MODULE SPECIFICATION

Module code	
Module title in Polish	**Konstrukcje metalowe 1**
Module title in English	**Metal Structures 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 Mechanics, Metal Structures and Computer Methods**
Module co-ordinator	**Monika Siedlecka, MSc, 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 5**
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	**30**	**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 acquire the abilities of dimensioning flat frame systems (on the basis of a portal frame) made from rolled I-beam sections (classes 1 and 2 as well as welded – class 3) in terms of dimensioning elements and joints.

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 determining a critical moment of a lateral-torsional buckling (LTB) concerning an arbitrarily cross-loaded with fork supported at ends.	l/c/p	B_W08 B_W09	T1A_W03 T1A_W07 T1A_W08
W_02	A student has knowledge as regards simplified methods of determining the critical load bearing capability of a column in a regular flat frame.	l/c/p	B_W06 B_W07 B_W08 B_W09	T1A_W02 T1A_W03 T1A_W04 T1A_W06 T1A_W07 T1A_W08
U_01	A student can design the columns in flat frames made with rolled I-beam sections (class 1 and 2 as well as welded – class 3).	l/c/p	B_U02 B_U03 B_U09 B_U14	T1A_U03 T1A_U04 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U11 T1A_U13 T1A_U14 T1A_U16
U_02	A student can design the fillet welds and front welds.	l/c	B_U14	T1A_U03 T1A_U04 T1A_U05 T1A_U14 T1A_U16
U_03	A student can design of articulated lap joints loaded with transverse force (front plate, side plate and a set of angle bars).	l/c/p	B_U09 B_U14	T1A_U03 T1A_U04 T1A_U05 T1A_U07 T1A_U09 T1A_U13 T1A_U14 T1A_U16
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 describes 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	Examples of steel structures. Comparing a loads on the basis of a flat portal frame and a multi storey frame. The combination of loads. Computer programs for static calculations and dimensioning steel structures.	U_01
2	Geometrical and strength characteristics of basic types of rolled I-beam section. Section class. The dependence of load bearing capacity of a I-beam section from the section class, for case of axial compressing as well as unidirectional bending.	U_01
3	Load bearing capacity of I-beam section during shear. The impact of shearing	U_01

	on load-bearing capacity while bending. Dimensioning tensile element axially.	
4	The coefficient of general instability in axial compression (the coefficient of buckling). Dimensioning element in axial compression (drawing attention to the coefficient of general instability).	W_02 U_01
5	The critical moment of lateral-torsional buckling of beam with fork supported at ends. Determining general stability reduction factor during unidirectional bending (the lateral-torsional buckling coefficient), according to the general method and the method for the I-beam section as well as their welded equivalents. Dimensioning of an element with a unidirectional bending (drawing attention to the stability reduction factor).	W_01 U_01
6	Checking the load-bearing capacity of a web under concentrated force. Designing cross ribs. Design of column base plate.	U_01
7	Design of fillet and butt welds.	U_02
8	Articulated lap joints loaded with the transverse force (front and side plate).	U_03
9	Articulated lap joints loaded with the transverse force (a set of angle bars). Checking the load bearing capacity in the event of operation as regards the axial force.	U_03
10	Comparison of internal forces obtained from the analysis of linear and nonlinear geometrically on the example of the flat portal frame and multi-storey. Deadweight critical framework flat. The factor buckling column length in frames with rigid or susceptible nodes.	W_02 U_01
11	Load bearing capacity of I-beam section in the case of mutual operation of axial force and bending moment. The impact of shearing on the load bearing capacity of a section during bending and compressing with bending. Design of columns in the flat frames (2D) during compressing with bending (drawing attention to the stability reduction factor according to Method 2 for class 1 and 2 sections).	U_01
12	Design of columns in the plane (2D) of the frames during compressing with bending (drawing attention to the stability reduction factor according to Method 1 for class 1 and 2 sections).	U_01
13	Lap joints carrying the bending moment (an assembly column contact). Butt compressed joints.	U_03
14	Discussing computer programs to calculate load bearing capacity and the rigidity of butt compressed joints.	U_03
15	Design of columns in the plane (2D) of the frames during compressing with bending (drawing attention to the coefficient of general instability according to Method 1 and 2 for class 3 sections).	U_01

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1-2	The dependence of load bearing capacity of I-beam section from class section, in the case of axial compressing as well as unidirectional bending.	U_01 K_01 K_02
3-4	Section class with simultaneous compressing and unidirectional bending. Load bearing capacity of I-beam section during shear. The impact of shearing on load bearing capacity during bending as well as during compressing with bending.	U_01 K_01 K_02
5-8	Design of axially-compressed elements (drawing attention to the coefficient of buckling). Design of unidirectionally bending elements (drawing attentions to the coefficient of lateral-torsional buckling).	W_01 W_02 U_01 K_01 K_02
9-11	Articulated lap joints loaded with the transverse force (front plate, side plate and a set of angle bars).	U_03 K_01 K_02
12-15	Design of columns in the plane (2D) of frames (drawing attention to the stability reduction factor according to Method 1 for class 1,2, and 3 sections).	W_01 W_02 U_01

		K_01 K_02

3. Topics to be covered in the projects

Project number	Topics	Module outcome code
1	Design of axially-compressed elements (drawing attention to the coefficient of buckling). Design of unidirectionally bending elements (drawing attentions to the coefficient of lateral-torsional buckling).	W_01 W_02 U_01 K_01 K_02
2	Articulated lap joints loaded with the transverse force (front plate, side plate). Design of fillet and butt welds. Checking the load bearing capacity of a web under the concentrated force. Design of the base of the column.	U_01 U_02 U_03 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	A test and a project
W_02	A test and a project
U_01	A test and a project
U_02	A test
U_03	A test and a project
K_01	A test and a project
K_02	A test and a project
K_03	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)	**1**
5	Contact hours: participation in project-based classes	**15**
6	Contact hours: meetings with a project module leader	**2**
7	Contact hours: attendance at an examination	
8		
9	**Number of contact hours**	**65** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**2.6**
11	Private study hours: background reading for lectures	**5**
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	**15**
17	Private study hours: preparation of a project/a design specification	**5**
18	Private study hours: preparation for an examination	
19		
20	**Number of private study hours**	**35** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**1.4**
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*	**33**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**1.3**