MODULE SPECIFICATION

Module code	
Module title in Polish	**Podstawy dynamiki i stateczności**
Module title in English	**Fundamentals of Dynamics and Stability**
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	**Building Structures**
Organisational unit responsible for module delivery	**The Department of Mechanics, Metal Structures and Computer Methods**
Module co-ordinator	**Urszula Radoń, 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 6**
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	**No** *(yes / no)*
ECTS credits	**2**

Mode of instruction	**lectures**	**classes**	**laboratories**	**project**	**others**
Total hours per semester	**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 to assess the stability and an influence of axial compression forces on the distribution of internal forces under given loads and to assess free vibrations of rod systems.

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 basic exact and approximate methods of stability and dynamic analysis of rod structures.	l/p	B_W07	T1A_W03 T1A_W04 T1A_W07
U_01	A student can determine safe stability regions.	l/p	B_U10 B_U12	T1A_U01 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U13 T1A_U14 T1A_U15
U_02	A student can determine internal forces taking into account the second-order influences.	l/p	B_U09 B_U10 B_U12	T1A_U01 T1A_U03 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U13 T1A_U14 T1A_U15
U_03	A student can determine the eigenfrequencies of free vibrations with continuous mass distribution.	l/p	B_U11 B_U12	T1A_U01 T1A_U05 T1A_U07 T1A_U08 T1A_U09 T1A_U14 T1A_U13 T1A_U15
K_01	A student can work individually.	p	B_K01	T1A_K01 T1A_K03 T1A_K04
K_02	A student is responsible for the reliability of the obtained results.	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
1-3	The concept of the Finite Element Method (FEM). Describing a rod frame element taking into account axial force. Determining the matrix of linear and geometrical stiffness - the shape functions, geometrical relationships, physical relationships, elastic energy. The relationship between exact and approximate approach – expressing the stiffness matrix in second-order theory as a power series.	W_01

4-5	Kinetic energy - determining the inertia matrix. The equation of equilibrium of transverse harmonic vibration taking into account axial force - determining transformational formulas of the Displacement Method. The relationship between exact and approximate approach - expressing the exact stiffness matrix as a power series.	W_01 U_03
6-7	Energy criterion for the determination of the stability - determining the critical loads and sketching equilibrium paths.	W_01

2. Topics to be covered in the classes
3. Topics to be covered in the projects

Project number	Topics	Module outcome code
1	Determining critical values of the load parameter for frame system using the exact and approximate approach. Determining the safe stability regions.	W_01 U_01 K_01 K_02 K_03
2	Determining the second-order influences on internal forces.	W_01 U_02 K_01 K_02 K_03
3	Determining the eigenfrequency of free vibrations for continuous system using exact and approximate approach. Determining the impact of axial forces on the frequency of vibrations.	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	A test and a project
U_01	A test and a project
U_02	A test and a project
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	
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	**30**

6	Contact hours: meetings with a project module leader	**3**
7	Contact hours: attendance at an examination	
8		
9	**Number of contact hours**	**49** *(total)*
10	**Number of ECTS credits for contact hours** *(1 ECTS credit =25-30 hours of study time)*	**1.6**
11	Private study hours: background reading for lectures	
12	Private study hours: preparation for classes	
13	Private study hours: preparation for tests	**2**
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	
19		
20	**Number of private study hours**	**12** *(total)*
21	**Number of ECTS credits for private study hours** *(1 ECTS credit =25-30 hours of study time)*	**0.4**
22	**Total study time**	**60**
23	**Total ECTS credits for the module** *(1 ECTS credit =25-30 hours of study time)*	**2**
24	**Number of practice-based hours** *Total practice-based hours*	**44**
25	**Number of ECTS credits for practice-based hours** *(1 ECTS credit =25-30 hours of study time)*	**1.5**