

**DOCTORAL SCHOOL OF WROCLAW UNIVERSITY OF SCIENCE AND
TECHNOLOGY**

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE:

Prof. of WUST, Wojciech Lorenc, PhD, Eng.
Department of Building Structures (W2/K5)

COURSE CARD

Course name in Polish: Zaawansowane konstrukcje zespolone stalowo-betonowe

Course name in English: Advanced steel-concrete composite constructions

Course language: English

University-wide general course type*:

1) basic science course (mathematics, physics, chemistry, computer science or other) :

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2) humanities course:

3) management course:

4) English language:

5) didactics of higher education course:

**Specialized courses for PhD students receiving education in
discipline*:**

1) specialized course in discipline: Civil Engineering and Transport

2) interdisciplinary course in the field of several disciplines:

3) seminar in discipline or interdisciplinary:

Subject code: ILQ100170W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	30			
Grading	Exam	Exam	Oral presentation	Exam, inspection, evaluation classes
Number of ECTS points	3			

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has the necessary advanced knowledge of the mechanics of construction and civil engineering
2. Has the necessary knowledge of the steel-concrete composite constructions.
3. Has the necessary knowledge of the FEM.

COURSE OBJECTIVES

- C1 Familiarization with contemporary steel-concrete composite structures.
- C2 Familiarization with advanced methods of laboratory tests of steel-concrete composite structures.
- C3 Familiarization with advanced methods of numerical simulation of behavior of steel-concrete composite structures.

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C4 Familiarization with shear connection using composite dowels.

PROGRAM CONTENTS

Form of classes – lecture (Lec)		Number of hours
Lec1	Subject and scope of the lecture, literature, rules of getting credit. State-of-the art of classic steel-concrete composite structures. Introduction to general composite section.	2
Lec2	Introduction to The History of the Theory of Structures. Working with old structures: strengthening and external prestressing of composite structures.	2
Lec3	Composite structures in buildings and bridges: main differences. Bridge construction – a strong driving force for developments in composite construction.	2
Lec4	Evolution of composite bridges. Basis of design of composite bridges. Un-cracked analysis and cracked analysis.	2
Lec5	From welded studs to composite dowels: evolution of shear connection. Fundamentals of Eurocode 4: steel skeleton.	2
Lec6	Evolution of composite dowels: from VFT to VFT-WIB.	2
Lec7	Composite dowels: searching for the shape and construction of first bridges. The first generation of bridges using composite dowels.	2
Lec8	Composite dowels: searching for design procedures and technology of production of steel part.	2
Lec9	Composite dowels: the final solution. Formal design procedures. The second generation of bridges using composite dowels.	2
Lec10	The concept of general composite section. The third generation of bridges using composite dowels. The forms constructed nowadays and predictable future.	2
Lec11	Laboratory testing of composite constructions: tests under static loads.	2
Lec12	Laboratory testing of composite constructions: tests under cyclic loads.	2
Lec13	FEM for purposes of laboratory testing:.	2
Lec14	FEM for purposes of design. Development of EC4.	2
Lec15	Final test.	2
Total hours:		30

TEACHING TOOLS USED

N1. Classic lecture.
N2. Multimedia presentations.
N3. Discussion with students.

ACHIEVED SUBJECT LEARNING OUTCOMES

Type of learning outcome	Code of learning outcome	Assessment of learning outcome
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Knowledge	P8S_WG	He has the knowledge at the advanced level of a fundamental nature to the field associated with the area of scientific research, including the latest research methods and verification of the results achieved
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PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

- [1] Kurrer K-E. The History of the Theory of Structures: Searching for Equilibrium. Ernst & Sohn 2018.
- [2] Wojciech Lorenc, Maciej P. Kozuch, Sebastian Balcerowiak, Wybrane zagadnienia modelowania przęseł mostów belkowych z dźwigarów zespolonych stalowo-betonowych. Wrocław: Dolnośląskie Wydawnictwo Edukacyjne, 2018. 168 s.
- [3] Jacques Berthelley, Günter Seidl, Wojciech Lorenc Recent structures and bridges built with the CL steel-concrete connection. W: Tomorrow's Megastructures : 40th IABSE Symposium 2018, Nantes, France, 19-21 September 2018. Zurich : IABSE, 2018. art. S2-51, s. 1-9.
- [4] Dennis Rademacher, Wojciech Ochojski, Wojciech Lorenc, Maciej P. Kozuch Advanced solutions with hot-rolled sections for economical and durable bridges. Steel Construction. 2018, vol. 11, nr 3, s. 196-204.
- [5] Wojciech Lorenc Nośność ciągłych łączników otwartych w zespolonych konstrukcjach stalowo-betonowych. Wrocław: Oficyna Wydawnicza Politechniki Wrocławskiej, 2010. 131, [2] s.
- [6] Wojciech Lorenc The model for a general composite section resulting from the introduction of composite dowels. Steel Construction. 2017, vol. 10, nr 2, s. 154-167.
- [7] Wojciech Lorenc Non-linear behaviour of steel dowels in shear connections with composite dowels: design models and approach using finite elements. Steel Construction. 2016, vol. 9, nr 2, s. 98-106.
- [8] Wojciech Lorenc The design concept for the steel part of a composite dowel shear connection. Steel Construction. 2016, vol. 9, nr 2, s. 89-97.

SECONDARY LITERATURE:

- [1] Wojciech Lorenc. Nowe technologie budowy mostów zespolonych. W: Mosty hybrydowe : Seminarium Naukowo-Techniczne Wrocławskie Dni Mostowe, Wrocław, 29-30 listopada 2018 / [red. Jan Biliszczyk, Jerzy Onysyk]. Wrocław : Dolnośląskie Wydawnictwo Edukacyjne, [2018]. s. 101-118.
- [2] Günter Seidl, Wojciech Lorenc Innovative Konstruktionen im Verbundbrückenbau mit Verbunddübeln. Stahlbau. 2018, Jg. 87, H. 6, s. 547-554.
- [3] Wojciech Lorenc, Tomasz Kołakowski, Andrzej Hukowicz, Günter Seidl Verbundbrücke bei Elbląg : Weiterentwicklung der VFT-WIB-Bauweise. Stahlbau. 2017, Jg. 86, H. 2, s. 167-174.

SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)

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