

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

SUPERVISOR DECLARING/CONDUCTING COURSE: Prof. Henryk Nowak, Prof. Adrian Różański, Prof. Piotr Mackiewicz, Dr inż. Michał Musiał, Dr inż. Piotr Koziół, Dr inż. Krzysztof Raszczuk, Dr inż. Tomasz Abel, Dr inż. Arkadiusz Szot, Dr inż. Bogdan Przybyła, Dr inż. Łukasz Skotnicki

DEPARTMENT: Faculty of Civil Engineering

SCIENTIFIC DISCIPLINE: Civil engineering and transport

COURSE CARD

Course name in Polish: Najnowsze kierunki badań w Inżynierii Lądowej i Transporcie

Course name in English: The latest research directions in Civil Engineering and Transport

Course language: ~~polish~~/ English

The course is intended for all PhD students: YES / NO

Civil engineering and transport discipline

- 1) ~~BASIC COURSE~~
- 2) ~~SPECIALIST COURSE~~
- 3) ~~SEMINAR~~
- 4) ~~HUMANISTIC COURSE~~
- 5) ~~LANGUAGE~~
- 6) ~~RESEARCH SKILLS~~

Subject code: ILQ100238W

* delete as applicable

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

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Has knowledge of mechanics, strength of materials and rules for calculating and designing engineering structures.
2. Has knowledge of the types of underground structures
3. Has knowledge of the types of underground network infrastructure
4. Has knowledge of the classic methods of building underground structures
5. Has knowledge of the basics of mathematical and statistics
6. Has knowledge of of materials and technologies used in civil engineering

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COURSE OBJECTIVES

- C1 Getting to know the latest techniques for solving large-scale geo- and hydrotechnical problems.
 C2 Getting to know the type and structure of network or systems
 C3 Getting to know the variations of line installations
 C4 Getting to know the trenchless construction methods
 C5 Getting to know the types of construction materials
 C6 Getting to know the rules of designing of road pavements.
 C7 Education and improving skills in the area of road materials.
 C8 Acquiring the knowledge of innovative technologies in road engineering.

PROGRAM CONTENTS

Form of classes		Number of hours
1	Numerical modeling in a continuous medium of elasto-plastic deformations, history of subsoil loading, hysteresis effects. An example of numerical analysis of soil-steel structure exposed to water infiltration.	2
2	Numerical modeling of large-scale geo- and hydrotechnical engineering problems. Reconstruction of the spatial arrangement of layers in the subsoil with the use of geostatistical interpolation. Examples of numerical models of the subsoil of real structures: dams of dry flood protection reservoirs and mining waste reservoirs.	2
3	Time and spatial optimization of technological measures increasing the safety of geo-and hydrotechnical structures with simultaneous use of monitoring results and advanced 3D computational models.	2
4	Methods of the analysis of reinforced concrete structures - theory, experiments, case studies	2
5	Research related to the implementation of steel and concrete hybrid beams	2
6	Contemporary trends in research on the subject: structural conservation and strengthening of historical objects	2
7	Application of infrared thermography in building - pasive and active thermography I	2
8	Application of infrared thermography in building - pasive and active thermography II	2
9	Measurements of thermal resistance of masonry walls	2
10	Variations of line installatons	2
11	CIPP technologies	2
12	Microtunneling, Pipe Jacking, Direct Pipe	2
13	Road pavements and designing.	2
14	Modern materials in road pavement layers.	2
15	Recycling in road engineering.	2
Total hours		

TEACHING TOOLS USED

- N1. Multimedia presentation.
 N2. personal computer, interactive whiteboard (calculations, drawings, descriptions, examples).
 N3.

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ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	P8S_WG	Final report, activity in group discussion
Knowledge	P8S_WK	Final report, activity in group discussion

PRIMARY AND SECONDARY LITERATURE
<p><u>PRIMARY LITERATURE:</u></p> <p>[1] Chaudhary, K. B., Phoon, K. K., & Toh, K. C. Large-Scale Geotechnical Finite Element Analysis on Desktop PCs.</p> <p>[2] Łydźba et al. Safety analysis of the Żelazny Most tailings pond: qualitative evaluation of the preventive measures effectiveness. <i>Studia Geotechnica et Mechanica</i>. Vol. 43 (2) 2021.</p> <p>[3] Łydźba et al. A comprehensive approach to the optimization of design solutions for dry anti-flood reservoir dams. <i>Studia Geotechnica et Mechanica</i>. Vol. 43 (2) 2021.</p> <p>[4] Maldague X., Theory and practice of infrared technology for nondestructive testing. John Wiley & Sons, Inc., 2001.</p> <p>[5] Minkina W., Dudzik S., Infrared thermography: errors and uncertainties. John Wiley and Sons, 2009.</p> <p>[6] Nowak H.: Application of infrared thermography in building (in Polish), Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2012.</p> <p>[7] Vollmer M., Mollmann K., P., Infrared Thermal Imaging. Fundamentals, research and Applications. Wiley-VCH Verlag, GmbH & KGaA, Germany 2010.</p> <p>[8] Trenchless Technology for Installation of cables and Pipelines – Dietrich Stein, STEIN&PARTNER, Germany, 2005</p> <p>[9] Trenchless Technology: Pipeline and Utility Design, Construction and Renewal - McGraw-Hill Education; 1 edition, 2005</p> <p>[10] Robinson R., Road Engineering for Development, Taylor & Francis, 2004</p> <p>[11] General Directorate for National Roads and Motorways (GDDKiA). Instruction for designing and embedding of mineral-cement-emulsion mixtures (MCE), Gdańsk, 2014.</p> <p>[12] General Directorate for National Roads and Motorways, Catalog of typical flexible and semi-rigid pavement constructions, Warsaw, Poland, 2014.</p> <p>[13] General Directorate for National Roads and Motorways – Asphalt pavements on national roads. WT-2 2014 – Part I. Bituminous mixtures. Technical requirements. Warsaw 2014.</p> <p><u>SECONDARY LITERATURE:</u></p> <p>[1] Hens H.: Applied building physics. Boundary Conditions, Building performance nad material properties. Wilhelm Ernst & Sohn, Berlin 2011.</p> <p>[2] Hens H.: Building physics – heat, air and moisture. Fundamentals and Engineering methods with examples and exercises. Wilhelm Ernst & Sohn, Berlin 2012.</p> <p>[3] Siegel R., Howell J.R., Thermal Radiation Heat Transfer. McGraw-Hill, New York, 1981.</p> <p>[4] http://inzynieria.com</p> <p>[5] European Standards: Bituminous mixtures - series EN 12697</p>
<p>SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)</p> <p>Prof. dr hab. Inż. Henryk Nowak, henryk.nowak@pwr.edu.pl</p> <p>Dr hab. inż. Adrian Różański, prof. uczelni, adrian.rozanski@pwr.edu.pl</p> <p>Dr. hab. inż. Piotr Mackiewicz, prof. uczelni, Piotr.mackiewicz@pwr.edu.pl</p>

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