MODULE DESCRIPTION

Module code	full-time studies:	**Z-ZIP1-E-304**
	part-time studies:	**Z-ZIPN1-E-304**
Module name	**Mechanics for Engineers**	
Module name in Polish	**Mechanika techniczna**	
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	**Dariusz Bojczuk, PhD, DSc**
Approved by:	

MODULE OVERVIEW

Type of subject / group of subjects	**Major**
Module status	**Compulsory**
Language of conducting classes	**English**
Module placement in the syllabus - semester	**Semester III**
Initial requirements	**No requirements**
Examination (YES/NO)	**NO**
Number of ECTS credit points	**2**

Method of conducting classes		**Lecture**	**Classes**	**Laboratory**	**Project**	**Other**
Per semester	full-time studies:	**15**	**15**			
	part-time studies:	**9**	**9**			

TEACHING RESULTS AND THE METHODS OF ASSESSING TEACHING RESULTS

Category	Symbol	Learning outcomes	Assignations to the directional learning outcomes
Knowledge	W01	A student is knowledgeable about formulating and analysing the conditions of equilibrium of force systems as well as their reduction.	ZIP1_W02
	W02	A student has knowledge of taking sliding friction and rolling resistance into consideration as regards statistics.	ZIP1_W02
	W03	A student has knowledge of centres of gravity and the methods of determining them.	ZIP1_W02
Skills	U01	A student is able to conduct simple static analyses including balances of force and their reduction.	ZIP1_U17
	U02	A student is able to conduct simple static analyses including sliding friction and rolling resistance.	ZIP1_U17
	U03	A student is able to determine the setting of a centre of gravity, flat surfaces, and lines.	ZIP1_U17
	U04	A student has the ability to assess the usefulness of static analyses in solving simple engineering issues.	ZIP1_U19
Social competences	K01	A student understands the need of continuous improvement of his/her knowledge from the field of mechanics for engineers.	ZIP1_K01

TEACHING CONTENTS

Method of conducting classes	Teaching contents
Lecture	General knowledge, elements of vector calculus, basic notions of mechanics. The laws and axioms of statics. The moment of a force about the axis, and a pair of forces. Bonds and the rules of releasing from bonds. Reducing a given balance of forces to a point, main vector as well as main moment, and balanced static sets. The conditions of equilibrium. The classification of types of balance of forces. Concurrent coplanar force system – equilibrium conditions, examples. Arbitrary coplanar force system – reduction of a system to a resultant (reduction condition), central axis equation, and continuous load – reduction to a resultant Arbitrary coplanar force system – conditions of equilibrium, examples of analysing simple and complex systems Sliding friction, developed and undeveloped friction, friction angle, cone of static friction, examples. Journal friction. Band friction – developed friction relation, examples. Rolling resistance, rolling condition. Parallel force system – reduction of a system to a resultant. Gravity and mass centres – integral and total formulas. Examples of determining centres of gravity for flat surfaces and lines. Spatial force system – reduction of a system to a wrench, reduction invariants, and cases of reduction. Spatial concurrent force system – equilibrium conditions, constraints, examples. Spatial arbitrary force system – equilibrium conditions, constraints, examples.

Classes	Revision of a vector calculus. Calculating the moment of a force about a point and axis. Releasing from bonds, formulating the conditions of equilibrium, and determining the reaction – concurrent coplanar force system. Releasing from bonds, formulating the conditions of equilibrium, and determining the reaction – arbitrary coplanar force system. Analysing problems as regards sliding friction. Analysing problems regarding sliding friction, band friction, and rolling resistance Determining centres of gravity of solids, flat surfaces, and lines. Releasing from bands, formulating the conditions of equilibrium, and determining the reaction – spatial concurrent force system and spatial concurrent force system.

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			
W03			X			
U01			X			
U02			X			
U03			X			
U04			X			
K01			X			

FORM AND CONDITIONS OF PASSING

Form of classes	Form of credit	Passing conditions
Lecture	Credit with grade	Obtaining at least 50% of the test points in the last lecture
Classes	Credit with grade	Obtaining at least 50% of test points during the class

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>15</td><td>15</td><td></td><td></td><td></td><td>9</td><td>9</td><td></td><td></td><td></td><td>h</td></tr>
<tr><td>2.</td><td>Other (consultation, exam)</td><td>2</td><td>2</td><td></td><td></td><td></td><td>2</td><td>2</td><td></td><td></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">34</td><td colspan="5">22</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">1,4</td><td colspan="5">0,9</td><td>ECTS</td></tr>
<tr><td>5.</td><td>Number of hours of a student's unassisted work</td><td colspan="5">16</td><td colspan="5">28</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">0,6</td><td colspan="5">1,1</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">50</td><td colspan="5">50</td><td>h</td></tr>
<tr><td>10.</td><td>Punkty ECTS za moduł
1 ECTS=25 hours</td><td colspan="10">2</td><td>ECTS</td></tr>
</table>

LITERATURE

1. Hendzel Z., Żylski W. (2016), *General mechanics. Statics,* Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów
2. Beer F., Johnston Jr., Eisenberg E., Mazurek D. (2009), *Vector mechanics for engineers: statics,* Mc Graw-Hill Science
3. Meriam J. L., Kraige G., Bolton J. N. (2019), *Engineering Mechanics: Statics SI Version*, John Wiley and Sons (JL)