

Course: Reliability-based optimization

Teaching hours: 15 h

Prerequisites: The course is primarily open to all PhD students at Gdansk University of Technology. Fundamentals on structural mechanics, probability theory are highly recommended.

This course is compulsory for PhD students assigned to Civil Engineering and Transport as well as Environmental Engineering, Mining and Power Engineering tracks at Doctoral School of GUT.

Course outline

Content

This module is all about getting the PhD student to be prepared to deal with uncertainty in the issues of engineering design, including optimization problems. The sessions provide essential information that the PhD student require to distinguish uncertainty sources in engineering, classification of methods to regard random variation of parameters involved in engineering design. The course is designed to deliver to the PhD students knowledge on uncertainty modelling and optimal design in uncertain terms. Throughout the course, the PhD students should gain skills to provide structural reliability assessment, distinguishing an appropriate analytical level.

General topics coverage:

1. Reliability assessment of engineering structures, random modelling of action and resistance parameters.
2. Three levels of reliability assessment, basic methodology, analytical and numerical tools (including Monte Carlo simulation method).
3. Fundamentals of reliability-based optimization.
4. Case studies of engineering structures.

Teaching mode

The course consists of lectures. The teaching method is basically a lecturer's delivery. In the final part of the semester, the PhD students will deliver their presentations on reliability assessment of structures and reliability-based optimization, based on literature sources.

Examination

A wide range of formative feedback from the tutor, questions and practical individual and group exercises will be used by tutors to aid learning as will exercises to encourage the researchers' abilities in critical and reflective learning. The exact nature of these assessment devices will be at the discretion of the tutor. The PhD students will be required to demonstrate their presentation skills, knowledge and understanding of the topic of uncertainty modelling and optimization problems in the form of presentations.

Fundamental readings:

1. Bucher C.: *Computational Analysis of Randomness in Structural Mechanics*. CRC Press, 2009.
2. Nowak A.S., Collins K.R.: *Reliability of Structures*. McGraw Hill, 2000.
3. Melchers R., *Structural Reliability: Analysis and Prediction*. Wiley, 1999.