MODULE SPECIFICATION

Module code	
Module title in Polish	**Wytrzymałość Materiałów 2**
Module title in English	**Materials Strength 2**
Module running from the academic year	**2016/2017**

A. MODULE IN THE CONTEXT OF THE PROGRAMME OF STUDY

Field of study	**Civil Engineering**
Level of qualification	**First cycle** *(first cycle, second cycle)*
Studies profile	**Academic** (*academic/practical)*
Mode of study	**Full-time** *(full-time / part-time)*
Specialism	
Organisational unit responsible for module delivery	**The Department of Strength of Materials, Concrete Structures and Bridges**
Module co-ordinator	**Grzegorz Świt, PhD, Dsc Eng., Professor of the University**
Approved by	**Marek Iwański, Professor**

B. MODULE OVERVIEW

Module type	**Core module** (*core/programme-specific/elective HES*)*
Module status	**Compulsory module** *(compulsory / non-compulsory)*
Language of module delivery	**English**
Semester in the programme of study in which the module is taught	**Semester 4**
Semester in the academic year in which the module is taught	**Summer semester** *(winter / summer)*
Pre-requisites	**None** (*module code/module title, where appropriate)*
Examination required	**Yes** *(yes / no)*
ECTS credits	**5**

Mode of instruction	**lectures**	**classes**	**laboratories**	**project**	**others**
Total hours per semester	**15**	**15**	**15**	**15**	

* elective HES − elective modules in the Humanities and Economic and Social Sciences

C. LEARNING OUTCOMES AND ASSESSMENT METHODS

Module aims	The aim of the module is to familiarise students with the ability of analysing complex strength cases as regards elastic and non-elastic work in beam systems with diagonal section (also circular and thin-walled systems with closed sections); the analysis of simple and complex stability of rod elements.

Module outcome code	Module learning outcomes	Mode of instruction *(l/c/lab/p/ others)*	Corresponding programme outcome code	Corresponding discipline-specific outcome code
W_01	A student is knowledgeable about physics and mathematics concerning potential energy of elastic systems.	l/c/p	B_W01	T1A_W01 T1A_W02
W_02	A student is knowledgeable about the principles of modelling material strength in complex stress states.	l/c/l/p	B_W06	T1A_W02 T1A_W03 T1A_W06
W_03	A student knows the fundamentals of analysing rod structures in terms of stability.	l/c/l/p	B_W07	T1A_W03 T1A_W04 T1A_W07
U_01	A student can conduct a static and strength analysis of rod structures in a rod load state.	l/c/p	B_U09	T1A_U03 T1A_U05 T1A_U07 T1A_U09 T1A_U13 T1A_U14
U_02	A student can make stability analysis of single and complex rod structures.	l/c/p	B_U10	T1A_U05 T1A_U09 T1A_U13
U_03	A student can obtain information from the appropriately selected sources. In addition, a student is capable of self-education. Moreover, a student can prepare a documented study as well as an oral presentation concerning the issues of material strength.	l/l/p	B_U29	T1A_U01 T1A_U03 T1A_U04 T1A_U05 T1A_U06 T1A_U07 T1A_U10
K_01	A student can work individually.	l/c/p	B_K01	T1A_K03
K_02	A student formulates conclusions and design the results of his/her own works.	l/c/p	B_K04	T1A_K01 T1A_K07

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1.	Energy theorems for elastic bodies.	W_01 W_02 K_01
2.	Strength hypotheses: material effort; effort hypotheses.	W_01 W_02 U_01 U_03 K_01
3.	Strength hypotheses: empirical fundamentals of the effort theory; geometrical interpretation of effort.	W_01 W_02 U_01 U_03

		K_01
4.	The analysis of strength concerning beam elements in a complex load state.	W_01 W_02 U_01 U_03 K_01
5.	The stability of rod beams: energy methods of determining critical force	W_01 W_03 U_03 K_01
6.	The stability of simple rods: dimensioning pressed rods (drawing buckling into consideration); an elastic and elastic-plastic range.	W_01 W_03 U_03 K_01
7.	Boundary load bearing capability in rod systems.	W_01 W_03 U_02 K_01

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1.	Assessing the effort of a rod subject to operation of a complex load (a circular and rectangular section).	W_02 U_01 U_03 K_01
2.	Assessing the effort of a rod subject to operation of a complex load (a thin-walled open and closed section).	W_02 U_01 U_03 K_01
3.	Selecting safe force for a slender pole operating in the elastic and elastic-plastic mode.	W_01 W_03 U_02 U_03 K_01
4.	Dimensioning pressed rods (taking buckling into consideration); simple and complex poles.	W_01 W_03 U_02 U_03 K_01
5.	Determining critical force with the energy method for a rod with step variable rigidity.	W_01 W_03 U_02 U_03 K_01
6.	Determining critical force with the energy method for a rod with variable section.	W_01 W_03 U_02 U_03 K_01
7.	Calculating simple cases of beams simultaneously bent and pressed materials.	W_01 W_03 U_02 U_03 K_01

3. Topics to be covered in the laboratories

No.	Topics	Module outcome code
1.	Assessing the effort of a rod subject to operation of a complex load (a circular and rectangular section).	W_02 U_01 U_03 K_01
2.	Assessing the effort of a rod subject to operation of a complex load (a thin-walled open and closed section).	W_02 U_01 U_03 K_01
3.	Selecting safe force for a slender pole operating in the elastic and elastic-plastic mode.	W_01 W_03 U_02 U_03 K_01
4.	Dimensioning pressed rods (taking buckling into consideration); simple and complex poles.	W_01 W_03 U_02 U_03 K_01
5.	Determining critical force with the energy method for a rod with step variable rigidity.	W_01 W_03 U_02 U_03 K_01
6.	Determining critical force with the energy method for a rod with variable section.	W_01 W_03 U_02 U_03 K_01
7.	Calculating simple cases of beams simultaneously bent and pressed materials.	W_01 W_03 U_02 U_03 K_01

4. Topics to be covered in the projects

Project number	Topics	Module outcome code
1.	Design the section of a beam in two mutually perpendicular planes. Preparing the solid of stresses in a dangerous beam section.	W_02 U_01 U_03 K_01
2.	Determining the core for a given section: a section with a single symmetry axis; a non-symmetrical section.	W_01 W_02 U_01 U_03 K_01
3.	Assessing the effort of a rod subject to the operation of complex load.	W_02 U_01 U_03 K_01
4.		W_01

	Selecting safe force for a given rod system.	W_03 U_02 U_03 K_01

Assessment methods

Module outcome code	Assessment methods *(Method of assessment; for module skills − reference to specific project, laboratory and similar tasks)*
W_01	An examination and a project
W_02	An examination and a project
W_03	An examination and a project
U_01	An examination and a project
U_02	An examination, a project, and a report
U_03	An examination, a project, and a report
K_01	A project, a report, and a multimedia presentation
K_02	An examination, a project, and a multimedia presentation

C. STUDENT LEARNING ACTIVITIES

ECTS summary		
	Type of learning activity	**Study time/ credits**
1	Contact hours: participation in lectures	**15**
2	Contact hours: participation in classes	**15**
3	Contact hours: participation in laboratories	**15**
4	Contact hours: attendance at office hours (2-3 appointments per semester)	**2**
5	Contact hours: participation in project-based classes	**15**
6	Contact hours: meetings with a project module leader	**10**
7	Contact hours: attendance at an examination	**3**
8		
9	**Number of contact hours**	**75** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**3**
11	Private study hours: background reading for lectures	**10**
12	Private study hours: preparation for classes	**3**
13	Private study hours: preparation for tests	**10**
14	Private study hours: preparation for laboratories	**10**
15	Private study hours: writing reports	**3**
16	Private study hours: preparation for a final test in laboratories	**4**
17	Private study hours: preparation of a project/a design specification	**5**
18	Private study hours: preparation for an examination	**5**
19		
20	**Number of private study hours**	**50** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**2**
22	**Total study time**	**125**

23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**5**
24	**Number of practice-based hours** *Total practice-based hours*	**61**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**2.4**