

Structural Reliability and Risk Analysis (E050923)

Course size (nominal values; actual values may depend on programme)

Credits 4.0 Study time 120 h Contact hrs 37.5 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	English	seminar	15.0 h
		lecture	22.5 h
B (semester 2)	Dutch	guided self-study	22.5 h
		seminar	15.0 h

Lecturers in academic year 2018-2019

Caspeele, Robby TW14 lecturer-in-charge

Offered in the following programmes in 2018-2019

	crdts	offering
Bridging Programme Master of Science in Civil Engineering	4	B
Bridging Programme Master of Science in Civil Engineering	4	A
Master of Science in Engineering: Architecture (main subject Architectural Design and Construction Techniques)	4	A
Master of Science in Engineering: Architecture (main subject Urban Design and Architecture)	4	A
Master of Science in Civil Engineering	4	B
Master of Science in Civil Engineering	4	A
Exchange Programme Architecture	4	A

Teaching languages

Dutch, English

Keywords

civil engineering, concrete, durability, repair, reliability analysis

Position of the course

The aim of the course is to introduce the students into risk analysis of structures, civil engineering works and construction processes. Some fundamental methods for risk quantification are taught.

Contents

- Introduction: risk perception in everyday life, historical perspective, structural failures: case-studies
- Probabilistic basis: Review of basic concepts of probability theory and statistics
- General concepts: definitions, types of uncertainty, modelling of material properties, modelling of loads
- Level 3 methods: analytical formulation, Monte-Carlo simulation
- Level 2 methods: context, safety index according to Hasofer and Lind, simplified level 2 methods
- Level 1 methods: semi-probabilistic verification procedure, numerical derivation of partial safety factors
- System reliability: modelling, series systems, parallel systems, logical trees, Bayesian decision theory, case-study
- Risk management: basic principles and methodology

Initial competences

probability theory and statistics, structural analysis, concrete structures, steel structures

Final competences

- 1 Understanding the influence of uncertainties in structural design.
- 2 Understanding the difference between structural reliability methods of level 1, 2 and 3.
- 3 Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods of level 2 and 3.
- 4 Being able to apply Monte Carlo simulations for the determination of failure probabilities.
- 5 Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes.
- 6 Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural applications.
- 7 Being able to apply fault and event trees to structural engineering applications.
- 8 Being able to apply Bayesian decision theory to structural engineering applications.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Guided self-study, lecture, seminar

Extra information on the teaching methods

For the exercises partly use is made of computer software (Excel, COMREL,...)

Learning materials and price

Syllabus (10 euro)

References

- A.Haldar: "Probability, Reliability and Statistical Methods in Engineering Design", uitgeverij: John Wiley & Sons, Inc
- P.Thoft-Christensen, M.J.Baker: "Structural Reliability Theory and its applications", uitgeverij: Springer-Verlag
- P.Thoft-Christensen, Y.Murotsu: "Application of Structural Systems Reliability Theory", uitgeverij: Springer-Verlag
- CUR 190: "Kansen in de civiele techniek", Directoraat-Generaal Rijkswaterstaat

Course content-related study coaching

The lecturer and assistants can be contacted before or after the lectures or exercise sessions, through e-mail or after making an appointment.

Evaluation methods

end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period

Open book examination, oral examination

Examination methods in case of periodic evaluation during the second examination period

Open book examination, oral examination

Examination methods in case of permanent evaluation

Report

Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

Extra information on the examination methods

During examination period: oral closed-book exam, written preparation; written open-book exam - problems. Continuous assessment: evaluation of the project work on the basis of the reports

Calculation of the examination mark

50% open book examination, 40 % oral examination, 10% reports of project work