SYLLABUS OF A MODULE

Polish name of a module	**Komputerowe wspomaganie prac inżynierskich**
English name of a module	**Computer Aided Engineering**
ISCED classification - Code	0715
ISCED classification - Field of study	*Mechanics and metal trades*
Languages of instruction	*English*
Level of qualification:	*1 – BSc (EQF 6)*
Number of ECTS credit points	*6*
Examination:	*A – assignment*
Available in semester:	*S*

Number of hours per semester:

Lecture	Exercises	Laboratory	Seminar	E-learning	Project
15		45			

MODULE DESCRIPTION

MODULE OBJECTIVES

O1. Expanding knowledge of 3D modeling.

O2. To acquire capabilities to conduct strength and frequency analyzes using the finite element method in relation to the selected CAE system.

PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Fundamentals of mechanics, mechanism and machine theory, strength of materials, vibration theory.
2. Ability to read and apply technical drawings.
3. Ability to build 3D models in CAD programs.
4. Capability of using source literature.
5. Capability of individual work and collaboration in a group.
6. Data analysis and presentation of results.

LEARNING OUTCOMES

LO 1 – Knowledge on parameterization and optimization of CAD models.

LO 2 – Knowledge on finite element method in relation to the selected CAE system.

LO 3 – Ability to construct the parameterized solid models and to conduct strength and frequency analyzes in selected CAE system.

MODULE CONTENT

Type of classes – lecture	**Number of hours**
Lec 1÷3 - Parameterization of CAD models. Global variables, equations, part configurations, configurations in assemblies.	**3**
Lec 4,5 - Stress and frequency analysis. The analysis process.	**2**
Lec 6 - Stress and frequency analysis. Modeling and discretization errors. The influence of mesh density.	**1**
Lec 7 - Stress and frequency analysis. Methods to present FEA results.	**1**
Lec 8 - Stress and frequency analysis. Mesh controls.	**1**
Lec 9 - Stress analysis. Stress concentrations.	**1**
Lec 10÷12- Stress and frequency analysis. Structural analyses of simple assemblies. Computational model of frame.	**3**
Lec 13 - Stress and frequency analysis. Contact conditions.	**1**
Lec 14,15 - Optimization of models by using a design study.	**2**
Sum	**15**
Type of classes– laboratory	**Number of hours**
Lab 1 - Use global variable. Create equations.	**2**
Lab 2 - Use configurations to represent different versions of a part within a single file. Suppress and unsuppress features.	**6**
Lab 3 - Change dimension values by configuration. Suppress features by configuration.	**2**
Lab 4 - Stress analysis. Preprocessing. Meshing. Processing. Post-	**2**

processing.	
Lab 5÷7 - Stress analysis. Execute a linear static analysis using solid elements.	**6**
Lab 8 - Frequency analysis. Preprocessing. Meshing. Processing. Post-processing.	**2**
Lab 9÷11 - Frequency analysis. Execute a frequency analysis using solid elements.	**6**
Lab 12 - Stress and frequency analyses. The influence of mesh density on results. Employ various methods to present FEA results.	**2**
Lab 13 - Stress analysis. Use mesh controls. Understand stress concentrations. Extract reaction forces.	**2**
Lab 14 - Stress analysis. Compatible and incompatible meshes.	**2**
Lab 15 - Stress and frequency analyses. Contact analysis.	**5**
Lab 16,17 - Stress analysis. Symmetrical and free self-equilibrated assemblies.	**4**
Lab 18 - Design study to analyze trends when specific parameters are varied.	**2**
Lab 19 - Find optimum value of some design parameters.	**2**
Sum	**45**

TEACHING TOOLS

1. - Power Point presentations, lecture notes, sample problems.
2. - Laboratory tutorials.
3. - Computer workstations equipped with the SolidWorks program -educational license.

WAYS OF ASSESSMENT (F – FORMATIVE, S – SUMMATIVE

F1. - assessment of preparation for laboratory exercises
F2. - assessment of the ability to apply the acquired knowledge while doing the exercises
F3. - evaluation of reports on the implementation of exercises covered by the curriculum
F4. - assessment of activity during classes

S1. - assessment of the ability to solve the problems posed and the manner of presentation obtained results - pass mark *
S2. - assessment of mastery of the teaching material being the subject of the lecture - test

*) in order to receive a credit for the module, the student is obliged to attain a passing grade in all laboratory classes as well as in achievement tests.

STUDENT'S WORKLOAD

No.	Forms of activity	Average number of hours required for realization of activity
1. Contact hours with teacher		
1.1	Lectures	15
1.2	Tutorials	0
1.3	Laboratory	45
1.4	Seminar	0
1.5	Project	0
1.6	Consulting teacher during their duty hours	5
1.7	Examination	0
Total number of contact hours with teacher:		65
2. Student's individual work		
2.1	Preparation for tutorials and tests	0
2.2	Preparation for laboratory exercises, writing reports on laboratories	60
2.3	Preparation of project	0
2.4	Preparation for final lecture assessment	15
2.5	Preparation for examination	0
2.6	Individual study of literature	10
Total number of hours of student's individual work:		85
Overall student's workload:		150
Overall number of ECTS credits for the module		6 ECTS
Number of ECTS points that student receives in classes requiring teacher's supervision:		2.4 ECTS

Number of **ECTS** credits acquired during practical classes including laboratory exercises and projects:	4.8 ECTS

BASIC AND SUPPLEMENTARY RESOURCE MATERIALS

1. Akin J.E.: Finite Element. Analysis Concepts. Via SolidWorks, World Scientific, 2010.
2. Dassault Systems SolidWorks Corporation: Introduction to Simulation. SOLIDWORKS Simulation, USA, 2017.
3. Dassault Systems SolidWorks Corporation: SOLIDWORKS Education Edition 2016-2017. Fundamentals of 3D Design and Simulation, USA, 2017.
4. Dassault Systems SolidWorks Corporation: SOLIDWORKS Simulation. SOLIDWORKS 2016 Training, USA, 2016.
5. Dassault Systems SolidWorks Corporation: SOLIDWORKS Web Help 2020.
6. Dechaumphai P., Sucharitpwatskul S.: Finite Element Analysis with SOLIDWORKS Simulation, Alpha Science, 2019.
7. Gill P.E.: Practical optimization. Academic Press, New York, 2000.
8. Nudehi S.S., Steffen J.R.: Analysis of Machine Elements Using SOLIDWORKS Simulation 2019, SDC Publications, 2019.
9. SilvaV. D.: Mechanics and Strength of Materials, 2006.
10. Verma G., Weber M.: SolidWorks Simulation 2017 Black Book, CADCAMCAE Works, 2016.
11. Woyand H.-B.: FEM mit CATIA V5, J. Schlembach Fachverlag Wilburgstetten, 2009.
12. Zeid I.: Mastering SolidWorks, Pearson Peachpit, 2014.

MODULE COORDINATOR (NAME, SURNAME, E-MAIL ADDRESS)

Dr hab. inż. Dawid Cekus prof. PCz - dawid.cekus@pcz.pl