GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Steel and composite bridge structures, PG_00045875						
Field of study	Civil Engineering						
Date of commencement of studies	February 2025		Academic year of realisation of subject	2025/2026			
Education level	second-cycle studies		Subject group	Optional subject group Subject group related to scientific research in the field of study			
Mode of study	Full-time studies		Mode of delivery	at the university			
Year of study	1		Language of instruction	Polish			
Semester of study	2		ECTS credits	5.0			
Learning profile	general academic profile		Assessment form	exam			
Conducting unit	Department of Railway Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Krzysztof Żółtowski					
	Teachers						

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	0.0	15.0	0.0	60

E-learning hours included: 0.0

Learning activity and number of study hours

Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
Number of study hours	60	10.0	55.0	125

Subject objectives

To get a basic knowledge of design of metal and composite bridge structures. A simplified mechanical models and reality. Basic issues of construction and design.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W15] has deep and adequate knowlege of civil engineering, within offered specialization and profile	Has knowledge of steel and composite bridges, in particular: a) types and properties of structural materials; b) types of structural systems (statics, design, construction); c) analysis and design of structural elements due to standards design and FEM calculations.	[SW1] Assessment of factual knowledge
[K7_W02] knows principles of analysis, design and dimensioning of complex constructions and its elements	Can: a) identify static and constructional problems related to the designed structural system; b) select methods and tools for static analysis and design of a given structural system.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_U02] can design and dimension complex steel, concrete (including reinforced), wood and masonry construtions and its details	Can: a) identify computational problems related to the designed structural system; b) select methods and tools for static analysis and design of a given structural system; c) adopt design solutions in accordance with the constructional principles of steel and composite spans.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject

<table>
<tr><td>Subject contents</td><td>LECTURES

1. Theory and real construction. The actual work of steel bridge elements (nodes, connections, bracing).
2. Complex bridges (steel - concrete). Shear connectors flex, rigid - with applications. Technologies perform concrete slabs. Prestressed Composite. Steel lattice structures with concrete deck. Rheology technical approach.
3. Steel girders - large spans with constant and variable height, sections open, closed one and hollow.
4. Lattice bridges - large spans. Principles of constructing of main girders: lattice with parallel flanges and with variable height. Recent types of trusses - calculation. Bridges without bracings in upper flange stability issues of compressed flange. The distributions of stresses in gusset plates. Portal frames and the types of concentrations.
5. Bridge bearings.
6. Arched bridges. Types of arch bridges: Langer type bridges, arches combined with the stiffness of the roadway. Location of roadway: top, bottom, middle position and stability issue associated with it. Large and small span in arches - differences. Bracing of arches: portal frames inclined, horizontal, type Vierendeel solution. Bracing and the related problems of the theory of second order. Arched truss bridges.
7. Suspended and cable stayed bridges. Types of bridge systems, geometry of cables, stays, pylons and roadway. Specificity of the construction of the road way. The construction of cables and hangers. Spans - cross sections open and hollow – wind action. Bearing for large suspension bridges. The specificity of assembly. Hanging footbridge . Dynamics and aerodynamics - selected issues. Overview of cable stayed and hanging bridges.
8. Swing bridges - review.
PRACTICAL CLASSES
A design study of the truss railway bridge (welded, single-span, single-track)
1. Construction of the span - structural and non-structural elements (equipment).
2. Static schemes of the girders.
3. Geometry of truss bridges - lattice types, girder's shape, decks.
4. Cross-section of structural elements - girder elements, deck elements, bracings.
5. Static analysis - spatial FEM model; loads and it's combinations; influence lines, inner forces (normal forces, bending moments).
6. Designing of elements - ultimate limit state, fatigue, serviceability limit state.
7. Designing of construction joints.
8. Designing of truss girders - general requirements.
9. Structural drawings.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Structural Mechanics, Strength of Materials. The theory of design of steel and reinforced concrete</td></tr>
<tr><td>Assessment methods and criteria</td><td><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>design work</td><td>70.0%</td><td>50.0%</td></tr><tr><td>written exam</td><td>60.0%</td><td>50.0%</td></tr></table></td></tr>
<tr><td>Recommended reading</td><td>Basic literature</td><td>1. Czudek H., Radomski W.: Podstawy mostownictwa. PWN, Warszawa 1983.
2. Leonhardt F.: Budowa mostów. WKiŁ, Warszawa 1982.
3. Madaj A., Wołowicki W.: Budowa i utrzymanie mostów. WKiŁ, Warszawa 1995.
4. Furtak K., Mosty zespolone, PWN, Warszawa, Kraków, 1999
5. Hydzik J.: „Mosty kolejowe”, WKŁ, Warszawa, 1986.
6. Ryżyński A., Wołowicki W., Skarżewski J., Karlikowski J.: „Mosty stalowe”, PWN, Warszawa – Poznań, 1984.
7. Danielski L.: „Mosty metalowe”, Politechnika Wrocławska, Wrocław, 1983.
8. Biliszczuk J., Mosty podwieszone. ARKADY, Warszawa, 2005</td></tr>
<tr><td></td><td>Supplementary literature</td><td>1. Cholewo J., Sznurowski M.: „Mosty kolejowe i fundamentowanie” ,WKŁ, Warszawa, 1965.
2. Korelewski J.: „Mosty stalowe”, Politechnika Krakowska, Kraków, 1980.
3. Szelągowski F.: „Mosty metalowe”, WKŁ, Warszawa, 1966.
4. Pszenicki A.: „Mosty stalowe nitowane”, Wydawnictwa Komunikacyjne, Warszawa, 1954.
5. Furtak K., Mosty zespolone, PWN, Warszawa, Kraków, 1999
6. Jarominiak A.; Mosty podwieszone. Oficyna Wydawnicza Politechniki Rzeszowskiej, Rzeszów 1997.
7. Karlikowski J., Sturzbecher K.: „Mosty stalowe. Mosty belkowe i zespolone. Przewodnik do ćwiczeń projektowych” Politechnika Poznańska, Poznań, 2003.
8. Malinowski M., Miśkiewicz M., Szafrański M.: „Materiały pomocnicze do projektowania mostów metalowych – wersja elektroniczna na stronie internetowej http://www.okno.pg.gda.pl.</td></tr>
<tr><td></td><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Static analysis and dimensioning of bridge structures</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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