body geometry, regularized Boolean operators, affiliation classification, motion representation. Modifying model properties, settings, order, regeneration, references.	Lecture, Discovery learning, Presentation	Distinguish systems and spatial modification of structural properties of 3D CAD models	I3
4.	Boundary views, parametric, analytical and complex surfaces, Hermit, Bezier,	Lecture, Discovery learning, Presentation	Use spatial features of parametric,	I4

	B-spline, NURBS, surfaces. Model composition (stacking, joining), Making a thin-walled model.		analytical, and complex 3D surfaces	
5.	Surface manipulation, surface point determination, assembly, offset, segmentation, intersection, transformation. Creating complex features, defining relationships.	Lecture, Discovery learning, Presentation	Use the principles of manipulating surfaces of complex features and defining relations	I4
6.	Features design and feature properties.	Lecture, Discovery learning, Presentation	Apply a variety of feature design models and feature properties.	I5
7.	Creating default models. Plane contour formation. Model creation and modification of model features.	Lecture, Discovery learning, Presentation	Use and explain the input and output factors of model formation and modification of model features	I5
8.	Composite features, feature taxonomy, validation and mapping. Model creation.	Lecture, Discovery learning, Presentation	Apply and distinguish the characteristics of composite features and taxonomy of creation	I5
9.	Feature recognition. Feature creation techniques.	Lecture, Discovery learning, Presentation	Apply and differentiate feature creation techniques	I5
10.	Data structures, data exchange standards.	Lecture, Discovery learning, Presentation	Apply and distinguish data structures and data exchange standards	I6
11.	Creating a default assembly.	Lecture, Discovery learning, Presentation	Apply and distinguish the characteristics of the elements of the given assembly	I7
12.	Creating technical documentation from a part or assembly model.	Lecture, Discovery learning, Presentation	Apply and distinguish features of features in 3D design and production, with the creation of technical documentation from the model of a part or assembly	I8
13.	Preparation of technical documentation for a given part or assembly.	Lecture, Discovery learning, Presentation	Apply and distinguish the characteristics of the technical documentation of a given part or assembly	I8
14.	Forming a family of parts and generating model views.	Lecture, Discovery learning, Presentation	Apply and distinguish the characteristics of the parts family design elements and generate model representations	I9
15.	Development CAD / CAM trends: Rapid and Virtual prototyping.	Lecture, Discovery learning, Presentation	Apply various developmental CAD / CAM spatial 3D models	I10