

STUDY MODULE DESCRIPTION FORM		
Name of the module/subject Modernization of Bridges		Code 1010102131010120225
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: 15 Classes: - Laboratory: - Project/seminars: 30		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 technical sciences Technical sciences		ECTS distribution (number and %) 3 100% 3 100%
Responsible for subject / lecturer: dr inż. Janusz Karlikowski email: janusz.karlikowski@put.poznan.pl tel. 61 647 58 33 Faculty of Civil and Environmental Engineering ul. Piotrowo 5, 60-965 Poznań		
Prerequisites in terms of knowledge, skills and social competencies:		
1	Knowledge	Principles of technical drawing Principles of shaping of steel and concrete bridges Knowledge on static analysis of beams and columns Principles of design of steel and reinforced concrete members
2	Skills	Arranging loads on bridges Creating computational models for structural analysis Ability to take notes during lectures
3	Social competencies	Ability to work single-handedly Respect for the rules of ethics
Assumptions and objectives of the course: --passing the knowledge on design of modernization of bridge supports and spans of concrete and steel bridges		
Study outcomes and reference to the educational results for a field of study		
Knowledge:		
1. 1. Knowledge on causes, aims and types as well as principles of design of bridge modernization - [-KW02,W04,W14,W16] 2. 2. Knowledge on methods of strengthening of steel bridges and concrete supports of bridges - [--KW02,W04,W14,W16] 3. 3. Knowledge on kinds of bridge refurbishment - [--KW02,W04,W14,W16]		
Skills:		
1. 1. Is able to characterize kinds of bridge modernization - [-KU01,U03] 2. 2. Is able to characterize methods of strengthening and refurbishment of steel and concrete bridges - [-KU04,U09] 3. 3. Is able to design of RC bridge modernization - [-KU04,U09]		
Social competencies:		
1. 1. Ability to work single-handedly - [-KK01] 2. 2. Responsibility for honesty of computation results - [-KK02] 3. 3. Awareness of necessity of constant professional education - [-KK03,K06]		

Assessment methods of study outcomes		
--Written test on general causes and methods of bridge modernization and principles of modernization design An exercise concerning design of modernization of RC bridge Written exam		
Course description		
--1. General causes, aims and types of bridge modernization 2. Procedure of design of bridge modernization 3. Bridge condition cataloguing 4. Connection used for bridge modernization 5. Direct and indirect strengthening of steel bridges 6. Direct and indirect strengthening of concrete supports 7. Types of bridge refurbishment		
Basic bibliography:		
1. 1. Rybak M., Przebudowa i wzmacnianie mostów. WKiŁ, Warszawa, 1983 2. 2. Madaj A., Wołowicki W., Budowa i utrzymanie mostów. WKiŁ, Warszawa, 1994		
Additional bibliography:		
1. 1. Bartoszewski J., Wzmacnianie i poszerzanie mostów. WKiŁ, Warszawa, 1962 2. 2. Spal L., Przebudowa konstrukcji stalowych. Arkady, Warszawa, 1973 3. 3. Współczesne metody wzmacniania i przebudowy mostów - referaty corocznego seminarium (od 1993r.) organizowanego przez IIL PP oraz Oddział Wielkopolski ZMRP		
Result of average student's workload		
Activity	Time (working hours)	
Student's workload		
Source of workload	hours	ECTS
Total workload	75	3
Contact hours	50	1
Practical activities	55	2