MODULE SPECIFICATION

Module code	
Module title in Polish	**Wytrzymałość Materiałów 1**
Module title in English	**Materials Strength 1**
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 and Concrete Structures
Module co-ordinator	Prof. **Wiesław Trąmpczyński, PhD hab., Eng.**
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 3**
Semester in the academic year in which the module is taught	**Winter semester** *(winter / summer)*
Pre-requisites	**None** (*module code/module title, where appropriate)*
Examination required	**No** *(yes / no)*
ECTS credits	**4**

Mode of instruction	**lectures**	**classes**	**laboratories**	**project**	**others**
Total hours per semester	**15**	**30**		**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 abilities of utilising equilibrium equations to determine interactions; other aims include: the ability of determining internal forces in basic plane statically determinate rod structures; determining geometrical characteristics of sections; analysing stresses and deformations; designing the sections 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 knows the fundamentals of preparing diagrams as well as static analysis of rod structures.	l/c/p	B_W07	T1A_W03; T1A_W04; T1A_W07
W_02	A student has fundamental knowledge on materials strength.	l/c	B_W06	T1A_W02; T1A_W03; T1A_W06
W_03	A student has basic knowledge as regards calculating simple rod elements.	l/c/p	B_W06	T1A_W02; T1A_W03; T1A_W06
U_01	A student can build equilibrium equations for simple statically determinate rod structures.	l/c/p	B_U08	T1A_U07; T1A_U08; T1A_U09; T1A_U15
U_02	A student can determine cross forces in statically determinate rod structures.	l/c/p	B_U08 B_U09	T1A_U03; T1A_U05; T1A_U07; T1A_U08; T1A_U09; T1A_U13; T1A_U14; T1A_U15
U_03	A student can determine a stress state in simple structures subject to loads in a plane.	l/c	B_U09 B_U13	T1A_U03; T1A_U05; T1A_U07; T1A_U09; T1A_U11; T1A_U13; T1A_U14; T1A_U15; T1A_U16
U_04	A student is able to determine normal and tangent stresses in rods with the selected sections.	l/c/p	B_U09	T1A_U03; T1A_U05; T1A_U07; T1A_U09; T1A_U13; T1A_U14
U_05	A student can design simple stretched, pressed, bent, and torsioned rods	l/c/p	B_U09 B_U13	T1A_U03; T1A_U05; T1A_U07; T1A_U09; T1A_U11; T1A_U13; T1A_U14; T1A_U15; T1A_U16

U_06	A student can determine the indicated linear and angular displacements in a simple bent beam.	l/c/p	B_U09	T1A_U03; T1A_U05; T1A_U07; T1A_U09; T1A_U13; T1A_U14
K_01	A student can work individually.	c/p	B_K01	T1A_K01; T1A_K03; T1A_K04
K_02	A student is responsible for the reliability of the obtained results.	c/p	B_K02	T1A_K02; T1A_K05; T1A_K07
K_03	A student formulates conclusions and described the results of his/her own work.	p	B_K04	T1A_K01; T1A_K07

Module content:

1. Topics to be covered in the lectures

No.	Topics	Module outcome code
1-2	Geometrical section characteristics (a static and inertia moment, main axes, main inertia moment), transformation formulas.	W_01 U_04
3-4	The types of structure bonds; calculating reactions for various type of simple loads. Determining section forces and their distribution.	W_01 U_02
5	The concept of stress and deformation. Main stresses. The states of stresses and deformations.	W_02 W_03 U_03
6-7	Experimental fundamentals of material strength. An attempt of single-axial stretching. The relationship between stresses and deformations. Hooke's law for single-axial and complex stress state.	W_02 U_03 U_04
8-9	The analysis of a plane stress state; determining the stress state with the use of a Mohr' circle.	W_02 W_03 U_03
10	Normal stresses in stretched (pressed) rods. Normal and tangent stresses for simple bending of beams. Designing beams resistant to torsion.	W_02 W_03 U_04
11	Beam deformations for simple bending. Differential equations of a deformed beam axis (a simplified method of integrating a differential equation).	W_02 U_06
12	Diagonal bending calculating stresses and displacements in diagonally bent beams.	W_02 W_03 U_05
13-14	Tangent stresses for rods subject to torsion with circular section. Pure torsion (determining stresses for rods with a circular, rectangular, and thin-walled section).	W_02 U_05
15	Calculating eccentrically pressed rods. Determining section core.	W_02 W_03 U_04 U_05

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1-4	Determining geometrical section characteristics.	W_01 U_04 K_01 K_02
5-6	Determining section forces in beams and frames.	W_01 U_02

		K_01 K_02
7-8	Designing stretched rods (drawing attention to deadweight). Calculating displacements in stretched (pressed) rods. The analysis of statically indeterminate cases.	W_02 W_03 U_04 K_01 K_02
9-11	Calculating stresses in a plane stress state with the use of a Mohr's circle.	W_02 U_03 K_01 K_02
12-14	Preparing the diagram of normal and tangent stresses in the assigned section of a bent beam.	W_02 W_03 U_04
15-17	Designing the section of a bent beam from the safety condition. Designing bent beam section made from the material with diverse resistance to stretching and pressing. Selecting the most favourable load.	W_02 W_03 U_04 U_05 K_01 K_02
18-19	Calculating displacements in the bent beams with the method of secondary loads.	W_02 W_03 U_06 K_01 K_02
20-23	Providing calculations for rods with the selected sections which are bent diagonally: designing the section, determining the position of an inert axis, finding maxim stress values, preparing the solid of stresses in the most dangerous rod section.	W_02 W_03 U_05 K_01 K_02
24-25	Providing calculations for rods freely torsioned with the circular, non-circular, thin-walled open and closed section.	W_02 W_03 U_05 K_01 K_02
26-28	Providing calculations for eccentrically pressed short and thick rods.	W_02 W_03 U_04 U_05
29-30	Determining the core of the assigned section.	W_02 W_03 U_04 U_05 K_01 K_02

3. Topics to be covered in the laboratories
4. Topics to be covered in the projects

Project number	**Topics**	**Module outcome code**
1	Determining geometrical characteristics for: any plane figure; a section set from cylindrical profiles.	W_01 K_01 K_02
2		W_01

	Calculating bent beams: designing a section; preparing the distribution diagrams of normal and tangent stresses in any beam section; analytical and graphical determining the values of main stresses and the directions of these stresses in the given points of any beam section.	W_02 W_03 U_01 U_02 U_03 U_04 U_05 K_01 K_02
3	Calculating the assigned linear and angular displacements in a bent beam with constant rigidness with the Clebsch method.	W_01 W_02 W_03 U_06 K_01 K_02

Assessment methods

Module outcome code	Assessment methods *(Method of assessment; for module skills − reference to specific project, laboratory and similar tasks)*
W_01	Obtaining a credit, a test, and a project
W_02	Obtaining a credit, a test, and a project
W_03	Obtaining a credit, a test, and a project
U_01	Obtaining a credit, a test, and a project
U_02	Obtaining a credit, a test, and a project
U_03	Obtaining a credit, a test, and a project
U_04	Obtaining a credit, a test, and a project
U_05	Obtaining a credit, a test, and a project
U_06	Obtaining a credit, a test, and a project
K_01	Obtaining a credit, a test, and a project
K_02	Obtaining a credit, a test, and a project
K_03	Obtaining a credit, a test, and a project

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	**30**
3	Contact hours: participation in laboratories	
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	**5**
7	Contact hours: attendance at an examination	**2**
8		
9	**Number of contact hours**	**69** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2.8**

11	Private study hours: background reading for lectures	**6**
12	Private study hours: preparation for classes	**5**
13	Private study hours: preparation for tests	**5**
14	Private study hours: preparation for laboratories	
15	Private study hours: writing reports	
16	Private study hours: preparation for a final test in laboratories	
17	Private study hours: preparation of a project/a design specification	**10**
18	Private study hours: preparation for an examination	**5**
19		
20	**Number of private study hours**	**31** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**1.2**
22	**Total study time**	**100**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**4**
24	**Number of practice-based hours** *Total practice-based hours*	**32**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**1.3**