DOCTORAL SCHOOL OF WROCŁAW UNIVERSITY OF SCIENCE AND TECHNOLOGY

SUPERVISOR/TEAM/ DECLARING/CONDUCTING COURSE: Wojciech Puła
DEPARTMENT: Civil Engineering Department
SCIENTIFIC DISCIPLINE: Civil Engineering and Transport

COURSE CARD

Course name in Polish: Metody probabilistyczne w inżynierii
Course name in English: Probabilistic methods in engineering
Course language: English
University-wide general course type*:
The course is intended for all PhD students: YES / NO
~~**1) BASIC COURSE**~~
2) SPECIALIST COURSE
~~**3) SEMINAR**~~
~~**4) HUMANISTIC COURSE**~~
~~**5) LANGUAGE**~~

Subject code: ILQ100024W

* delete as applicable

	Lecture	Foreign language course	Seminar	Mixed forms
Number of hours of organized classes in university (ZZU)	**30**	**-**	**-**	-
Grading	Exam	-	-	-
Number of ECTS points	**0**	-	-	-

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. A basic course in soil mechanics and foundation engineering
2. A basic course in probability and statistics
3. A course in calculus

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COURSE OBJECTIVES

C1. To enable PhD students to use probabilistic methods within their PhD theses.
C2. To demonstrate students the rules of probability based design

PROGRAM CONTENTS

Form of classes – lecture (Lec)		Number of hours
Lec1	General comments on uncertainty in geotechnical analyses. Sources and types of uncertainty in geomechanical properties.	**1**
Lec2	Basic discrete probability theory.	**1**
Lec3	Some basic concepts of probability measures theory.	**2**
Lec4	Random variables and probability distributions, expected values, variance, moments of higher order. Random vectors, stochastic independence, covariance/correlation Common discrete and continuous distributions.	**2**
Lec5	Convergence of probability distributions. Limit theorems	**1**
Lec6	Stochastic processes and random fields	**4**
Lec7	Probabilistic modelling of soil properties. Estimation problems. Theory and examples	**2**
Lec8	Structural reliability methods and reliability assessments in geomechanics	**3**
Lec9	Reliability oriented simulation techniques. Random fields Simulation.	**2**
Lec9	Advanced reliability evaluations. Bearing capacity of shallow foundations.	**2**
Lec9	Advanced reliability evaluation. Response surface method and its application to foundation settlement problem	**2**
Lec10	Stochastic finite element method and the random element method (RFEM). An overview.	**2**
Lec11	Applications of RFEM to various geomechanical problems.	**2**
Lec12	Reliability based design. General rules and examples.	**1**
Lec13	Calibration of characteristic and design values in conjunction of rules given by Eurocodes	**3**
	Total hours:	**30**

TEACHING TOOLS USED
N1. Classical lecture N2. Multimedial presentations N3. Discussions of problems.

ACHIEVED SUBJECT LEARNING OUTCOMES		
Type of learning outcome	Code of learning outcome	Assessment of learning outcome
Knowledge	**P8S_WG**	has knowledge at an advanced level of a basic nature for a field related to the area of scientific research, including the latest methods of research and verification of achieved results
Knowledge	P8S_W	Understanding the basic methods of structural reliability methods.
Knowledge	P8S_WK	A knowledge in reliability based design

Skills	P8U_U	An elementary skill in probabilistic modelling
Skills	P8S_UK	An elementary skill in reliability evaluations
Skills	P8S_UO	A skill in characteristic and design evaluation
Social competence		

PRIMARY AND SECONDARY LITERATURE

PRIMARY LITERATURE:

[1] FENTON G.A., GRIFFITHS D.V. (2008), *Risk assessment in geotechnical engineering*. John Wiley & Sons, Hoboken, N.J.
[2] EUROCODE 7 AND RELIABILITY-BASED DESIGN. IN: RELIABILITY BASED DESIGN IN GEOTECHNICAL ENGINEERING, TAYLOR AND FRANCIS, LONDON–NEW YORK,
[3] BAECHER G.B., CHRISTIAN J.T. (2003), RELIABILITY AND STATISTICS IN GEOTECHNICAL
[4] ENGINEERING. J. WILEY & SONS, CHICHESTER.
[5] FISZ M. (1980), PROBABILITY THEORY AND MATHEMATICAL *statistics*. Krieger Publ. Co.

SECONDARY LITERATURE:

[1] DITLEVSEN O., MADSEN H.O. (1996), STRUCTURAL RELIABILITY METHODS. JOHN WILEY & SONS, CHICHESTER.
[2] PROBABILISTIC METHODS IN GEOTECHNICAL ENGINEERING. ED. BY D. V. GRIFFITHS,
[3] GORDON A. FENTON. WIEN; NEW YORK: SPRINGER, COP. 2007. S. 127-145. ISBN: 978-3-211-73365-3.
[4] MELCHERS R.E. (2018), STRUCTURAL RELIABILITY. ANALYSIS AND PREDICTION. 3RD EDITION, JOHN WILEY & SONS.

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

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