

CT4130	Probabilistic Design	4
Instructor	Madelon Burgmeijer	
Instructor	Pieter van Gelder	
Instructor	Han Vrijling	
Instructor	Ton Vrouwenvelder	
Education Period	1st Education Period, 2nd Education Period	
Exam Period	2nd Exam Period, 4th Exam Period	
Course Language	English	
Course Contents	<p>Objectives of probabilistic design of civil structures. Probability Calculus; Steps in a Risk Analysis; Inventory of possible unwanted events, effects and consequences; Determining and evaluating the risk. Decision-making based on risk analysis; Decision-making under uncertainties; Probabilistic analysis of the decision problem; Frame of reference concerning safety; Current dutch safety standards; Generally applicable safety standards. Reliability of an element; Limit state functions, strength and load; Ultimate and serviceability limit states; Strength of concrete, steel, timber, soil, etc; Loads of traffic, wind, waves, water, earthquakes, precipitation, ice, etc; Time dependence. Reliability calculation methods; Level III methods; Numerical integration; Monte carlo method; Level II methods; Non-linear limit state functions; Non-normally distributed variables; Dependent random variables; Comparison of different calculation methods. Failure probability and life span; Deterioration processes; Risk calculation of systems with a variable rate of failure; Non availability; Markov processes; Load combinations. Strength calculation with level I method; Linking the level I method to the failure probability calculation; Standardisation of α-values; Load combinations for level I strength calculations. Reliability of systems; Probability of failure of the serial system; Probability of failure of the parallel system; FMEA (Failure Modes and Effects Analysis); FMECA (Failure Modes, Effects and Criticality Analysis); Event tree; Fault tree; Cause consequence chart; Reliability of correctable systems. Scheduling the realisation of activities; Introduction to scheduling uncertainties; Influence of corrective measures on duration and costs; Maintenance; Introduction to maintenance strategies; Effect of maintenance on risk; Influence of inspections. Application areas; Structural safety of buildings, dikes, offshore platforms, bridges, etc; Maintenance and management; Quality assurance; Safety management; Geostatistics; Reliability of software.</p>	
Study Goals	After the course, the student has to be able to do Level I, II and III calculations, risk-based optimisations and system probability calculations.	
Education Method	Lectures, Excercise, participation is voluntary. Half point bonus for exam, when excercise is passed sufficiently.	
Literature and Study Materials	obligatory lecturenote(s)/textbook(s): Probabilistic Design Available at BookShop Civil Engineering. recommended other materials: Tentamenbundel Available at BookShop Civil Engineering, also on blackboard.	
Assessment	Written exam: three questions, they refer mainly to different parts of the course	
Permitted materials during tests	No restrictions	
Judgement	one mark, based on written exam and a voluntary excercise. Half point bonus for exam, when excercise is passed sufficiently. This bonus is valid for one year.	
Contact	<>	