

(faculty stamp)

COURSE DESCRIPTION

Z1-PU7

WYDANIE N1

Strona 1 z 2

1. Course title: SECURITY OF WATER SUPPLY SYSTEMS		2. Course code		
3. Validity of course description: 2012/2013				
4. Level of studies: BA, BSc programme / MA, MSc programme lub 1 st cycle / 2 nd cycle of higher education				
5. Mode of studies: <u>intramural studies</u> / extramural studies				
6. Field of study: ENVIRONMENTAL ENGINEERING		(FACULTY SYMBOL) RIE		
7. Profile of studies: general academic studies				
8. Programme: Water, Wastewater and Soil Technology				
9. Semester: III				
10. Faculty teaching the course: Institute of Water and Wastewater Engineering				
11. Course instructor: dr hab. Inż. Izabela ZIMOCH, Associate Professor				
12. Course classification: specialty subjects				
13. Course status: <u>compulsory</u> / elective				
14. Language of instruction: English				
15. Pre-requisite qualifications: Statistics, Reliability of water and sewage systems in industry, Water technology, Wastewater technology, Water networks and systems, Sewage systems and networks. Basic knowledge in: statistics, analysis of the technical systems reliability, water and wastewater technologies, and exploitation of water and sewage systems				
16. Course objectives: Getting acquainted with principles of: <ul style="list-style-type: none"> - basics of the theory reliability of the water supply systems (WSS), - interpretation of conditions and reliability operations of WSS, - safety theory of water supply systems,, - risks theory of exploitation of technical systems, - application of analytical methods in the assessment of reliability and risk of WSS exploitation. 				
17. Description of learning outcomes:				
Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Student has the knowledge of the basics of reliability theory of technical systems: renewable and nonrenewable elements	Written test	Lecture	K_W05, K_W10, K_W17, K_W19, K_W21, K_W22
2.	Student is able to use the safety theory in identifying technical and environmental hazards of WSS operation	Written test	Lecture	K_W02, K_W05, K_W10, K_W17, K_W19, K_W21, K_W22
3.	Student has the knowledge of the basics of risk theory and can identified risk for the different conditions of water supply system operation	Written test	Lecture	K_W02, K_W05, K_W10, K_W17, K_W19, K_W21, K_W22
4.	Student is able to determine the availability factor and generalized reliability factor as well as their interpretation for water supply subsystem	Project	Project	K_U05, K_U06, K_U08, K_U15, K_U16, K_U26, K_U27, K_K02, K_K06
5.	Student uses a two-parameter method based on decomposition method and the modified method of minimum unserviceability cross- sections to determine the availability factors	Project	Project	K_U02, K_U05, K_U06, K_U08, K_U15, K_U16, K_U26, K_U27, K_K03, K_K06
6.	Student identifies environmental and technical hazards and applies the matrix method to risk assessment of WSS	Project	Project	K_U02, K_U05, K_U08, K_U10, K_U11, K_U16, K_U17, K_U22, K_U26, K_U27, K_K02, K_K03, K_K04

18. Teaching modes and hours

Lecture / BA/MA Seminar / Class / Project / Laboratory

Lecture - 15 h., Semester 3

Project - 30 h., Semester 3

19. Syllabus description:**Lecture, Semester 3:**

Basic theory of reliability and safety of technical systems; structure, types and characteristics of the water supply system.

Basic reliability theory of technical non-renewable elements: failure rate and probability of non-failure work.

Failure and recovery processes of recovery elements: renewable elements of immediate restoration and elements with the finite recovery time.

Methods of determination the reliability of water supply systems (WSS): method of failure rate, method of minimum unserviceability cross-sections, fault tree analysis.

The required reliability level of WSS and methods of raising reliability of WSS.

Structure and characteristics of basic and complex structure of WSS, the methodology for determining the basic reliability parameters and criteria of reliability assessment.

Risk theory of WSS operation. Principles and methods of risk assessment: quantitative and qualitative methods.

Risk management - principles of building of Water Safety Plans (WSPs).

Project, Semester 3:Project No. 1: Determination of reliability parameters based on two-parameter method using the decomposition method and the modified method of minimum unserviceability cross-sectionsProject No. 2 : Reliability and risk analysis of water supply systems**20. Examination: No****21. Primary sources:**

1. Bartkowska J., Królikowski A., Orzechowska M.: Gospodarka wodno-ściekowa w zakładach przemysłowych. Politechnika Białostocka 1991.
2. Mielcarzewicz E. Gospodarka wodno-ściekowa w zakładach przemysłowych. PWN Warszawa 1986.
3. Wieczysty A i inni, Metody oceny i podnoszenia niezawodności działania komunalnych systemów zaopatrzenia w wodę. Monografie KiS PAN, vol.2., Kraków 2001
4. Wieczysty A. Niezawodność systemów wodociagowych i kanalizacyjnych - teoria niezawodności i jej zastosowania, Skrypt Politechniki Krakowskiej, Kraków 1990.
5. Kwietniewski M., Roman M., Kłoss-Trębaczewicz H. Niezawodność wodociągów i Kanalizacji, Arkady, Warszawa 1993.
6. Rak J., Tchorzewska-Cieślak B. Metody analizy i oceny ryzyka w systemie zaopatrzenia w wodę, Oficyna Wyd. Pol. Rzeszowskiej, Rzeszów 2005.
7. Rak J. Wybrane zagadnienia niezawodności i bezpieczeństwa w zaopatrzeniu w wodę, Oficyna Wyd. Pol. Rzeszowskiej, Rzeszów 2008.
8. Rak J. Bezpieczeństwo systemów zaopatrzenia w wodę, PAN IBS, seria: Badania systemoe, tom 66, Warszawa 2009.
9. Pollard S.J.T. Risk Managment for Woter and Wastwater Utilities. IWA Publishing, London, 2008.
10. Anderson D.R., Sweeney D.J., Williams T.A. Introduction to statistics: concepts and applications. West Publication Company, St. Paul 1991.
11. Sobczyk M. Statystyka. PWN, Warszawa 2005.

22. Secondary sources:

specialist and industry journals

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode :	Contact hours / Student workload hours
1	Lecture	15 / 10
2	Classes	/
3	Laboratory	/
4	Project	30 / 15
5	BA/ MA Seminar	/
6	Other	15 / 5
	Total number of hours	60 / 30

24. Total hours: 90**25. Number of ECTS credits:** 3**26. Number of ECTS credits allocated for contact hours: 2****27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1****26. Comments:**

Approved:

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(date, Instructor's signature).....
(date, the Director of the Faculty Unit signature)