MODULE DESCRIPTION

Module code	full-time studies:	**Z-ZIP1-E-505**
	part-time studies:	**Z-ZIPN1-E-505**
Module name	**Engineering Design**	
Module name in Polish	**Projektowanie inżynierskie**	
Valid from academic year	**2019/2020**	

MODULE PLACEMENT IN THE SYLLABUS

Field of study	**MANAGEMENT AND PRODUCTION ENGINEERING**
Level of education	**1st degree**
Studies profile	**General**
Form and method of conducting classes	**Full-time and Part-time**
Specialisation	**All**
Unit conducting the module	**Department of Production Engineering**
Module co-ordinator	**Artur Szmidt, PhD**
Approved by:	**Dariusz Bojczuk, PhD, DSc**

MODULE OVERVIEW

Type of subject / group of subjects	**Major**
Module status	**Compulsory**
Language of conducting classes	**English**
Module placement in the syllabus - semester	**Semesetr V**
Initial requirements	**Engineering Graphics, Engineering Graphics-SolidWorks Materials Strength**
Examination (YES/NO)	**NO**
Number of ECTS credit points	**3**

Method of conducting classes		**Lecture**	**Classes**	**Laborato-ry**	**Project**	**Other**
Per semester	full-time studies:	**30**			**15**	
	part-time studies:	**18**			**9**	

TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Category	Symbol	Learning outcomes	Assignations to the directional learning outcomes
Knowledge	W01	A student has advanced knowledge of general principles of engineering design, basic calculation procedures, materials selection, determining boundary conditions for the designed device, and modelling constructions according to the binding norms and possible optimisation and innovative solutions.	ZIP1_W06 ZIP1_W07
	W02	A student has advanced knowledge concerning the principles of work as regards computer support of an engineer's designing work (with reference to CAD/CAE), taking simulation as well as optimisation possibilities of the modelled construction into consideration.	ZIP1_W04
Skills	U01	A student can make a functionality analysis of the designed simple construction, prepare a calculation process using basic materials strength analyses, conduct a simulation concerning the condition of the construction in CAD/CAE support packages (as regards an engineer's work).	ZIP1_U14 ZIP1_U17
	U02	A student can prepare technological documentation of an engineering project, provide documentation for it with appropriate reference to the literature on the subject and formulate final conclusion concerning the functioning of the designed device in the production process and during later exploitation.	ZIP1_U01 ZIP1_U03
Social competences	K01	A student understands the necessity of continuous improvement of his/her knowledge and skills as regards engineering design, drawing particular attention to learning CAD/CAE computer packages supporting an engineer's work;	ZIP1_K01
	K02	A student is also aware of his/her impact on the environment of the designed devices and the responsibility for their functioning.	ZIP1_K02

TEACHING CONTENTS

Method of conducting classes	Teaching contents
Lecture	System conditions of the designing process, General legitimate constructing of mechanical devices, constructor's tasks. Basic calculation procedures for static and fatigue loads. Materials used in mechanical engineering. Determining the characteristics of materials relevant to design. New materials in mechanical constructions. Designed using the SolidWorks program - strength analysis, interpretation of results. The problem of parameterization in designing with the use of SolidWorks software Characteristics of screw, bolt and welded connections. Calculation methods. Structural elements of the shaft. Calculation of shaft strength. Types of bearings, structure, features and advantages. Ways of selecting rolling and sliding bearings. Gear transmissions, belt transmissions. Types of couplings, methods of selecting couplings. Problems of reliability, energy consumption and efficiency of mechanical devices. Evolution of devices of a mechanical nature to mechatronic solutions.

	Analysis of selected mechanical devices and original patents - case study. SolidWorks in designing electrical systems Other applications of the SolidWorks program in engineering design - an overview of the possibilities.
Project	Implementation of the design of a simple screw mechanism in various applications: implementation of the basic elements of the design process from the initial analysis, determination of basic functionalities, basic calculations, structure modeling, preparation of documentation and final analysis, analysis of the structure's environmental impact and determination of critical states of the designed structure, analysis of the simulation of structure behavior in the engineer support packages - SolidWorks and formulation of appropriate conclusions Selection of a structural element, eg a coupling, gear motor for predefined applications from manufactured, ready-made structural elements on the market (selection from many possible variants due to technical and other parameters, with justification given).

METODS OF ASSESSING TEACHING RESULTS

Symbol	Methods of checking the learning outcomes *(select X)*					
	Oral exam	**Written exam**	**Test**	**Project**	**Statement**	**Other**
W01			X			
W02			X			
U01				X		
U02				X		
K01				X		X
K02				X		X

FORM AND CONDITIONS OF PASSING

Form of classes	Form of credit	Passing conditions
Lecture	Credit with grade	Obtaining at least 50% of the points in the test carried out in the last lecture classes.
Project	Credit with grade	Obtaining a total of at least 50% of points from two projects.

STUDENT WORKLOAD

<table>
<tr><th colspan="13">Balance of ECTS points</th></tr>
<tr><td rowspan="3">No.</td><td rowspan="3">Type of student's activity</td><td colspan="10">Student's workload</td><td rowspan="3">Unit</td></tr>
<tr><td colspan="5">full-time</td><td colspan="5">part-time</td></tr>
<tr><td>Lc</td><td>C</td><td>Lb</td><td>P</td><td>O</td><td>Lc</td><td>C</td><td>Lb</td><td>P</td><td>O</td></tr>
<tr><td>1.</td><td>Participation in the activities</td><td>30</td><td></td><td></td><td>15</td><td></td><td>18</td><td></td><td></td><td>9</td><td></td><td>h</td></tr>
<tr><td>2.</td><td>Other (consultation, exam)</td><td>2</td><td></td><td></td><td>2</td><td></td><td>2</td><td></td><td></td><td>2</td><td></td><td>h</td></tr>
<tr><td>3.</td><td>Number of hours of a student's assisted work</td><td colspan="5">49</td><td colspan="5">31</td><td>h</td></tr>
<tr><td>4.</td><td>Number of ECTS credit points which are allocated for assisted work</td><td colspan="5">2,0</td><td colspan="5">1,2</td><td>ECTS</td></tr>
<tr><td>5.</td><td>Number of hours of a student's unassisted work</td><td colspan="5">26</td><td colspan="5">44</td><td>h</td></tr>
<tr><td>6.</td><td>Number of ECTS credit points which a student receives for unassisted work</td><td colspan="5">1,0</td><td colspan="5">1,8</td><td>ECTS</td></tr>
<tr><td>7.</td><td>Work input connected with practical classes</td><td colspan="5">25</td><td colspan="5">25</td><td>h</td></tr>
<tr><td>8.</td><td>Number of ECTS credit points which a student receives for practical classes</td><td colspan="5">1,0</td><td colspan="5">1,0</td><td>ECTS</td></tr>
<tr><td>9.</td><td>Total number of hours of a student's work</td><td colspan="5">75</td><td colspan="5">75</td><td>h</td></tr>
<tr><td>10.</td><td>Punkty ECTS za moduł
1 ECTS=25 hours</td><td colspan="10">3</td><td>ECTS</td></tr>
</table>

LITERATURE

1. Golenko A. (2010), *Fundamentals of Machine Design. A Coursebook for Polish and Foreign Students*, Politechnika Wrocławska, Wrocław (https://www.dbc.wroc.pl/Content/7154/Golenko_Fundamentals%20of%20Machine%20Design.pdf
2. Jha S., *150 CAD Exercises* (https://www.usb.ac.ir/FileStaff/1365_2018-11-17-9-30-19.pdf)
3. Narayana K.L, Kannaiah P., Reddy K.V. (2006), *Machine Drawing*, New Age International (P) Ltd.
4. Simmons C.H., Phelps N., Maguire D.E (2012), *Manual of Engineering Drawing*, Elsevier Ltd.
5. https://www.autodesk.com/solutions/3d-cad-software
6. https://www.solidworks.com/