

## SDAŃSK UNIVERSITY 的 OF TECHNOLOGY

## Subject card

Subject name and code	Bridge structures, PG_00041518							
Field of study	Civil Engineering							
Date of commencement of studies	October 2022		Academic year of realisation of subject		2022/2023			
Education level	second-cycle studies		Subject group			Option	nal subject gr	oup
Mode of study			Mode of de	liverv		at the university		
Year of study	1			of instructio	n	Polish	1	
Semester of study	2		ECTS credits		3.0			
Learning profile			Assessment form		assessment			
Conducting unit	Department of Railwa	ay Engineering	-> Faculty of C	ivil and Enviro	nmental	Engine	eering	
Name and surname	Subject supervisor		-	arcin Abramsk				
of lecturer (lecturers)	Teachers							
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM
of instruction	Number of study hours	30.0	0.0	0.0	15.0		0.0	45
	E-learning hours inclu	uded: 0.0						
Learning activity and number of study hours	Learning activity		rticipation in didactic isses included in study an		Participation in consultation hours		tudy	SUM
	Number of study hours	45	45		5.0 25.0			75
Subject objectives	Basic knowledge on I equipment and maint system.							
Learning outcomes	Course outcome		Subject outcome		Method of verification			
	analysis, design and dimensioning of complex constructions and its elements		After passing the course students should be able to: • define basic terms concerning the bridge structures, • name and determine types of bridges, • recognize structural members of bridge structures and explain system of carrying the loads by them, • name bridge equipment elements and explain their role, • draw sample cross-sections and longitudinal sections of plate, beam, frame, arch, cable-stayed and suspension bridges.			[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation		
	(including reinforced), wood and masonry construtions and its details		After passing the course students should be able to do the following for a single-span reinforced concrete grid bridge structure: • calculate bending moments and shear forces for any given longitudinal girder, • present principles of design, i.e. detailing and dimensioning of the individual structural members, • draw detailed cross-section and longitudinal section of the structure, including bridge equipment.		fulfilment [SU5] Assessment of ability to present the results of task			

LECTURES           1. Proteneous         Products a strip in design process: bill, includes and partial proteines. Branded and unbanded post- tries, strands and cables, Decad-nd and Ive-ond anchorages of strands and cables. Modes of failure for prestressed concrete structures.           2. Bridge supports. Abutment: Bit parts and their role in carrying the loads. Soil lateral pressure on abutments. Approach stats in abutments. Clobal stability of abutments may best. Concrete Soil bridge abutments. Approach stabs in abutments. Clobal stability of abutments in brazers for bridge supports.           3. Closalification of bridges with regret to structure hype of drain ginter: beam bridges, mass bridges, frame bridges, amb bridge, abutments. Brazer of drain ginter: beam bridges, mass bridges, frame bridges, amb bridge, abutments. Brazer of drain ginter: beam bridges, mass bridges, frame bridges, amb bridges, and medium-spen concrete beam bridges cable-stayed bridges, act- adoed bridge bases in Bill or gantally continuous. Bioinforces, path costs sections (including side bridge bases in Billy or gantally continuous. Bioinforces, bases cable stayed bridges, extradoed bridges, stressed rithout holpes.           6. Other types of concrete bridges: frame bridges, and bridges, next adoed bridges, stressed fritobridges. <ul> <li>Contemporary technics of concrete bridge constructor: fully cast on falsework, with prefabricated structural members, incremental launching, balanced-cantilever method.</li> <li>Elements of bridge scuptoment. Expansion joints (types and choice principles), bearings, drainage, britters, tailing, acabit britters.</li> <li>Traffic basis contraines force (framid) modes.</li> <li>Traffic basis contrained force (framid) moment, strataring force), considering six cross-sections situated overy (1/10</li></ul>							
Intersioning, Structure anticy in design process: full, reduced and particip pretensing, Problem of failure for prestnessed concrete structures.           2. Bridge supports, Abutment: its parts and their role in carrying the loads. Soil lateral pressure on abutments. Approach slabs in abutanents. Global stability of abutments and piese. Geosynthesic Reinforced Soil bridges, and bridges with regard to structure type of main griders: beam bridges, trans bridges, cabe stayed bridges, subspension bridges, extended bridges, sub-stages, cabe stayed bridges, subspension bridges, extended bridges, subspension bridges, extended bridges, and bridges upports.           3. Classification of bridges with regard to structure type of main griders: beam bridges, trans bridges, cabe stayed bridges, stratesed bridges, stratesed bridges, and bridges and their particle contracts beam bridges, cabe stayed bridges, stratesed bridges, and bridges and their particle contracts beam bridges, cabe stayed bridges, extradosed bridges, attreased from bridges, and bridges and their particle contracts.           5. Other types of concrete bridges frame bridges, and bridges, bridge inspections. Rehabilitation and strengt and their and design (beam bridges, cabe stayed bridges, extradosed bridges, attreased follows).           6. Contemporary technics of concrete bridge construction: billy cast on falsework, with prefabricated structural members, incremental launching, balanced cantilever method.           7. Exploitation and maintenance of bridges. Bridge damages, bridge inspections. Rehabilitation and strengthering methods.           8. Tendic loads on bridges.           9. Traffic loads on bridges.           9. Traffic loads on bridges.           9. Traffic loads according to Eurocode 1,	Subject contents	LECTURES					
abutments. Approach sites in abutments. Global stability of abutments and piors. Geosynthetic Reinforced: Sol bridge abutments. Rever piers, ice aprons. Source piers. Settion hazards for bridge supports.           3. Classification of bridges with regard to structure type of main girders: beam bridges, trues bridges, arch bridges. Cable-stayed bridges. Suspension bridges, extradosed bridges, suspension bridges, extradosed bridges, suspension bridges, and true true of the structure type of main girders: beam bridges, frame bridges, girdes approximation. Methods of making freely supported bridges piers fully continuous. Bituminous expansion joints.           5. Other types of concrete bridges: frame bridges, cable-stayed bridges, extradosed bridges, astradosed bridge, astradosed bridge, astradosed bridge, astradosed bridges, astradosed bridg		•					
bridges, arch bridges, and bestaged bridges, suspension bridges, extradosed bridges, stressed           4. Short- and medium-span concrete beam bridges. Static schemes. Span cross-sections (including slab bridge spans fully or partially continuous Bituminous expansion parts.           5. Other types of concrete bridges: frame bridges, arch bridges, cable-stayed bridges, extradosed bridges, stressed ribbon bridges.           6. Contemporary technics of concrete bridge construction. fully cast on falsework, with prefabricated structural methods.           7. Exploitation and maintenance of bridges. Bridge damages, bridge inspections. Rehabilitation and strengthening methods.           8. Elements of bridge equipment. Expansion joints (types and choice principles), bearings, drainage, barriers, nallings. ecoustic barriers.           9. Traffic loads on bridges.           10. Stell bridges - construction and design (beam bridges, truss bridges, arch bridges), 11. Stell bridges - construction and design (beam bridges, truss bridges, arch bridges), 11. Stell bridge construction and design (beam bridges, truss bridges, arch bridges), 11. Draff project (drawings), 2. Static calculation: 3. Inflamos line rigid coasa-bridge in static system of grid. 3. Draff project (drawings), 2. Static calculation: 3. Inflamos line rigid coasa-bridge in static system of grid. 3. Design of a signen grider in Utilinate Limit State: 3. Design of a signen grider in Utilinate Limit State: 3. Design of a signen grider in Utilinate Limit State: 3. Design of a signen grider in Utilinate Limit State: 3. Design of a signen grider in Utilinate Limit State: 3. Design of a signen grider for the dealing moment, shearing force) considering six cross-sections situated every U10 in length. 3. Desering of a signen griderine deal do lonivicual grider. 4		abutments. Approach slabs in abutments. Global stability of abutments and piers. Geosynthetic Reinf					
bridges;         Using prefabricated concrete beams in bridge construction. Methods of making freely supported bridge spans fully or partially continuous. Bituminous expansion joints.           5. Other types of concrete bridges; frame bridges, arch bridges, cable-stayed bridges, extradosed bridges, attressed ribbon bridges.           6. Contemporary technics of concrete bridge construction: fully cast on faisework, with prefabricated structural method.           7. Exploitation and maintenance of bridges. Bridge damages, bridge inspections. Rehabilitation and strengthening methods.           8. Elements of bridge equipment. Expansion joints (types and choice principles), bearings, drainage, barriers, railings, acoustic barriers.           9. Traffic loads on bridges.           10. Steeb bridges - construction and design (beam bridges, truss bridges, arch bridges).           11. Bridge testing (load tests, measurement techniques).           12. Fatigue life of bridges.           10. Steeb bridges - construction and design (beam bridge, truss bridges, arch bridges).           11. Bridge testing (load tests, measurement techniques).           12. Fatigue life of bridges.           10. Steeb bridge of loads related to individual grider, or determining of loads according to Eurocode 1, or determining of loads according to Individual grider, d) determining of loads related to individual grider, d) determining of loads related to individual grider, d) adtermining of loads related to individual grider, d) bertoming, b) ad							
stressed ribbon bridges.           6. Contemporary technics of concrete bridge construction: fully cast on falsework, with prefabricated structural members, incremental launching, balanced-cantilever method.           7. Exploitation and maintenance of bridges. Bridge damages, bridge inspections. Rehabilitation and strengthening methods.           8. Elements of bridge equipment. Expansion joints (types and choice principles), bearings, drainage, barriers, railings, acoustic barriers.           9. Traffic bads on bridges.           10. Steel bridges - construction and design (beam bridges, truss bridges, arch bridges).           11. Bridge testing (load tests, measurement techniques).           12. Fraigue life of bridges.           PROJECT           Single-span reinforced concrete road bridge in static system of grid.           1. Deft project (drawings).           2. Static calculation:           a) Influence line (rigid cross-beam method),           b) determining of loads related to individual grider.           12. Harting of a given grider in Ultimate Limit State:           a) bending.           3. Design of a a given grider in Ultimate Limit State:           a) shearing.           4. Drawings.           3. general drawing of bridge           b) structure of main grider           Presentation           Assessment methods           Structural statics: statically determinant structures <td></td> <td colspan="5">bridges). Using prefabricated concrete beams in bridge construction. Methods of making freely supported</td>		bridges). Using prefabricated concrete beams in bridge construction. Methods of making freely supported					
structural members, incremental launching, balanced-cantilever method.           7. Exploitation and maintenance of bridges. Bridge damages, bridge inspections. Rehabilitation and strengthening methods.           8. Elements of bridge equipment. Expansion joints (types and choice principles), bearings, drainage, barriers, railings, acoustic barriers.           9. Traffic loads on bridges.           10. Steel bridges - construction and design (beam bridges, truss bridges, arch bridges).           11. Bridge lesting (load tests, measurement techniques).           12. Faitgue life of bridges.           PROLECT           Single-span refloreed concrete road bridge in static system of grid.           11. Bridge score of bridge score of the road of bridge in static system of grid.           12. Faitgue life of bridges.           PROLECT           Single-span refloreed concrete road bridge in static system of grid.           12. Static production;           2. Faitgue life of bridges.           Product on;           2. Other informing of internal forces (bending moment, shearing force) considering six cross-sections situated every L/10 in length.           3. Desting of a a given girder in Ultimate Limit State:           a) bending.           b) bridge of a a given girder in Ultimate Limit State:           b) bridge of a divers of bridge           b) structure of main girder           Structure I statics: statically determinant structu							
strengthening methods.         8. Elements of bridge equipment. Expansion joints (types and choice principles), bearings, drainage, barriers, railings, acoustic barriers.         9. Traffic loads on bridges.         10. Steel bridges - construction and design (beam bridges, truss bridges, arch bridges).         11. Bridge lesting (load lests, measurement techniques).         12. Fatigue life of bridges.         PROLECT         Single-span reinforced concrete road bridge in static system of grid.         1. Draft project (drawings).         2. Static calculation:         a) dremming of loads according to Eurocode 1,         c) determining of loads according to Eurocode 1,         c) deterding,         d) bearing,         a) general drawing of bridge         b) streature of main grider         Prereequisites							
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10. Steel bridges - construction and design (beam bridges, truss bridges, arch bridges).         11. Bridge testing (load tests, measurement techniques).         12. Fatigue life of bridges.         PROJECT         Single-span reinforced concrete road bridge in static system of grid.         1. Draft project (drawings).         2. Static calculation:         a) influence line (rigid cross-beam method),         b) determining of loads according to Eurocode 1,         c) determining of loads according moment, shearing force) considering six cross-sections situated every L/10 in length.         3. Design of a a given girder in Ultimate Limit State:         a) bending.         b) brading.         a) general drawing of bridge         b) shearing.         a) general drawing of bridge         b) shearing.         cocrete structures: designing reinforced concrete beam members subjected to bending moments and shearing forces         Concrete structures: designi		<ul> <li>barriers, railings, acoustic barriers.</li> <li>9. Traffic loads on bridges.</li> <li>10. Steel bridges - construction and design (beam bridges, truss bridges, arch bridges).</li> <li>11. Bridge testing (load tests, measurement techniques).</li> <li>12. Fatigue life of bridges.</li> <li><b>PROJECT</b></li> <li>Single-span reinforced concrete road bridge in static system of grid.</li> <li>1. Draft project (drawings).</li> <li>2. Static calculation: <ul> <li>a) influence line (rigid cross-beam method),</li> <li>b) determining of loads according to Eurocode 1,</li> <li>c) determining of loads related to individual girder,</li> <li>d) determining of internal forces (bending moment, shearing force) considering six cross-sections situated every L/10 in length.</li> <li>3. Design of a a given girder in Ultimate Limit State: <ul> <li>a) bending,</li> <li>b) shearing.</li> <li>c) Drawings.</li> <li>a) general drawing of bridge</li> </ul> </li> </ul></li></ul>					
c) determining of loads related to individual girder, d) determining of internal forces (bending moment, shearing force) considering six cross-sections situated every L/10 in length.         3. Design of a a given girder in Ultimate Limit State: a) bending, b) shearing.       3) benering.         a) general drawing of bridge b) structure of main girder       4. Drawings.         Prerequisites and co-requisites       Structural statics: statically determinant structures         Assessment methods and criteria       Stubject passing criteria       Passing threshold         Presentation       60.0%       10.0%         Project       60.0%       25.0%         Project       60.0%       40.0%         Recommended reading       Basic literature       Zhao J.J., Tonias D.E.: Bridge Engineering: Design, Rehabilitation, an Maintenance of Modern Highway Bridges. Publisher: McGraw- Hill Education, 3rd ed.: 2012.         Supplementary literature       Calgaro JA., Tschumi M., Gulvanessian H.: Designer's Guide to							
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shearing forces       shearing forces         Assessment methods and criteria       Subject passing criteria       Passing threshold       Percentage of the final grade         Presentation       60.0%       10.0%         Project defence in written form       60.0%       25.0%         Project       60.0%       25.0%         Test on lectures       60.0%       40.0%         Recommended reading       Basic literature       Zhao J.J., Tonias D.E.: Bridge Engineering: Design, Rehabilitation, an Maintenance of Modern Highway Bridges. Publisher: McGraw- Hill Education, 3rd ed.: 2012.         Supplementary literature       Calgaro JA., Tschumi M., Gulvanessian H.: Designer's Guide to							
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and criteria       Presentation       60.0%       10.0%         Project defence in written form       60.0%       25.0%         Project       60.0%       25.0%         Test on lectures       60.0%       40.0%         Recommended reading       Basic literature       Zhao J.J., Tonias D.E.: Bridge Engineering: Design, Rehabilitation, an Maintenance of Modern Highway Bridges. Publisher: McGraw- Hill Education, 3rd ed.: 2012.         Supplementary literature       Calgaro JA., Tschumi M., Gulvanessian H.: Designer's Guide to	Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade			
Project defence in written form       60.0%       25.0%         Project       60.0%       25.0%         Test on lectures       60.0%       40.0%         Recommended reading       Basic literature       Zhao J.J., Tonias D.E.: Bridge Engineering: Design, Rehabilitation, an Maintenance of Modern Highway Bridges. Publisher: McGraw- Hill Education, 3rd ed.: 2012.         Supplementary literature       Calgaro JA., Tschumi M., Gulvanessian H.: Designer's Guide to				ů ů			
Test on lectures         60.0%         40.0%           Recommended reading         Basic literature         Zhao J.J., Tonias D.E.: Bridge Engineering: Design, Rehabilitation, an Maintenance of Modern Highway Bridges. Publisher: McGraw- Hill Education, 3rd ed.: 2012.           Supplementary literature         Calgaro JA., Tschumi M., Gulvanessian H.: Designer's Guide to							
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Maintenance of Modern Highway Bridges. Publisher: McGraw- Hill Education, 3rd ed.: 2012.         Supplementary literature         Calgaro JA., Tschumi M., Gulvanessian H.: Designer's Guide to		Test on lectures	60.0%	40.0%			
Calgaro JA., Tschumi M., Gulvanessian H.: Designer's Guide to	Recommended reading	Maintenance of Modern Highway Bridges. Publisher: McGraw- Hill					
Eurocode 1: Actions on bridges. Thomas Telford Ltd. London, 2010.	Supplementary literature		Calgaro JA., Tschumi M., Gulvanessian H.: Designer's Guide to Eurocode 1: Actions on bridges. Thomas Telford Ltd. London, 2010.				

	eResources addresses	Adresy na platformie eNauczanie: Bridge structures - 2022/2023 - Moodle ID: 24011 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=24011
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	