MODULE SPECIFICATION

Module code	
Module title in Polish	**Mechanika budowli 2**
Module title in English	**Structural Mechanics 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 Mechanics, Metal Structures and Computer Methods**
Module co-ordinator	**Agnieszka Dudzik, PhD, 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	**Yes** *(yes / no)*
ECTS credits	**5**

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 acquire skills which concern calculating internal forces in statically indeterminable rod structures with the displacement method; another aim is to acquire skills of stability analysis and dynamic analysis of rod structures.

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 familiar with the methods an principles of static analysis, stability analysis and dynamic analysis of rod structures.	l/c/p	B_W07	T1A_W03 T1A_W04 T1A_W07
U_01	A student can determine internal forces in statically indeterminable rods structures with the displacement method.	l/c/p	B_U09	T1A_U03 T1A_U05 T1A_U07 T1A_U09 T1A_U13 T1A_U14
U_02	A student is able to determine critical values of the load parameter and draw equilibrium paths.	l/c/p	B_U10	T1A_U05 T1A_U09 T1A_U13
U_03	A student can determine the frequency of natural vibration of structure with discrete mass distribution.	l/c/p	B_U11	T1A_U05 T1A_U08 T1A_U09 T1A_U13
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
1-2	The assumption of building mechanics. Comparing the method of forces and displacements. Differential comparison of a rod loaded with constant axial force. The theory of the first and second order. Transformational formulas of the theory of first and second order for a basic rod element.	W_01
3	The concept of system stability. Critical load for single rods. The application of the displacement method to calculate critical values of the load parameter concerning a frame system.	W_01 U_02
4	Equilibrium path. Symmetrical and asymmetrical form of losing stability.	W_01 U_02
5	Basic concepts of building dynamics. The number of dynamic degrees of freedom. Systems with a single degree of freedom (a mechanical oscillator). The equation of a free motion for discrete systems. The frequency of natural vibrations of structure.	W_01 U_03
6	Determining the frequency of natural vibrations concerning beams with discrete mass distribution. Induced vibrations. Harmonic resonance.	W_01 U_03
7	Differential equation of dynamic equilibrium concerning a rod. The equation of amplitudes concerning rod harmonic vibrations. Determining the frequency of natural vibrations of rod. Determining the relationship between the frequency of natural vibrations and the compressive force in orthogonal frames with continuous mass distribution.	W_01 U_03

2. Topics to be covered in the classes

No.	Topics	Module outcome code
1-5	The method of displacements in its application to the statics of flat frames. Determining the degree of geometrical indeterminacy. The equilibrium equations of node and a storey. Rigidity matrix of a rigid frame system. Output forces. The system of canonical equations. Samples of frames with orthogonal rod mesh (determining the distributions of internal forces from static loads).	W_01 U_01 K_01 K_02
6-10	The application of the displacement method to calculate critical values of the loading parameter concerning a rigid frame system. Equilibrium path. Symmetrical and asymmetrical form of losing stability.	W_01 U_02 K_01 K_02
10-15	Determining rigidity matrix, yielding matrix as well as the frequency of natural vibrations of beams with concentrated masses. Determining the relationship between the frequency of vibration and the compressive force in orthogonal frames with continuous mass distribution.	W_01 U_03 K_01 K_02

3. Topics to be covered in the projects

Project number	Topics	Module outcome code
1	The application of the displacement method to determine internal forces in orthogonal frames.	W_01 U_01 K_01 K_02 K_03
2	The application of the displacement method to calculate critical values of the loading parameter in a frame system. Determining equilibrium frame.	W_01 U_02 K_01 K_02 K_03
3	Determining the frequency of natural vibrations for discrete systems (beams).	W_01 U_03 K_01 K_02 K_03

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, a test, and a project
U_01	An examination, a test, and a project
U_02	An examination, a test, and a project
U_03	An examination, a test, and a project
K_01	An examination, a test, and a project
K_02	An examination, a test, and a project
K_03	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	**2**
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	**15**
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	**25**
18	Private study hours: preparation for an examination	**10**
19		
20	**Number of private study hours**	**60** *(total))*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**2.4**
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*	**43**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**1.7**