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EUROPEAN UNIVERSITY FOR CUSTOMISED EDUCATION

STUDY GUIDE

Reliability and Safety of Engineering Systems

Organised by

Poznan University of Technology (PUT)

1. IDENTIFYING DATA.	
· Course Name.	Reliability and Safety of Engineering Systems
· Coordinating University.	Poznan University of Technology (PUT)
· Partner Universities Involved.	-
· Course Field(s).	Engineering/ Environmental Engineering / Civil Engineering / Infrastructure Systems
· Related Study Programme.	MSc in Environmental Engineering (or Civil Engineering / Infrastructure Engineering)
· ISCED Code.	071 (Engineering and Engineering Trades)
· SDG.	SDG 6 – Clean Water and Sanitation SDG 9 – Industry, Innovation and Infrastructure SDG 11 – Sustainable Cities and Communities
· Study Level.	Master (MSc), Doctorate (D)
· EUNICE Key Competencies	[Indicate the Key Competencies offered by the course.] • Green – strongly • Orange - moderately • Red – partially • Blank cell - not at all Problem solving → Green (strongly) Teamworking → Green (strongly) Communication → Orange (moderately) Self-management → Orange (moderately) Cognitive flexibility → Green (strongly) Digital competence → Orange (moderately)

Problem solving	
Teamworking	
Communication	
Self-management	

	Cognitive flexibility	
	Digital competence	
	Technical competence	
	Global intercultural competence	

· Number of ECTS credits allocated.	2 ECTS
· Mode of Delivery.	Online live
· Language of Instruction.	English
· Course Dates.	3 March – 9 June 2027
· Precise Schedule of the Lectures.	Meetings each Wednesday at 9.30 am throughout the summer semester. **Lectures:** 3,10,17,24,31 March 2027 14,28 April 2027 12 May 2027 **Exercise:** 7,21 April 2027 5,19,26 May 2027 2,9 June 2027
· Key Words.	Reliability, Safety Engineering, Risk Analysis, Critical Infrastructure, Water Supply Systems, Water Safety Plan, Resilience, NIS2
· Catchy Phrase.	"Design safer and more reliable infrastructure systems using real-world engineering tools and risk-based thinking."

· Prerequisites and co-requisites.	Basic probability and statistics. Fundamentals of engineering systems Basic knowledge of environmental or civil or energy engineering (recommended).

	whether a student must have successfully completed certain courses before s/he can take this course and any other requisites such as i.e. linguistic skills course is available for (Msc and D); English language required
· Number of EUNICE students that can attend the Course.	15
· Number of EUNICE students that can attend the course per institution	3÷5
· Course inscription procedure(s).	Standard EUNICE registration procedure

2. CONTACT DETAILS.	
· Department.	Faculty of Environmental Engineering and Energy,
· Name of Lecturer.	Agnieszka Szuster-Janiaczyk, PhD
· E-mail.	agnieszka.szuster-janiaczyk@put.poznan.pl
· Other Lecturers.	Jędrzej Bylka, PhD ; Rafał Brodziak, PhD

3. COURSE CONTENT.

This course covers fundamental and applied aspects of reliability and safety engineering with a focus on critical infrastructure systems, particularly water supply systems. Students learn how to assess system reliability, identify hazards, and perform risk analysis using engineering methods such as FMEA and risk matrices.
Special emphasis is placed on Water Safety Plans developed by the World Health Organization and regulatory frameworks such as the NIS2 Directive.
The course combines theoretical lectures with problem-based learning (PBL), where students analyze a real-world water supply system and propose improvements to its reliability and safety.

4. LEARNING OUTCOMES.

Students will be able to:

- Explain key concepts of reliability, safety, and risk
- Apply basic reliability metrics and models
- Perform risk assessment using engineering methods
- Identify critical components in infrastructure systems
- Develop a simplified Water Safety Plan
- Interpret simulation results (e.g. EPANET)

- Propose engineering solutions to improve system safety and reliability
- Work effectively in teams

5. OBJECTIVES.

- Introduce reliability and safety engineering principles
- Develop skills in risk analysis and decision-making
- Provide knowledge of critical infrastructure protection
- Apply theory to real-world water systems
- Develop teamwork and problem-solving skills

6. COURSE ORGANISATION.

UNITS

1.	Fundamentals of Reliability and Safety Engineering
2.	Reliability Models and System Structures
3.	Risk Analysis and Assessment Methods
4.	Critical Infrastructure and Regulations
5.	Water Supply Systems – Reliability Aspects
6.	Water Safety Plans and Risk Management
7.	Critical Infrastructure Sectors and Best Practices

LEARNING RESOURCES AND TOOLS.

Lecture materials (slides, notes), Case studies, EPANET (limited use), Scientific papers and reports, WHO WSP guidelines

PLANNED LEARNING ACTIVITIES AND TEACHING METHODS.

Lectures , Problem-Based Learning (PBL) , Group work , Case studies , Project-based assignments

7. ASSESSMENT METHODS, CRITERIA AND PERIOD.

Passing the lectures based on a final test, passing the exercises based on the assessment of the performance of the PBL group task.
Graded course.

OBSERVATIONS.

Continuous assessment based on project progress and engagement.

8. BIBLIOGRAPHY AND TEACHING MATERIALS.

Birolini, A. – Reliability Engineering: Theory and Practice
Zio, E. – An Introduction to the Basics of Reliability and Risk Analysis
World Health Organization – Water Safety Plan Manual
A practical guide to Auditing water safety plans, WHO, IWA, 2015
Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption
ISO 31000 – Risk Management
IEC 61508 – Functional Safety
NIS2 Directive