STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Dynamics of Bridges		**1010102131010120363**
Field of study: **Civil Engineering Second-cycle Studies**	Profile of study (general academic, practical): **general academic**	Year /Semester: **2 / 3**
Elective path/specialty: **Bridges and Underground Engineering**	Subject offered in: **Polish**	Course (compulsory, elective): **obligatory**
Cycle of study: **Second-cycle studies**	Form of study (full-time,part-time): **full-time**	
No. of hours: Lecture: **1** Classes: **1** Laboratory: **-** Project/seminars: **-**		No. of credits: **3**
Status of the course in the study program (Basic, major, other): **major**	(university-wide, from another field): **from field**	
Education areas and fields of science and art		ECTS distribution (number and %)

Responsible for subject / lecturer:

dr inż. Krzysztof Ziopaja
email: krzysztof.ziopaja@put.poznan.pl
tel. 61 647 58 37
Faculty of Civil and Environmental Engineering
ul. Piotrowo 5 60-965 Poznań

Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	The student knows the basics of building dynamics presented in the context of the subject Dynamics Bridges. (Year/Semester: 1/2)
2	**Skills**	The student can individually access to the technical knowledge from any source; has a predisposition to continuing self-education.
3	**Social competencies**	The student understands the essence of the profession of civil engineer, also in terms of social and legal responsibility.

Assumptions and objectives of the course:

Getting to know the types of dynamic load, the load-structure interaction, modeling impacts of high-speed railway rolling stock, pedestrians and wind. Acquiring the ability to carry out dynamic analysis of simple bridge structures.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. The student knows the types of interactions of dynamic live loads of bridges, their characteristics and methods of modeling. - [K_W01]
2. The student knows the basics of modal analysis of the structure. - [K_W02, K_W03, K_W04]
3. The student knows the rules and equipment for the dynamic testing of bridges and knows the ways of reducing (damping) vibration of simple construction. - [K_W03]

Skills:

1. The student is able to apply models of variable loads (specified by standards and literature) to the dynamic analysis of bar structures. - [K_U01, K_U02]
2. Student is able to perform dynamic analysis of a simple bar structures 2 and 3-D in order to determine the basic modal parameters. - [K_U04, K_U06, K_U07]
3. Student is able to redesign the structure in order to reduce excessive vibration. - [K_U03]

Social competencies:

1. The student can own or as part a team to work effectively in carrying out simple modal analysis of engineering structures. - [K_K01]
2. The student is aware of the need for constant self-education in order to improve their skills and increase knowledge related to technological progress in the field of bridge and building construction. - [K_K03, K_K06]
3. Student is able to critically evaluate the results of the analyzes and calculations design and dimensioning of bridges (for projects under tutorials). - [K_K02]

Assessment methods of study outcomes

1. Project execution entitled 'Dynamic analysis of the construction of a footbridge' (Class auditorium) - submission before the end of the semester
2. Written test at the end of a series of lectures in the second half of semester (Lecture)

Course description

1.Influence of wind on the design of a bridge structure
2.The impact of road and rail rolling stock
3.Pedestrian impact
4.Identification of the dynamic parameters of a bridge structure
5.Modal analysis as a tool to identify structures
6.Interpretation of experimental results and load test
7.Equipment for testing and measurements

Basic bibliography:

1. A. Flaga, Inżynieria wiatrowa. Podstawy i zastosowania, Arkady, Warszawa, 2008
2. A. Flaga, Mosty dla pieszych, WKŁ, Warszawa, 2011
3. M. Klasztorny, Dynamika mostów belkowych obciążonych pociągami szybkobieżnymi, Wydawnictwo Naukowo-Techniczne, Warszawa, 2005
4. Stahlbau Kalender 2008, praca zbiorowa, Ernst & Sohn, Berlin, 2008
5. J. Biliszczuk, Mosty podwieszone, projektowanie i realizacja, Arkady, Warszawa, 2005
6. J. Biliszczuk (praca zbiorowa), Projektowanie stalowych kładek dla pieszych, Dolnośląskie Wydawnictwo Edukacyjne, Wrocław, 2007

Additional bibliography:

1. R. Ciesielski, E. Maciąg, Drgania drogowe i ich wpływ na budynki, WKŁ, Warszawa, 1990
2. R. Lewandowski, Dynamika konstrukcji budowlanych, Wydawnictwo Politechniki Poznańskiej, Poznań, 2006
3. T. Chmielewski, Z. Zembaty, Podstawy dynamiki budowli, Arkady, W-wa 1998
4. Kładki dla pieszych: architektura, projektowanie, realizacja, badania, materiały seminaryjne, dWe, Wrocław 2007

Result of average student's workload

Activity	Time (working hours)
1. Participation in lectures	30
2. The reading of selected monographs and technical press - including in English or German.	15
3. Preparing to pass the lectures.	15
4. Preparation and implementation of the exercise.	30

Student's workload

Source of workload	hours	ECTS
Total workload	90	3
Contact hours	30	2
Practical activities	20	1