I. SYLLABUS

Name of the subject in Polish:	**Inżynierska grafika komputerowa (CAD)**	Kod przedmiotu **CAD**
Name of the subject in English	**Engineering computer graphics (CAD)**	
Course of Study:	Technical and Computer Science Education Programme	
Level of studies:	Full-time studies / first-cycle, engineering programme	
Study Profile:	Practical	
Teaching institution:	THE KARKONOSZE STATE APPLIED SCIENCES UNIVERSITY IN JELENIA GÓRA FACULTY OF MEDICAL AND TECHNICAL SCIENCES	
Lecturer:		
	Email address:	

I. Courses, number of hours

Semester	Lecture	Practical	Laboratory	Project	Seminar	Total
VI	15	-	30	-	-	**45**
Form of crediting a course	graded test	-	graded test			
No. of ECTS points	1		3			**4**

II. Goals of the subject:

C1	Getting to know the basic computer tools for CAD / CAM design.
C2	To familiarize students with the principles of creating CAD / CAM projects and to develop skills in reading technical drawings
C3	Understanding the basic functions of programs by the student; AutoCAD - Inventor, SolidWorks and CAM production (EdgeCAM)

III. Preliminary requirements in terms of knowledge, skills and other competences:

None

IV. Expected learning outcomes:

Knowledge	**The student:**
EK1	Knows the rules of designing and creating graphics and 2D and 3D models (2D, 3D) using CAD graphics software (AutoCAD, / Inventor /, SolidWorks,
EK2	Knows the capabilities of CAD graphics software (AutoCAD, / Inventor /, SolidWorks, / CATIA /) to create two- and three-dimensional graphics (2D, 3D)
EK3	Knows what kind of CAD / CAM support tools can be used in the engineering design process.

Skills	
EK4	The student is able to use CAD graphics software (AutoCAD, / Inventor /, SolidWorks, / CATIA /) to create two- and three-dimensional graphics (2D, 3D).
Social Competences	
EK5	The student understands the need to constantly improve his knowledge of technical drawing

V. Curriculum:

Form of classes: lecture		**Number of hours**
Lec1	To familiarize students with the subject. Presentation of the objectives, curriculum and references. Forms of evaluation.	**1**
Lec 2	Design principles and criteria using CAD-CAM-CAE systems - visual, functional and market evaluation of the product, creating a prototype. Concurrent design principles (CE, CD)	**2**
Lec 3	The use of CAD graphics software (AutoCAD, / Inventor /, SolidWorks, / CATIA /) to create graphics and two- and three-dimensional models (2D, 3D) as well as software supporting CAE calculations and CAM production (EdgeCAM)	**2**
Lec4	Presentation of CAD graphic programs (AutoCAD, / Inventor /, SolidWorks and CAM production (EdgeCAM) - rules for creating templates, prototype drawing, object location modes and their editing, creating and handling layers, dimensioning styles, rules for creating and handling blocks).	**2**
Lec5	Introduction to parametric CAD design systems (SolidWorks or INVENTOR).	**2**
Lec6	Operating principles and application of CAE software overlays for the SolidWorks package - basic structural calculations using FEM.	**2**
Lec7	Material removal processes using CNC machine tools - construction. Principles of NC Code construction and their generation using computer simulations.	**2**
Lec8	The principles of selection and calculation of material removal parameters - tools	**2**
Total class contact hours - Lectures		**15**
Form of classes – Practical classes		
Lab1	Development of a 2D model of a selected object: scanning, editing a raster document, attaching to a CAD document, calibration, developing a vector model, dimensioning, preparation for printing.	**4**
Lab2	Graphic designs (2D). Implementation, based on a model (axonometric projection), using the AutoCAD and SolidWorks software package, technical drawing (2D), using the necessary number of views, using the "half-half-cross-section", taking into account dimensioning, tolerance and surface roughness. Application of parameterization. Group task and	**6**

	individual tasks	
Lab3	Graphic design (2D and 3D). Development of graphic design, two tasks to choose from: assembly of a safety valve, assembly of a thermostat or design of a tool for carrying out the process of plastic forming of metals (e.g. extrusion matrix or shaped die); using the task of vectorizing raster objects. 2D and 3D graphics - AutoCAD or SolidWorks. Group task and individual tasks	**10**
Lab4	Graphic design (3D). Construction of a complex spatial object (3D) (e.g. machine or device element) with generation of technical documentation (SolidWorks program). For assumed boundary conditions, performing FEM calculations and determining stress and deformation distributions - using the SimulationXpress Analysis Wizard software overlay - shape and structure optimization. Group task.	**6**
Lab5	Construction of 3D models and development of material removal processes - computer simulations (EdgeCAM) and physical simulations - HSM_CNC FRP 500 milling machine.	**4**
Total class contact hours – Practical classes		**30**

VI. Educational tools:	
1.	Multimedia presentations.
2.	Computer models of geometric constructions.
3.	Sample technical documentation on paper and in electronic form.
4.	Drawing exercises conducted in a classic way on paper, board and using CAD type computer software.
5.	Computer with AutoCAD - Inventor, SolidWorks and CAM production (EdgeCAM)

VII. Ways of assessment (F – formative, P – summative)	
F1	Tests checking knowledge of lectures and assessment for individual oral responses during lectures.
F2	Final test.
F3	Tutorial list of projects - Evaluation of control work from individual project exercises.
F4	Assessment for independent drawing documentation of a medium complex real object, developed by students partly during class-contact hours classes, and partly at home.
P1.	The final grade from the design exercises is a weighted average calculated from the F4 forming grade (50%) and the average of the F3 forming grades (50%).
P2	The final lecture grade is a weighted average calculated from the F2 forming grade (50%) and the F1 average forming grade (50%). The condition of admission to the final test is to obtain positive results from all tests.

VIII. Student workload	
Activity type	**Total and average number of hours for the conducted activities**
Participation in lectures, labs	**45**

Independent studying of materials concerning the topic of lectures and laboratories.	**25**
Independent drawing for drawing exercises.	**30**
Consultations	**15**
Preparing for the final test	**5**
TOTAL	**120**
TOTAL NUMBER OF ECTS POINTS	**4**

IX.Basic and supplementary literature

Basic Literature:

1.Pikoń A.: AutoCAD 2009 PL. Helion, 2009.
2.Babiuch M.: SolidWorks w praktyce. Helion, 2007.
3.Babiuch M.: SolidWorks 2009Pl, ćwiczenia. Helion 2009.
4.Bajkowski J.:Rysunek techniczny z elementami komputerowych technik kreślenia. Warszawa 1994.

Supplementary literature:

5.Winkler T.: Wspomaganie komputerowe CAD-CAM. Komputerowy zapis konstrukcji. WNT 1997.
6.Dobrzański T.: Rysunek techniczny maszynowy. WNT, 2009.
7. Stach B.: Podstawy programowania obrabiarek steowanych numerycznie. WSiP. Warzawa 1999.
8. Tarnowski W.: Wspomaganie komputerowe CAD-CAM. Podstawy projektowania technicznego. WNT 1997.
9. Augustyn A.: EdgeCAM; 2017.

X. Didactic methods

M1	Informative lecture (conventional)
M2	Practical

XI. Table of connections between subject and course learning outcomes with subject objectives and didactic methods used

Learning Outcomes	Reference to a Learning Outcome defined for the course of study	Goals of the subject	Curriculum	Didactic tools	Didactic methods
EK1	K_W10	C1	Lec1 – Lec8	1,2	M1
EK2	K_W10	C2	Lec1 – Lec8	1,4	M1
EK3	K_W10	C3	Lec1 – Lec8	1 - 4	M1
EK4	K_U07, K_U08	C3	Lab.1 - 5	1,2,4	M2
EK5	K_K04	C3	Lec.1 - 8, Lab.1 - 5	1-4	M2

XII. Ways assessment of expected learning outcomes

Learning Outcome	Way of assessment
EK1	F1,P1
EK2	F1,2,P1
EK3	F1,2, P1
EK4	F3,P2
EK5	F4,P2

Grade criteria

Way of assessment	For 2,0 grade	For 3,0 grade	For 3,5 grade	For 4,0 grade	For 4,5 grade	For 5,0 grade
F1,F2,F3,F4 Lectures, practical classes (laboratory)	when the student obtains less than 50% of the sum of points assessing the level of knowledge required.	when the student obtains from 50% to 60% of the sum of points assessing the level of knowledge required.	when the student obtains from 61% to 70% of the sum of points assessing the level of knowledge required.	when the student obtains from 71% to 80% of the sum of points assessing the level of knowledge required.	when the student obtains from 81% to 90% of the sum of points assessing the level of knowledge required.	when the student obtains from 91% to 100% of the sum of points assessing the level of knowledge required.
P1, P2	Final average (criteria described in ways of student assessment) is less than 3.0.	Final average (criteria described in ways of student assessment) is between 3.0 and 3,20.	Final average (criteria described in ways of student assessment) is between 3.21 and 3,70.	Final average (criteria described in ways of student assessment) is between 3.71 and 4,20.	Final average (criteria described in ways of student assessment) is between.4.21 and 4,70.	Final average (criteria described in ways of student assessment) is between..4.71 and 5,00.
Social competences developed during the laboratories	The student does not demonstrate in any way the knowledge or the ability to use it.	Knowledge and skills acquired at a sufficient level, used in an irregular way, active support from more experienced people necessary.		Knowledge and skills acquired at good level, allowing for their independent practical use during professional activities.		Has the ability to creatively use and develop knowledge, skills and attitudes appropriate for a given range of activities, very well implements tasks in a given range and passes on to others.