

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Bridges and Underground Structures		Code 1010101161010120217
Field of study Civil Engineering First-cycle Studies	Profile of study (general academic, practical) (brak)	Year /Semester 3 / 6
Elective path/specialty -	Subject offered in: Polish	Course (compulsory, elective) obligatory
Cycle of study: First-cycle studies	Form of study (full-time, part-time) full-time	
No. of hours Lecture: 30 Classes: 15 Laboratory: - Project/seminars: 15		No. of credits 3
Status of the course in the study program (Basic, major, other) (brak)		(university-wide, from another field) (brak)
Education areas and fields of science and art		ECTS distribution (number and %)
Responsible for subject / lecturer: Iwona Jankowiak email: iwona.jankowiak@put.poznan.pl tel. 61 647 58 28 Faculty of Civil and Environmental Engineering ul. Piotrowo 5, 60-965 Poznań		Responsible for subject / lecturer: Arkadiusz Madaj email: arkadiusz.madaj@put.poznan.pl tel. 61 647 58 30 Faculty of Civil and Environmental Engineering ul. Piotrowo 5, 60-965 Poznań
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Knowledge of the strength of materials, structural mechanics, soil mechanics, concrete structures, steel structures, foundation design and fundamentals of bridge engineering in the field of engineering degree studies
2	Skills	Skills related to the static calculations and design of concrete and steel structures, skills of formation simple bridge structure, self-learning skills
3	Social competencies	Ability to adapt of the type of any civil engineering structure to the communication requirements and social expectations, respect for the Polish language, understand the need for lifelong learning and group collaboration
Assumptions and objectives of the course: Familiarizing of students with the issues of conceptual design, structural analysis and mechanical design of different types of typical bridge structures - concrete structures (RC and prestressed), steel structures (including composites bridges) and tunnels - performed in different technologies.		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. Student knows the specifics of the work and design of different types of bridges - [K_W05, K_W10] 2. Student knows the basis for calculating the main structural elements of bridge structures - [K_W07, K_W09] 3. Student knows the procedure for the static-strength calculations of concrete structures according to the system of the PN-EN code - [K_W06]		
Skills:		
1. Student can perform the basic static-strength calculations of main structural components of any bridge - [K_U02, K_U04] 2. Student can conduct calculations in accordance with the principles set out in the new system of European standards PN-EN - [K_U08]		
Social competencies:		
1. Student can adapt the type of structure to the communication requirements and social expectations - [K_K08] 2. Student can collaborate and work together in a group, is aware of the need for self-education - [K_K01, K_K03] 3. Student complies with the principles of the Polish language and the rules of preparation of technical documentation - [K_K07]		
Assessment methods of study outcomes		

<p>Written test of the student's knowledge in the field of material presented during the lectures Written test of the student's knowledge in the field of material presented during the seminars Preparation of some static-strength calculation of simple road beam bridge (project) and oral test of knowledge of the range of this project</p>		
Course description		
<ol style="list-style-type: none"> 1. General principles for design of different bridge structures 2. Materials used in bridge structures 3. Rules of conceptual and communication design of road, railway and pedestrian bridges 4. Designing and dimensioning of bridge supports (abutments) 5. Main rules of static-strength calculations and dimensioning of bridges according to old (PN) and new standards (Eurocodes). 6. Consideration the impact of the phases of structure work during construction for static calculations and design of bridges 7. Preparation of the static calculation of bridge structures (moving loads, influence lines of the internal forces, envelopes of the internal forces, etc.) 8. Formation of concrete bridge structures (RC and prestressed) with different shapes of cross sections 9. Formation of steel bridge structures - arch bridges, truss bridges, frame bridges, cable-stayed bridges, suspension bridges, encased steel beams bridges etc. 10. Prefabricated elements in bridge engineering 11. Main rules of static-strength calculations and dimensioning of steel-concrete composite bridges according to different phases of structure erection. 12. Rules of conceptual and communication design of tunnel structures (including pedestrian crossings) 13. Influence of terrain conditions on the selection and design of the urban underground pedestrian crossings 		
Basic bibliography:		
<ol style="list-style-type: none"> 1. Arkadiusz Madaj, Witold Wołowicki, Podstawy projektowania budowli mostowych, WKiŁ Warszawa 2003/2007 2. Arkadiusz Madaj, Witold Wołowicki, Projektowanie mostów betonowych, WKiŁ Warszawa 2010 3. Henryk Czudek, Wojciech Radomski Podstawy mostownictwa, PWN Warszawa 1983 4. Arkadiusz Madaj, Witold Wołowicki, Mosty betonowe WKŁ 1980/2002/... 5. Arkadiusz Madaj, Witold Wołowicki, Mosty betonowe. Wymiarowanie i projektowanie, WKiŁ Warszawa 1998/2002/2005/? 6. Andrzej Ryżyński, Witold Wołowicki, Jacek Skarżewski, Janusz Karlikowski, Mosty stalowe, PWN, Warszawa-Poznań 1984 7. Kazimierz Furtak, Maciej Kędracki, Podstawy budowy tuneli, Wydawnictwo Politechniki Krakowskiej, Kraków 2005 		
Additional bibliography:		
<ol style="list-style-type: none"> 1. Kazimierz Furtak, Mosty zespolone, PWN, Warszawa-Kraków 1999 2. Fritz Leonhardt, Podstawy budowy mostów betonowych, WKiŁ, Warszawa 1982 3. Juliusz Szczygieł, Mosty z betonu zbrojonego i sprężonego, WKiŁ, Warszawa 1972 4. Kazimierz Furtak Mosty zespolone, PWN 1999 5. Jan Biliszczuk Mosty podwieszane. Projektowanie i realizacja, Arkady 2005 6. Andrzej Flaga, Mosty dla pieszych, WKiŁ, Warszawa 2011 7. Stefan Gałczyński, Podstawy budownictwa podziemnego, Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2001 		
Result of average student's workload		
Activity	Time (working hours)	
1. Participation in lectures	30	
2. Participation in classes	15	
3. Participation in projects	15	
4. Project realization	15	
5. Studying	15	
Student's workload		
Source of workload	hours	ECTS
Total workload	90	3
Contact hours	60	2
Practical activities	15	1