Competence coverage ı	matrix							Gene	eral Co	urses										Ма	jors					Mast r's Disse tatio
GHENT UNIVERSITY Master of Science in Civ	vil Engineering		Constitutive Material Laws in Structural	bility and Risk Analysis	ering and Harbour Construction	ye and Tunnel Engineering	Civil Structures	mics	and Contaminant Flow	, lity	nent and Environment	ures: Prestressed Concrete and	iys and Locks		ad Engineering and Mobility	Maritime Technology (partim)	ures	ynamics	Foundations	Techniques and Processes	es	E044571 Non-linear and Plastic Methods of Structural Analysis	sign		ide Structures	
Academic year 2021-20	22		and	Structural Reliability	Coastal Engineering	Advanced Bridge	Design of Civil	Structural Dynamics	undwater ar	Structural Stability	ter Management	Concrete Structures:	ind Waterways	Geotechnics	Specialised Road	Introduction to [Offshore Structures	Coastal Hydrodynamics	Offshore Found		Spatial Structures	n-linear and	Conceptual Design	Seismic Design	ss and Facade	Master's Dissertation
Legend: T=teaching methods			E044940 FEM a	E050923 Stru	E054920 Coa	E044821 Adv	E050100 Des	E040661 Stru	E045621 Groundwater	E044311 Stru	E045860 Water	E052621 Cor Slabs	E054820 Inland	E052210 Geo	E053560 Spe	E055044 Intr	E044666 Offs	E055400 Coa	E044671 Offs	E054680 Dredging:	E061502 Spa	:044571 Nor nalysis	E044902 Cor	E044930 Sei	E044631 Glass	E091103 Mas
E=evaluation methods Competences in		T 19	Т	Т	Т	Т	Т	Т	Т	Т	Ш	Т	Т	Т	Т	Ш	Ш	Т	Т	Т	ш	Т	Т	Т	Ш	Т
one/more scientific discipline(s)	discipline in solving complex problems. Apply Computer Aided Engineering (CAE) tools and advanced communication instruments in a creative and purposeful way.	E 19 T 8 E 8	E T E	E T E	E	T E	E T E	E T	E T E	E		Е	E	E	E			Е	E T E	E		E	E T E	E		E
	Innovative use of expert knowledge in the field of the finite element methods and structural dynamics.		T E	_		T E	Т	T E	Т			T E			_				-				Т	Т		T E
	Apply knowledge about roads and bridges (use of materials, way of construction and integration in the environment), bearing in mind the environmental effects.					T E	Т					T E			T E											T E
	innovative way during the process of design and research.	T 8 E 7				T E	T E					T E			T E					T E			T E	Т		T E
	Use profound civil engineering knowledge in order to analyse and solve complex civil engineering problems.	T 15 E 12	T E			T E	T E		Т	T E		Т		T E	T E				T E	T E	T E		Т	T E	T E	T E
	Analyse and solve new and complex civil engineering problems by means of advanced calculation methods.	T 13 E 12	T E	T E		T E	T E		T E	T E					Т		T E		T E	T E			T E	T E		T
	Be familiar with behaviour of materials, models of materials and the application of materials in complex constructions.	T 13 E 11	T	_		T E	T		T	-				T E	T E		_		T		T E	T	T	T	T E	T
	To critically apply knowledge of flowing water and its mathematical formulation to hydraulic engineering constructions and problems concerning integral water management.				T E	_			T E		T E		T E	_		T E		T E								
Scientific competences	Analyse complex problems and translate them into concrete research questions.	T 14 E 13	T E	T E		T E	T E	T E	T E	T E				T E	T E	T E			T E	T E			Т			T E
	· ·	T 5 E 5				T E					T E				T E						T E					T E
		T 22 E 22	T E	T E	T E	T E	T E	T E	T E	T E	T E	T E		T E	T E	T E	T E		T E	T E	T E	T E	T E	T E	T E	T
	Develop and validate mathematical models and methods.	T 7 E 5	T E	T E		T E	Т							T E					T E				Т			
	Interpret research findings in an objective and critical manner.	T 6 E 4	T E			T E	Т								T E								Т			T E
	examine the stability of advanced constructions.	T 17 E 17	T E	T E	T E	T E	T E		T E	T E		T E			T E		T E		T E		T E	T E	T E	T E	T E	T E
	Apply design and research methods and techniques to highly advanced ideas and applications in various civil engineering sectors.	T 8 E 6				E	E		Т						E					E			E	Т		E
		T 9 E 8			T E	T E	T E							T E	T E			T E	T E				Т			T E
ntellectual competences	Independently form an opinion on complex situations and problems, and defend this point of view.	T 9 E 8	T E	T E		T E	T E			T					T E					T E			T E			T E
		T 12 E 11			T E	T E	T E					Т		T E	T E			T E	T E	T E			T E		T E	T E
	Critically reflect on one's own way of thinking and acting, and understand the limits of one's competences.	T 9 E 9	T E			T E	T E				T E				T E		T E						T E	T E		T E
	Stay uptodate with the evolutions in the discipline to elevate the own competences to expert level.	T 13 E 9	T E			T E	Т		Т	T E		Т			T E					T E	T E	T E	Т		T E	T E
	Readily adapt to changing professional circumstances.	T 5 E 3				T E	Т								T E									Т		T
Jooperation and	specialisation.	T 20 E 20	T E	T E		T E	T E	T E		T E		T E	T E	T E	T E	T E	T E		T E	T E	T E	T E	T E	T E	T E	T E
communication	Project management: have the ability to formulate objectives, report efficiently, keep track of targets, follow the progress of the project,	T 9 E 9			E	E	E	Т							E	E			E				E	E		E
	Have the ability to work as a member of a team in a multi disciplinary workingenvironment, as well as being capable of taking on supervisory responsibilities.	T 6 E 4	T E			T E	Т								E				Т		T E		Т			
		T 19 E 18	T E		T E	T E	T E	T		T E	T E		T E	T E	T E	T E	T E	T E	T E	T E	T E		T E	T E		T
Societal competences	Act in an ethical, professional and social way.	T 7 E 5				T	Т								T E					T			Т	T		T
	own engineering discipline.	T 7 E 6				T E	Т				T E				T E	T E	T E			T E				_		
	Understand the historical evolution of the own engineering discipline and its social relevance.	T 6 E 4				T E									Т	T E				T E				Т		T E
Profession-specific competence		T 10 E 10	T E	T E	T E	T E	T E	T E							T E					T E			T E			T E
	Reconcile conflicting specifications and prior conditions in a high quality and innovative concept or process.	T 6 E 6				T E	T E								T E			T E					T E			T E
	Synthesize incomplete, contradictory or redundant data into useful information.	T 12 E 12	T E			T E	T E						T E	T E	T E	T E	T E				T E		T E	T E		T E
	Possess sufficient ready knowledge and understanding to evaluate the results of complex calculations, or make approximate	T 17 E 15	T E	T E		T E	T E	T E	Т	T E				T E	T E		T E		T E	T E	T E		Т	T E	T E	T E

Profession-specific competence Pay attention to entire life cycles of systems, machines, and processes. Pay attention to sustainability, energyefficiency, environmental cost, use of raw materials and labour costs. Pay attention to all aspects of reliability, safety, and ergonomics. Pay attention to all aspects of reliability, safety, and ergonomics. Pay attention to all aspects of reliability, safety, and ergonomics. Table 1 E Table 2 Table 3 Table 4 E Table 5 E Table 5 E Table 7 Table 8 Table	GHENT UNIVERSITY Master of Science in Civil Eng Academic year 2021-2022 Legend: T=teaching methods E=evaluation methods	ineering		E044940 FEM and Constitutive Material Laws in Structural Engineering	E050923 Structural Reliability and Risk Analysis	E054920 Coastal Engineering and Harbour Construction	E044821 Advanced Bridge and Tunnel Engineering	E050100 Design of Civil Structures	E040661 Structural Dynamics	E045621 Groundwater and Contaminant Flow	E044311 Structural Stability	E045860 Water Management and Environment	E052621 Concrete Structures: Prestressed Concre Slabs	E054820 Inland Waterways and Locks	E052210 Geotechnics	E053560 Specialised Road Engineering and Mobility	E055044 Introduction to Maritime Technology (partim)	E044666 Offshore Structures	E055400 Coastal Hydrodynamics	E044671 Offshore Foundations	E054680 Dredging: Techniques and Processes	E061502 Spatial Structures	E044571 Non-linear and Plastic Methods of Structural Analysis	E044902 Conceptual Design	E044930 Seismic Design	E044631 Glass and Facade Structures	E091103 Master's Dissertation
cost, use of raw materials and labour costs. E 4																T E				T E							
Have insight into and understanding of the importance of entrepreneurship. Show perseverance, innovativeness, and an aptitude for creating added value. Be able to perform design and/or research independently in a broad range of advanced civil engineering working situations. Be aware of the social responsibility of a civil engineer. E E E E E E E E E E E E E E E E E E E																											
entrepreneurship. Show perseverance, innovativeness, and an aptitude for creating added value. E66 E E Be able to perform design and/or research independently in a broad range of advanced civil engineering working situations. Be aware of the social responsibility of a civil engineer. T1 T2 T3 T4 T5 E4 EE T7 T7 T7 T7 T7 T7 T7 T7 T7	Pay atte	ntion to all aspects of reliability, safety, and ergonomics.			-		-	Т																Т	Т		
added value. E 6 E E E E E E E E E E E E E E E E E			T 2					Т																Т			
broad range of advanced civil engineering working situations. E 4 Be aware of the social responsibility of a civil engineer. T9 T T T T T T T T T T T T T T T T T							- 1				Т					E				T E				1			T E
E5 E E E E E E	Be able broad ra	to perform design and/or research independently in a nge of advanced civil engineering working situations.														-								Т			T E
W 20 W 13 W 9 W 37 W 35 W 10 W 14 W 13 W 7 W 10 W 5 W 12 W 31 W 10 W 9 W 6 W 18 W 18 W 11 W 6 W 32 W 20 W 10 W 3	Be awar	e of the social responsibility of a civil engineer.			Т		Т	Т		Т		Т				-								Т	Т		Т

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	evonden in de studiefiche		
E044940 FEM and Constitutive Material Laws in Structura Engineering		written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E050923 Structural Reliability and Risk Analysis	guided self-study seminar lecture	open book examination report oral examination	Being able to apply Monte Carlo simulations for the determination of failure probabilities. Being able to apply Bayesian decision theory to structural engineering applications. Understanding the difference between structural reliability methods of level 1, 2 and 3. Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods of level 2 and 3. Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes. Understanding the influence of uncertainties in structural design. Being able to apply fault and event trees to structural engineering applications. Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural applications.
E054920 Coastal Engineering and Harbour Construction	group work lecture	oral examination report	Design coastal structures along the coastline and in the sea, in particular breakwaters, and understand the construction processes. Describe and argue the coastal hydrodynamic processes, in particular waves and (tidal) currents and their interaction with coastal structures. Report (written and oral) the results from a design project.
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop ar opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E040661 Structural Dynamics	guided self-study seminar: coached exercises practicum lecture	written examination oral examination	Apply modelstructure preserving reduction techniques. Apply Matlab for structural dynamics. Identify modal parameters from experiments. Perform a modal analysis of a structure and formulate structural modifications. Calculate vibration levels of civil structures when they are subjected to dynamic loads of different nature. Design of vibration isolation and vibration absorption devices. Model structures based on Lagrange's technique.

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	project	report open book examination	To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented.
E044930 Seismic Design	lecture lecture seminar: coached exercises	written examination with open questions	Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to apply EN 1998-1 in a suitable way
E044902 Conceptual Design	group work	open book examination	Explain the notions: plastic hinge, collapse mechanism, safe and statically admissible distribution of bending moments, kinematically possible mechanism, the real collapse mechanism. Demonstrate the basic principles of the yield line theory. Derive kinematically admissible yield line patterns for isotropic and orthotropic slabs. Asses the factors which influence the plastic rotation capacity of reinforced concrete sections. Derive simplified ductility conditions. Elucidate the basic principles of moment redistribution in continuous reinforced concrete beams. Substantiate the influence on the reinforcement distribution. Direct calculation of the ultimate load of simple continuous beams and frames. Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model
E044571 Non-linear and Plastic Methods of Structural Analysis	lecture seminar	open book examination oral examination	Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions. Have insight in the basic principles of limit analysis. Demonstrate the differences with a linear elastic analysis. Perform a step by step calculation of the collapse load with estimation of the deflections just prior to collapse.
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	standards. Knowledge of the various offshore foundation concepts and how to design these. Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies.
E044671 Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation
E055400 Coastal Hydrodynamics	lecture	open book examination report	To have knowledge of and insight in basic engineering usage of coastal hydrodynamics (waves, currents and sediment transport) as loading conditions for nearshore and offshore structures. Analyse physical model testing in the laboratory wave flume and wave tank. Apply wave propagation modelling tools as design tool.
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E052210 Geotechnics E053560 Specialised Road Engineering and Mobility	guided self-study seminar: coached exercises lecture	written examination	Evaluating deep foundations Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials
	project lecture		Knowing the different types of lock filling-emptying systems and having insight into their respective range of applicability Having insight into the respective mode of operation of mitre gates and rolling gates and into the load transfer Being able to discern the major components of mitre gates and rolling gates Being able to discern the major components of a navigation lock and knowing their function Having insight into the role of the water balance and the soil balance in the design of a canal Knowing the different means of infrastructural measures to improve the navigability of a river (river training, normalization, canalization) and their respective range of applicability Having insight into factors influencing the geometrical characteristics of a waterway, including lock-complexes
E054820 Inland Waterways and Locks	guided self-study seminar	oral examination report	Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a prestressing tendon on a concrete beam. Derive the the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the eccentricity can be determined by a stepwise procedure. Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Substantiate the influence of prestressing on the shear resistance of beams. Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages. Being familiar with the most important terminology of (maritime and inland) navigation and with the CEMT classification of inland waterways
E052621 Concrete Structures: Prestressed Concrete and Slabs	guided self-study seminar: coached exercises lecture	oral examination	Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding and excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures. Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material laws Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders. Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indeterminate systems.
E044311 Structural Stability	guided self-study seminar: coached exercises lecture	written examination oral examination open book examination	degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flow, multiphase flow, transient flow To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable). To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems.
E043021 Groundwater and Contaminant Flow	seminar: coached exercises lecture group work	report	stress, Retention curve; erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical behavior of unsaturated soils. SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determination of flow characteristics out of pump tests; design of barriers against the transport of contaminants INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater pressure and the saturation
E045621 Groundwater and Contaminant Flow	guided self-study	oral examination	DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, suction

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E091103 Master's Dissertation master's dissertation oral examination assignment Define, study and analyse the research problem in a specific domain.

Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance.

Self-assessment with adequate and critical self-correction and objectivity.

Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople.

Render and synthesise the results concisely.

Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the

reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,...). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	vonden in de studiefiche		
E044940 FEM and Constitutive Material Laws in Structural Engineering	guided self-study seminar: practical PC room classes lecture	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E050923 Structural Reliability and Risk Analysis	seminar	open book examination	Being able to apply Monte Carlo simulations for the determination of failure probabilities. Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods of level 2 and 3.
E044821 Advanced Bridge and Tunnel Engineering	lecture online lecture PDE tutorial microteaching	oral examination report peer assessment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop at opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridge (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E040661 Structural Dynamics	practicum		Apply Matlab for structural dynamics.
E045621 Groundwater and Contaminant Flow	guided self-study seminar: coached exercises lecture group work	oral examination report	DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, suction stress, Retention curve; erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical behavior of unsaturated soils. SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determination of flow characteristics out of pump tests; design of barriers against the transport of contaminants INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater pressure and the saturation degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flow multiphase flow, transient flow
E053560 Specialised Road Engineering and Mobility		assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understandin of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E044671 Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures

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Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evalua	atievormen voorafgegaan door ** werden niet terugge	vonden in de studiefiche		
E044940 FEM a	and Constitutive Material Laws in Structural	auided self-study	written examination	Be able to make appropriate choices with respect to the element mesh and solution method.
	eering	seminar: practical PC room classes		Gain an insight into the working and possibilities of finite element methods.
_	-	lecture	_	Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results
				Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural
				engineering applications.
E044004 Ash sa	and Dridge and Transpl Continues	and a death at the		Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
=044821 Advar	nced Bridge and Tunnel Engineering	guided self-study PDE tutorial	oral examination report	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary
		microteaching	peer assessment	conditions from a technical as well as non-technical nature.
		lecture	assignment	Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop a
			3	opinion about the subject.
				Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and
				general buckling,
				suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridge (connectors, stay cable
				bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,)
				Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial
				concept. Knowing the crucial
				elements of the design and understanding them.
E050100 Desig	n of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a structure.
				Detect the function and use of construction parts and place them in the whole structure
				Apply independently the knowledge acquired from other courses to real structures
E040661 Struct	tural Dynamics	lecture	written examination	Apply modelstructure preserving reduction techniques.
		seminar: coached exercises practicum	oral examination	Identify modal parameters from experiments. Perform a modal analysis of a structure and formulate structural modifications.
		practicum		Calculate vibration levels of civil structures when they are subjected to dynamic loads of different nature.
				Design of vibration isolation and vibration absorption devices.
E045621 Groun	ndwater and Contaminant Flow	guided self-study		DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, suction
		seminar: coached exercises		stress, Retention curve;
		lecture		erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical
		group work		behavior of unsaturated soils.
				SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determination of flow characteristics out of
				pump tests; design of barriers against the transport of contaminants
				INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater
				pressure and the saturation
				degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flow
				multiphase flow, transient
E052621 Concr	rete Structures: Prestressed Concrete and	guided self-study	oral examination	flow Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material law
Slabs		seminar: coached exercises	oral examination	Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders.
5.55		lecture		Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indeterminate
				systems.
				Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a
				prestressing tendon on a concrete
				beam. Derive the the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the
				eccentricity can be determined
				by a stepwise procedure.
				Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic
				safety format. Identify and
				characterize the relevant limit states.
				Substantiate the influence of prestressing on the shear resistance of beams.
E044902 Conce	entual Design	group work		Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages. Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model
LUTTOUZ CUITCE	opidai Desigii	lecture		Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts
				Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural
				analysis; build a physical model of
				an advanced concept; develop original concepts for structures
E044930 Seism	nic Design	lecture		Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design
		seminar: coached exercises		To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is
		project		prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality
				preserved during the life
				of the structure.
E091103 Maste	er's Dissertation	master's dissertation	oral examination	Define, study and analyse the research problem in a specific domain.
			assignment	Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance.
				Self-assessment with adequate and critical self-correction and objectivity.
				Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to
				laypeople.
				Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search,
				topical study, research and the
				reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,).
				Tolloction on the recognition, experimental experimentations, accidence control to account to the recognition of the recognitio

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg			
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop a opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridge (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E052621 Concrete Structures: Prestressed Concrete and Slabs	guided self-study seminar: coached exercises lecture	oral examination	Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material law Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders. Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indeterminate systems. Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a prestressing tendon on a concrete beam. Derive the the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the eccentricity can be determined by a stepwise procedure. Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Substantiate the influence of prestressing on the shear resistance of beams. Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages.
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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<<	EMingwClVI1.3 Having the attitude to use soci	ial sciences in an inventive	or innovative way during the pro	ocess of design and research
Course	Teaching me	nethods Evaluation	n methods Course learning	outcome

Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	evonden in de studiefiche		
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E052621 Concrete Structures: Prestressed Concrete and Slabs	guided self-study seminar: coached exercises lecture	oral examination	Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material laws Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders. Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indeterminate systems. Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a prestressing tendon on a concrete beam. Derive the the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the eccentricity can be determined by a stepwise procedure. Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Substantiate the influence of prestressing on the shear resistance of beams. Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages.
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044930 Seismic Design	lecture seminar: coached exercises project		Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to apply EN 1998-1 in a suitable way To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is preserved during the life of the structure.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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		<u> </u>	Competences in one/more scientific discip
Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods evonden in de studiefiche	Evaluation methods	Course learning outcome
E044940 FEM and Constitutive Material Laws in Structura Engineering		written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained re Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and development.
	lecture	assignment	opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, loca general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite b (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the in concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E045621 Groundwater and Contaminant Flow	guided self-study seminar: coached exercises lecture group work		DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, s stress, Retention curve; erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical behavior of unsaturated soils. SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determine of flow characteristics out of
			pump tests; design of barriers against the transport of contaminants INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater pressure and the saturation degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and couple multiphase flow, transient flow
E044311 Structural Stability	guided self-study seminar: coached exercises lecture	written examination oral examination open book examination	To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable). To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, foldin excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.
E052621 Concrete Structures: Prestressed Concrete and Slabs	guided self-study seminar: coached exercises lecture		Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders. Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indeterm systems. Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a prestressing tendon on a concrete beam.
			Derive the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the eccentricity can be determined by a stepwise procedure. Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Substantiate the influence of prestressing on the shear resistance of beams. Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages.
E052210 Geotechnics	guided self-study seminar: coached exercises lecture	written examination	Evaluating deep foundations Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understand the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E044671 Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E061502 Spatial Structures	lecture seminar: coached exercises	written examination open book examination	Analyse and design spatial structures using simplified methods.
E044902 Conceptual Design	group work lecture		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044930 Seismic Design	lecture seminar: coached exercises project	written examination with open questions report open book examination	Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that function preserved during the life of the structure.

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E044631 Glass and Facade Structures	lecture	oral examination	Design conceptually and structurally correct glass structures and facade structures. Recognise and apply basic principles of holistic facade design Recognise, denominate and explain frequent glass pathologies. Perform strength and stability checks of elementary glass and facade components and connections. Explain construction and structural concepts.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	Teaching methods ggevonden in de studiefiche	Evaluation methods	Course learning outcome
E044940 FEM and Constitutive Material Laws in Structu Engineering		written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E050923 Structural Reliability and Risk Analysis	guided self-study seminar lecture	open book examination report oral examination	Being able to apply Monte Carlo simulations for the determination of failure probabilities. Being able to apply Bayesian decision theory to structural engineering applications. Understanding the difference between structural reliability methods of level 1, 2 and 3. Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods of level 2 and 3. Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes. Understanding the influence of uncertainties in structural design. Being able to apply fault and event trees to structural engineering applications. Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural applications.
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E045621 Groundwater and Contaminant Flow	guided self-study seminar: coached exercises lecture group work	oral examination report	DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, suction stress, Retention curve; erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical behavior of unsaturated soils. SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determination of flow characteristics out of pump tests; design of barriers against the transport of contaminants INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater pressure and the saturation degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flow multiphase flow, transient flow
E044311 Structural Stability	guided self-study seminar: coached exercises lecture	written examination oral examination open book examination	To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable). To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding and excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.
E053560 Specialised Road Engineering and Mobility	guided self-study lecture		The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E044666 Offshore Structures	group work lecture	open book examination report oral examination	CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energy; renewable energy SKILLS: design of offshore structures INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on piles; insight in potential and problems related to offshore constructions; renewable energies
044671 Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044930 Seismic Design	lecture seminar: coached exercises project	written examination with open questions report open book examination	Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality preserved during the life of the structure.

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E091103 Master's Dissertation master's dissertation oral examination assignment Define, study and analyse the research problem in a specific domain.

Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance.

Self-assessment with adequate and critical self-correction and objectivity.

Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople.

Render and synthesise the results concisely.

Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the

reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,...). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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<<	EMingwCIVI1.6 Be familiar with behaviour of materials, models of materials and the application of materials in complex constructions

Competences in one/more scientific discipline(s)

Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods vonden in de studiefiche	Evaluation methods	Course learning outcome
E044940 FEM and Constitutive Material Laws in Structural Engineering	seminar: practical PC room classes	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial	oral examination	engineering applications. Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary.
	microteaching	report peer assessment	influence of several boundary conditions from a technical as well as non-technical nature.
	lecture	assignment	Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an
			opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and
			general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges
			(connectors, stay cable
			bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial
			concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination	Design constructions autonomously; analyse and calculate independently components of a structure.
		report	Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E045621 Groundwater and Contaminant Flow	guided self-study		DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, suction
	seminar: coached exercises lecture		stress, Retention curve; erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical
	group work		behavior of unsaturated soils.
			SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determination of flow characteristics out of
			pump tests; design of barriers against the transport of contaminants
			INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater pressure and the saturation
			degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flow,
			multiphase flow, transient flow
E052210 Geotechnics	guided self-study	written examination	Evaluating deep foundations
	seminar: coached exercises lecture		Designing deep foundations Designing common ground improvement techniques applications
			Evaluating common ground improvement techniques applications
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations
		Goo.go	The student must be able to understand tender documents.
			The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding
			of the relationship between
E044671 Offshore Foundations	group work		mobility, infrastructure and space and on the knowledge of relevant paradigms The possibility to combine the knowledge in a project with analytical and numerical calculations.
E044071 Offshore Foundations	lecture		What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some
			knowledge on the calculation standards.
			Knowledge of the various offshore foundation concepts and how to design these.
E061502 Spatial Structures	lecture seminar: coached exercises	written examination	Analyse and design spatial structures using simplified methods. Use three-dimensional thinking with respect to structural design and analysis.
	Seminar. Coached exercises	report assignment	Understand the behaviour, formfinding, design and erection methods of spatial structures.
E044571 Non-linear and Plastic Methods of Structural	lecture	open book examination open book examination	Have insight in the basic principles of limit analysis. Demonstrate the differences with a linear elastic analysis.
Analysis	seminar	oral examination	Perform a step by step calculation of the collapse load with estimation of the deflections just prior to collapse.
			Explain the notions: plastic hinge, collapse mechanism, safe and statically admissible distribution of bending moments, kinematically possible mechanism,
			the real collapse mechanism.
			Demonstrate the basic principles of the yield line theory. Derive kinematically admissible yield line patterns for isotropic and orthotropic slabs.
			Asses the factors which influence the plastic rotation capacity of reinforced concrete sections. Derive simplified ductility
			conditions. Elucidate the basic principles of moment redistribution in continuous reinforced concrete beams. Substantiate the influence on
			the reinforcement
			distribution. Direct calculation of the ultimate load of simple continuous beams and frames.
E044902 Conceptual Design	group work	open book examination	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model
	lecture	report assignment	Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural
		assignment	analysis; build a physical model of
E044930 Seismic Design	lecture	written examination with open	an advanced concept; develop original concepts for structures Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design
EUTTOU GEIGITIIC DESIGN	seminar: coached exercises	questions	To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is
	project	report open book examination	prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is
		open book examination	preserved during the life
E044631 Glass and Facade Structures	lecture	oral examination	of the structure. Design conceptually and structurally correct glass structures and facade structures.
			Recognise and apply basic principles of holistic facade design Recognise, denominate and explain frequent glass pathologies.
			Perform strength and stability checks of elementary glass and facade components and connections.
E004402 Mantaria Discontation	manataule disease de Cara	and assemble Co.	Explain construction and structural concepts.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance.
		J	Self-assessment with adequate and critical self-correction and objectivity.
			Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to
			Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely.
			Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople.

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Course	Teaching methods	Evaluation methods	Course learning outcome
loot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg			
054920 Coastal Engineering and Harbour Construction	group work	oral examination	Design coastal structures along the coastline and in the sea, in particular breakwaters, and understand the construction
004520 Coastal Engineering and Halbour Constitution	lecture	report	processes.
			Describe and argue the coastal hydrodynamic processes, in particular waves and (tidal) currents and their interaction with coastal structures. Report (written and oral) the results from a design project.
045621 Groundwater and Contaminant Flow	guided self-study	oral examination	DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, suction
	seminar: coached exercises lecture group work	report	stress, Retention curve; erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical behavior of unsaturated soils.
	•		SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determinatio of flow characteristics out of
			pump tests; design of barriers against the transport of contaminants INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater pressure and the saturation
			degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flow multiphase flow, transient flow
045860 Water Management and Environment	guided self-study	open book examination	INSIGHT: Schelde estuary
	seminar: coached exercises lecture	report oral examination	SKILLS: Simulation of tides in a river INSIGHT: sediment transport
	group work		INSIGHT: tides and tides in rivers
			SKILLS: Regulation of flood waves
			CONCEPTS: Flood management, water quality, hydrology of wetlands INSIGHT: waves
			CONCEPTS: European Water Framework Directive; environmentally friendly structures SKILLS: Design of sandtraps
054820 Inland Waterways and Locks	guided self-study seminar	oral examination report	Being familiar with the most important terminology of (maritime and inland) navigation and with the CEMT classification of inla waterways
	project lecture		Knowing the different types of lock filling-emptying systems and having insight into their respective range of applicability Having insight into the respective mode of operation of mitre gates and rolling gates and into the load transfer Being able to discern the major components of mitre gates and rolling gates
			Being able to discern the major components of a navigation lock and knowing their function
			Having insight into the role of the water balance and the soil balance in the design of a canal
			Knowing the different means of infrastructural measures to improve the navigability of a river (river training, normalization, canalization) and their respective
			range of applicability
055044 Introduction to Maritime Technology (partim)	lecture	oral examination	Having insight into factors influencing the geometrical characteristics of a waterway, including lock-complexes Reason out the manoeuvring behaviour of a ship. Distinguish the most important characteristics of a ship's steering equipment
103044 Introduction to Mantine Technology (partin)	lecture	oral examination	(rudder). Define the main
			techniques used to determine and evaluate a ship' smanoeuvring behaviour.
			Distinguish the most important physical causes of a ship's resistance. Reason out the most important parameters on which a ship's resistance depends.
			Define and recognise the most usual technologies used for a ship's propulsion.
			Get acquinted with the specific hydrodynamic behaviour of a ship in shallow and confined navigation areas.
			Give an explanation for the dynamic behaviour of a floating structure in waves. Be able to use professional terminology with respect to the behaviour of
			floating structures in waves.
OFF 400. On a stall lively a drop of the	In atoms	and had a second	Gain insight into hydrostatics and stability of floating structures.
055400 Coastal Hydrodynamics	lecture	open book examination report	To have knowledge of and insight in basic engineering usage of coastal hydrodynamics (waves, currents and sediment transport) as loading conditions for
		- I	nearshore and offshore structures.
			Analyse physical model testing in the laboratory wave flume and wave tank. Apply wave propagation modelling tools as design tool.

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Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	Teaching methods gevonden in de studiefiche	Evaluation methods	Course learning outcome
E044940 FEM and Constitutive Material Laws in Structure		written examination	Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural
Engineering	seminar: practical PC room classes lecture	assignment	engineering applications. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results
E050923 Structural Reliability and Risk Analysis	guided self-study	oral examination	Being able to apply Monte Carlo simulations for the determination of failure probabilities.
·	seminar		Being able to apply Bayesian decision theory to structural engineering applications.
	lecture		Understanding the difference between structural reliability methods of level 1, 2 and 3.
			Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods of level 2 and 3.
			Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes.
			Understanding the influence of uncertainties in structural design.
			Being able to apply fault and event trees to structural engineering applications.
			Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural applications.
E044821 Advanced Bridge and Tunnel Engineering	guided self-study	oral examination	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the
	PDE tutorial	report	influence of several boundary
	microteaching	peer assessment	conditions from a technical as well as non-technical nature.
	lecture	assignment	Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject.
			Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and
			general buckling,
			suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges
			(connectors, stay cable
			bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial
			concept. Knowing the crucial
			elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination	Design constructions autonomously; analyse and calculate independently components of a structure.
		report	Detect the function and use of construction parts and place them in the whole structure
F040664 Characterial Description	looturo	written aversing the	Apply independently the knowledge acquired from other courses to real structures
E040661 Structural Dynamics	lecture seminar: coached exercises	written examination oral examination	Calculate vibration levels of civil structures when they are subjected to dynamic loads of different nature. Perform a modal analysis of a structure and formulate structural modifications.
	practicum	oral examination	i Gnorm a mouar analysis of a structure and formulate structural mounications.
E045621 Groundwater and Contaminant Flow	guided self-study	oral examination	DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, suction
	seminar: coached exercises	report	stress, Retention curve;
	lecture	-	erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical
	group work		behavior of unsaturated soils.
			SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determination of flow characteristics out of
			pump tests; design of barriers against the transport of contaminants
			INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater
			pressure and the saturation
			degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flow,
			multiphase flow, transient flow
E044311 Structural Stability	guided self-study	written examination	To be able to design and to calculate a frame taking into account geometrically non linear behaviour.
•	seminar: coached exercises	oral examination	To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable).
	lecture	open book examination	To understand the effect of imperfections on the behaviour of structures.
			Being able to solve basic instability problems. Being able to design a twofold compression member.
			Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding and
			excentric compression.
			To understand and to be able to apply the theory of non linear behaviour of structures.
E052210 Geotechnics	guided self-study	written examination	Evaluating deep foundations
E052210 Geotechnics	seminar: coached exercises	written examination	Designing deep foundations
E052210 Geotechnics	,	written examination	
	seminar: coached exercises	written examination oral examination	Designing deep foundations Designing common ground improvement techniques applications
	seminar: coached exercises lecture		Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations
	seminar: coached exercises lecture guided self-study	oral examination	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents.
E052210 Geotechnics E053560 Specialised Road Engineering and Mobility	seminar: coached exercises lecture guided self-study	oral examination	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure
	seminar: coached exercises lecture guided self-study	oral examination	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents.
E053560 Specialised Road Engineering and Mobility	seminar: coached exercises lecture guided self-study lecture	oral examination assignment	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
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E053560 Specialised Road Engineering and Mobility E055044 Introduction to Maritime Technology (partim)	seminar: coached exercises lecture guided self-study lecture seminar: coached exercises	oral examination assignment open book examination report	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms Analyse specific problems concerning hydrostatics and stability of a simple floating structure.
	seminar: coached exercises lecture guided self-study lecture seminar: coached exercises group work	oral examination assignment open book examination report oral examination	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms Analyse specific problems concerning hydrostatics and stability of a simple floating structure. The possibility to combine the knowledge in a project with analytical and numerical calculations.
E053560 Specialised Road Engineering and Mobility E055044 Introduction to Maritime Technology (partim)	seminar: coached exercises lecture guided self-study lecture seminar: coached exercises	oral examination assignment open book examination report oral examination report	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms Analyse specific problems concerning hydrostatics and stability of a simple floating structure. The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some
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E053560 Specialised Road Engineering and Mobility E055044 Introduction to Maritime Technology (partim) E044671 Offshore Foundations	seminar: coached exercises lecture guided self-study lecture seminar: coached exercises group work	oral examination assignment open book examination report oral examination report	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms Analyse specific problems concerning hydrostatics and stability of a simple floating structure. The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
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E053560 Specialised Road Engineering and Mobility E055044 Introduction to Maritime Technology (partim) E044671 Offshore Foundations E054680 Dredging: Techniques and Processes E044902 Conceptual Design	seminar: coached exercises lecture guided self-study lecture seminar: coached exercises group work lecture lecture group work group work	oral examination assignment open book examination report oral examination report assignment written examination open book examination open book examination	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms Analyse specific problems concerning hydrostatics and stability of a simple floating structure. The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these. Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions. Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for
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E053560 Specialised Road Engineering and Mobility E055044 Introduction to Maritime Technology (partim) E044671 Offshore Foundations E054680 Dredging: Techniques and Processes	seminar: coached exercises lecture guided self-study lecture seminar: coached exercises group work lecture lecture group work lecture group work lecture	oral examination assignment open book examination report oral examination report assignment written examination open book examination open book examination	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms Analyse specific problems concerning hydrostatics and stability of a simple floating structure. The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these. Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depending on dredger type, installed power and soil conditions. Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis
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EMingwALG2.2 Consult the scientific literature as part of the own research.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru			
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E045860 Water Management and Environment	guided self-study seminar: coached exercises lecture group work	open book examination report oral examination	INSIGHT: Schelde estuary SKILLS: Simulation of tides in a river INSIGHT: sediment transport INSIGHT: tides and tides in rivers SKILLS: Regulation of flood waves CONCEPTS: Flood management, water quality, hydrology of wetlands INSIGHT: waves CONCEPTS: European Water Framework Directive; environmentally friendly structures SKILLS: Design of sandtraps
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E061502 Spatial Structures	seminar: coached exercises	report	Analyse and design spatial structures using simplified methods. Understand the behaviour, formfinding, design and erection methods of spatial structures.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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<<	EMingwALG2.3 Select and apply the appropriate models, methods and techniques.	Scientific competences
1		

			Course Issuering outcome
Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods vonden in de studiefiche	Evaluation methods	Course learning outcome
E044940 FEM and Constitutive Material Laws in Structural Engineering		written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E050923 Structural Reliability and Risk Analysis	guided self-study seminar lecture	open book examination oral examination	Being able to apply Monte Carlo simulations for the determination of failure probabilities. Being able to apply Bayesian decision theory to structural engineering applications. Understanding the difference between structural reliability methods of level 1, 2 and 3. Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods of level 2 and 3. Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes. Understanding the influence of uncertainties in structural design. Being able to apply fault and event trees to structural engineering applications. Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural applications.
E054920 Coastal Engineering and Harbour Construction	group work	report	Design coastal structures along the coastline and in the sea, in particular breakwaters, and understand the construction
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E040661 Structural Dynamics	guided self-study seminar: coached exercises practicum lecture	written examination oral examination	Apply modelstructure preserving reduction techniques. Apply Matlab for structural dynamics. Identify modal parameters from experiments. Perform a modal analysis of a structure and formulate structural modifications. Calculate vibration levels of civil structures when they are subjected to dynamic loads of different nature. Design of vibration isolation and vibration absorption devices. Model structures based on Lagrange's technique.
E045621 Groundwater and Contaminant Flow	guided self-study seminar: coached exercises lecture group work	oral examination report	DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, suction stress, Retention curve; erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical behavior of unsaturated soils. SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determination of flow characteristics out of pump tests; design of barriers against the transport of contaminants INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater pressure and the saturation degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flow multiphase flow, transient flow
E044311 Structural Stability	guided self-study seminar: coached exercises lecture	written examination oral examination open book examination	To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable). To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding and excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.
E045860 Water Management and Environment	guided self-study seminar: coached exercises lecture group work	open book examination report oral examination	INSIGHT: Schelde estuary SKILLS: Simulation of tides in a river INSIGHT: sediment transport INSIGHT: tides and tides in rivers SKILLS: Regulation of flood waves CONCEPTS: Flood management, water quality, hydrology of wetlands INSIGHT: waves CONCEPTS: European Water Framework Directive; environmentally friendly structures SKILLS: Design of sandtraps
E052621 Concrete Structures: Prestressed Concrete and Slabs	guided self-study seminar: coached exercises lecture	oral examination	Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material law Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders. Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indeterminate systems. Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a prestressing tendon on a concrete beam. Derive the the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the eccentricity can be determined by a stepwise procedure. Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Substantiate the influence of prestressing on the shear resistance of beams.
E052210 Geotechnics	guided self-study seminar: coached exercises lecture	written examination	Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages. Evaluating deep foundations Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications

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E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E055044 Introduction to Maritime Technology (partim)	guided self-study seminar: coached exercises	open book examination report	Analyse specific problems concerning hydrostatics and stability of a simple floating structure. Execute hydrostatic calculations and stability calculations for a pontoon by means of specialised software.
E044666 Offshore Structures	group work lecture	open book examination report oral examination	CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energy; renewable energy SKILLS: design of offshore structures INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on piles; insight in potential and problems related to offshore constructions; renewable energies
E044671 Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E061502 Spatial Structures	lecture seminar: coached exercises	written examination report open book examination	Analyse and design spatial structures using simplified methods.
E044571 Non-linear and Plastic Methods of Structural Analysis	lecture seminar	open book examination oral examination	Have insight in the basic principles of limit analysis. Demonstrate the differences with a linear elastic analysis. Perform a step by step calculation of the collapse load with estimation of the deflections just prior to collapse. Explain the notions: plastic hinge, collapse mechanism, safe and statically admissible distribution of bending moments, kinematically possible mechanism, the real collapse mechanism. Demonstrate the basic principles of the yield line theory. Derive kinematically admissible yield line patterns for isotropic and orthotropic slabs. Asses the factors which influence the plastic rotation capacity of reinforced concrete sections. Derive simplified ductility conditions. Elucidate the basic principles of moment redistribution in continuous reinforced concrete beams. Substantiate the influence on the reinforcement distribution. Direct calculation of the ultimate load of simple continuous beams and frames.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044930 Seismic Design	lecture seminar: coached exercises project	written examination with open questions report open book examination	Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to apply EN 1998-1 in a suitable way To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is preserved during the life of the structure.
E044631 Glass and Facade Structures	lecture	oral examination	Design conceptually and structurally correct glass structures and facade structures. Recognise and apply basic principles of holistic facade design Recognise, denominate and explain frequent glass pathologies. Perform strength and stability checks of elementary glass and facade components and connections. Explain construction and structural concepts.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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FMingwAl G2 4 Develop and validate mathematical models and methods

Course		Teaching methods	Evaluation methods	Course learning outcome
	en evaluatievormen voorafgegaan door ** werden niet terugge		Lvaluation methods	Course learning outcome
	FEM and Constitutive Material Laws in Structural Engineering	I guided self-study seminar: practical PC room classes lecture	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications.
E050923	Structural Reliability and Risk Analysis	guided self-study lecture	oral examination	Gain a critic insight about the application possibilities of different types of elements for structural engineering applications. Being able to apply Monte Carlo simulations for the determination of failure probabilities. Being able to apply Bayesian decision theory to structural engineering applications. Understanding the difference between structural reliability methods of level 1, 2 and 3. Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods of level 2 and 3. Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes. Understanding the influence of uncertainties in structural design. Being able to apply fault and event trees to structural engineering applications. Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural
E044821	Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100	Design of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E052210	Geotechnics	guided self-study seminar: coached exercises lecture	written examination	Evaluating deep foundations Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications
E044671	Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
E044902	Conceptual Design	group work lecture		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures

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EMingwALG2.5 Interpret research findings in an objective and critical manner. <<

Scientific competences

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge		Evaluation methods	Course learning outcome
vooi. leer- en evaluatievormen vooralgegaan door - werden niet terugge	vonden in de studienche		
E044940 FEM and Constitutive Material Laws in Structural Engineering	guided self-study seminar: practical PC room classes lecture	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E044902 Conceptual Design	group work lecture		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods evonden in de studiefiche	Evaluation methods	Course learning outcome	
E044940 FEM and Constitutive Material Laws in Structura Engineering	I guided self-study seminar: practical PC room classes lecture	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtain Know and be able to differentiate the different material laws and be able to indicate their suitability for different struct engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.	tural
E050923 Structural Reliability and Risk Analysis	seminar	report	Being able to apply Monte Carlo simulations for the determination of failure probabilities. Being able to apply Bayesian decision theory to structural engineering applications. Understanding the difference between structural reliability methods of level 1, 2 and 3. Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability relevel 2 and 3. Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes. Understanding the influence of uncertainties in structural design. Being able to apply fault and event trees to structural engineering applications. Understanding specific properties of series and parallel systems and being able to apply such schematisation in struapplications.	methods of
E054920 Coastal Engineering and Harbour Construction	group work	oral examination	Design coastal structures along the coastline and in the sea, in particular breakwaters, and understand the construction	tion
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	report oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders general buckling,	develop an
E050400 Decima of Oixil Otracture			suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) compo (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine concept. Knowing the crucial elements of the design and understanding them.	_
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures	
E045621 Groundwater and Contaminant Flow	guided self-study seminar: coached exercises lecture group work	oral examination report	DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capilla stress, Retention curve; erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechar behavior of unsaturated soils. SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; de of flow characteristics out of pump tests; design of barriers against the transport of contaminants INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundw pressure and the saturation degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and comultiphase flow, transient	nical termination
E044311 Structural Stability	guided self-study seminar: coached exercises lecture	written examination oral examination open book examination	To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstab To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.	·
E052621 Concrete Structures: Prestressed Concrete and Slabs	guided self-study seminar: coached exercises lecture	oral examination	Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and in Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders. Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indexystems. Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted beam. Derive the the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force are eccentricity can be determined by a stepwise procedure. Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probasifety format. Identify and characterize the relevant limit states. Substantiate the influence of prestressing on the shear resistance of beams. Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages.	eterminate by a and the
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the un of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms	derstandinç
E044666 Offshore Structures	group work lecture	open book examination report oral examination	CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energy; renewable energy SKILLS: design of offshore structures INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on piles; insight in potential ar related to offshore constructions; renewable energies	nd problems
E044671 Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.	some
E061502 Spatial Structures	lecture seminar: coached exercises	written examination report assignment open book examination	Analyse and design spatial structures using simplified methods. Use three-dimensional thinking with respect to structural design and analysis. Understand the behaviour, formfinding, design and erection methods of spatial structures.	

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E044571 Non-linear and Plastic Methods of Structural Analysis	lecture seminar	open book examination oral examination	Have insight in the basic principles of limit analysis. Demonstrate the differences with a linear elastic analysis. Perform a step by step calculation of the collapse load with estimation of the deflections just prior to collapse. Explain the notions: plastic hinge, collapse mechanism, safe and statically admissible distribution of bending moments, kinematically possible mechanism, the real collapse mechanism. Demonstrate the basic principles of the yield line theory. Derive kinematically admissible yield line patterns for isotropic and orthotropic slabs. Asses the factors which influence the plastic rotation capacity of reinforced concrete sections. Derive simplified ductility conditions. Elucidate the basic principles of moment redistribution in continuous reinforced concrete beams. Substantiate the influence on the reinforcement distribution. Direct calculation of the ultimate load of simple continuous beams and frames.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044930 Seismic Design	lecture seminar: coached exercises project	written examination with open questions report open book examination	Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is preserved during the life of the structure.
E044631 Glass and Facade Structures	lecture	oral examination	Design conceptually and structurally correct glass structures and facade structures. Recognise and apply basic principles of holistic facade design Recognise, denominate and explain frequent glass pathologies. Perform strength and stability checks of elementary glass and facade components and connections. Explain construction and structural concepts.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course	Teaching methods	Evaluation methods	Course learning outcome	
loot: leer- en evaluatievormen voorafgegaan door ** werden niet teru				
E044821 Advanced Bridge and Tunnel Engineering	guided self-study	oral examination	Understand the impact on the overall design of certein elements from codes, construction n	pathods atc. Understand the
2044021 Advanced Bridge and Turner Engineering	PDE tutorial	report	influence of several boundary	iethous, etc. Oriderstand the
	microteaching	peer assessment	conditions from a technical as well as non-technical nature.	
	lecture	assignment	Being able to understand and discuss research material relevant to the course subject. Disc	cuss this with others and develop an
			opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts	distortion of hox girders, local and
			general buckling,	, distortion of box girders, local and
			suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerance	s, wind loads,) composite bridges
			(connectors, stay cable	ding)
			bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunne Designing a bridge in the most suited software package. Being able to reoport about this an	
			concept. Knowing the crucial	g
			elements of the design and understanding them.	
E050100 Design of Civil Structures	project	oral examination	Design constructions autonomously; analyse and calculate independently components of a Detect the function and use of construction parts and place them in the whole structure	structure.
		report	Apply independently the knowledge acquired from other courses to real structures	
E045621 Groundwater and Contaminant Flow	guided self-study		DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equ	uipotential height; capillarity, suction
	seminar: coached exercises		stress, Retention curve;	
	lecture		erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multi-	tiphase flow, soil mechanical
	group work		behavior of unsaturated soils. SKILLS: modelling of transport of groundwater, design of granular filters; concept and design	in of water extraction: determination
			of flow characteristics out of	,,
			pump tests; design of barriers against the transport of contaminants	a Constant of the constant of the
			INSIGHTS: application of numerical models; determination of the risk and causes of erosio pressure and the saturation	n, impact of the groundwater
			degree on the stability of the soil and underground structures, mass transport of contaminar	nts in groundwater and coupled flow,
			multiphase flow, transient	
E053560 Specialised Road Engineering and Mobility	guided self-study	oral examination	The student must be able to choose the most efficient materials	
2000000 Opecialised Road Engineering and Mobility	lecture	assignment	The student must be able to grasp the design problems for non-standard design situations	
		-	The student must be able to understand tender documents.	
			The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarif	fy them, based on the understanding
			of the relationship between	if them, based on the understanding
			mobility, infrastructure and space and on the knowledge of relevant paradigms	
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cut	
	Seminar. Coached exercises	open book examination	Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspe Knowledge of different contracts forms, pricing and project approach for dredging contracts	
			Understanding how various subprocesses are linked to each other and sees the dependent	cies.
			Calculating the production for the different types of dregders depeding on dredger type, inst	•
E044902 Conceptual Design	group work lecture	open book examination	Determine the list of requirements for a structure; develop basic concepts; assess experiments of sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention to generate alternatives for structures; persuing originality and additional sufficient attention	
	lecture	report assignment	Derive requirements for a concept, developed one-self; design a numerical model; use advantaged and address for a concept, developed one-self; design a numerical model; use advantaged and address for a concept, developed one-self; design a numerical model; use advantaged and address for a concept, developed one-self; design a numerical model; use advantaged and address for a concept, developed one-self; design a numerical model; use advantaged and address for a concept, developed one-self; design a numerical model; use advantaged and address for a concept, developed one-self; design a numerical model; use advantaged and address for a concept, developed one-self; design a numerical model; use advantaged and address for a concept, developed one-self; design a numerical model; use advantaged and address for a concept, developed one-self; design a numerical model; use advantaged and	
		S .	analysis; build a physical model of	
5044000 Octobris Bodie	Last as		an advanced concept; develop original concepts for structures	ata ata da ata a
E044930 Seismic Design	lecture seminar: coached exercises		Understand the differences, advantages and drawbacks of low dissipative and dissipative s To be able to apply EN 1998-1 in a suitable way	eismic design
	project		To be able to incorporate the probability of extreme earthquakes in the design such that col	lapse of the construction is
			prevented.	
			To be able to ensure elastic behavior of a steel and concrete construction under a moderate preserved during the life	e earthquake such that functionality is
			of the structure.	
E091103 Master's Dissertation	master's dissertation	oral examination	Define, study and analyse the research problem in a specific domain.	
		assignment	Give proof of independency, motivation, dedication, drive to innovation and creativity, initiating a self-appropriate and a his stirity.	ive and perseverance.
			Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found the	em, both to colleagues as to
			laypeople.	, zom to osnouguoo do to
			Render and synthesise the results concisely.	
			Critically analyse, formulate, study, execute and/or process different aspects in the execution topical study, research and the	on or research (literature search,
			reflection on the research, experiments, experimentations, designs, simulations, results, con	
			Find an appropriate methodology, in accordance with the applicable scientific norms of the	

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EMingwCIVI2.3 Assess, design, calculate and evaluate every building from foundations to construction in an integrated and multidisciplinary

Scientific co	ompetences
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Course	way.	Teaching methods	Evaluation methods	Course learning outcome
loot: leer- e	n evaluatievormen voorafgegaan door ** werden niet terugge			
E054920	Coastal Engineering and Harbour Construction	group work lecture	oral examination report	Design coastal structures along the coastline and in the sea, in particular breakwaters, and understand the construction processes.
		lecture	ιθροιτ	Describe and argue the coastal hydrodynamic processes, in particular waves and (tidal) currents and their interaction with coastal structures.
E044821	Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop ar opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial
				elements of the design and understanding them.
=050100	Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
052210	Geotechnics	guided self-study seminar: coached exercises lecture	written examination	Evaluating deep foundations Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications
053560	Specialised Road Engineering and Mobility	guided self-study lecture	oral examination	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E055400	Coastal Hydrodynamics	lecture	open book examination	To have knowledge of and insight in basic engineering usage of coastal hydrodynamics (waves, currents and sediment transport) as loading conditions for nearshore and offshore structures.
044671	Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
E044902	Conceptual Design	group work lecture		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
091103	Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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<<	EMingwALG3.1 Independently for	in an opinion on complex situa	ulons and problems, al	nu uciciiu iiiis poiiii oi view.	Intellectual competence
Course		Teaching methods	Evaluation methods	Course learning outcome	
loot: leer- er	n evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche			
	FEM and Constitutive Material Laws in Structu Engineering	ral guided self-study seminar: practical PC room classes lecture	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution me Be able to execute a FEM analysis of a simple application and be able to perform a crit Know and be able to differentiate the different material laws and be able to indicate the engineering applications. Gain a critic insight about the application possibilities of different types of elements for	tical assessment of the obtained results eir suitability for different structural
E050923 \$	Structural Reliability and Risk Analysis	guided self-study seminar lecture	oral examination report	Being able to apply Monte Carlo simulations for the determination of failure probabilitie Being able to apply Bayesian decision theory to structural engineering applications. Understanding the difference between structural reliability methods of level 1, 2 and 3. Being able to determine the failure probability of simple, but realistic, limit state equation level 2 and 3. Having insight into the background of the semi-probabilistic methodology used in the Sunderstanding the influence of uncertainties in structural design. Being able to apply fault and event trees to structural engineering applications. Understanding specific properties of series and parallel systems and being able to applications.	ons using structural reliability methods of structural Eurocodes.
E044821	Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construct influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, toler (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tolersigning a bridge in the most suited software package. Being able to reoport about the concept. Knowing the crucial elements of the design and understanding them.	. Discuss this with others and develop an bolts, distortion of box girders, local and ances, wind loads,) composite bridges tunneling,)
E050100 I	Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures	
E044311 \$	Structural Stability	guided self-study seminar: coached exercises lecture		To be able to design and to calculate a frame taking into account geometrically non line. To perceive possible instabilities and being able to find out the nature of the equilibrium. To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping tors excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.	n (stable, indifferent or unstable). ion, lateral torsional buckling, folding and
E053560 S	Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situati The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms	ions
E054680 I	Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting an Knowledge of dredging processes, pumps as used on dredging ships, and ecological a Knowledge of different contracts forms, pricing and project approach for dredging contruderstanding how various subprocesses are linked to each other and sees the dependence of the production for the different types of dregders depeding on dredger types.	aspects racts. ndencies.
E044902(Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess exp Give sufficient attention to generate alternatives for structures; persuing originality and Derive requirements for a concept, developed one-self; design a numerical model; use analysis; build a physical model of an advanced concept; develop original concepts for structures	perimentally physical model additional value in basic concepts
E091103 I	Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, in Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and foundaypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution on the research and the reflection on the research, experiments, experimentations, designs, simulations, results Find an appropriate methodology, in accordance with the applicable scientific norms of	d them, both to colleagues as to ecution of research (literature search, s, conclusions,).

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Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en e	valuatievormen voorafgegaan door ** werden niet terugge	evonden in de studiefiche		
E054920 Co	pastal Engineering and Harbour Construction	group work lecture	oral examination report	Design coastal structures along the coastline and in the sea, in particular breakwaters, and understand the construction processes. Describe and argue the coastal hydrodynamic processes, in particular waves and (tidal) currents and their interaction with
E044821 Ad	dvanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop ar opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial
E050100 De	esign of Civil Structures	project	oral examination report	elements of the design and understanding them. Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure
	oncrete Structures: Prestressed Concrete and abs	guided self-study seminar: coached exercises lecture		Apply independently the knowledge acquired from other courses to real structures Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material laws. Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders. Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indeterminate systems. Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a prestressing tendon on a concrete beam. Derive the the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the eccentricity can be determined by a stepwise procedure. Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Substantiate the influence of prestressing on the shear resistance of beams. Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages.
E052210 Ge	eotechnics	guided self-study seminar: coached exercises lecture	written examination	Evaluating deep foundations Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications
E053560 Sp	pecialised Road Engineering and Mobility	guided self-study lecture	oral examination	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E055400 Co	pastal Hydrodynamics	lecture	open book examination	To have knowledge of and insight in basic engineering usage of coastal hydrodynamics (waves, currents and sediment transport) as loading conditions for nearshore and offshore structures.
E044671 Of	fshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards.
E054680 Dr	redging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Knowledge of the various offshore foundation concepts and how to design these. Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E044902 Co	onceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044631 Gl	ass and Facade Structures	lecture	oral examination	Design conceptually and structurally correct glass structures and facade structures. Recognise and apply basic principles of holistic facade design Recognise, denominate and explain frequent glass pathologies. Perform strength and stability checks of elementary glass and facade components and connections. Explain construction and structural concepts.
E091103 Ma	aster's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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< EMingwALG3.3 Critically reflect on one's own way of thinking and acting, and understand the limits of one's competences.					Intellectual competences
Course		Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en	evaluatievormen voorafgegaan door ** werden niet terugge	evonden in de studiefiche			
	EM and Constitutive Material Laws in Structura Engineering	•	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical ass Know and be able to differentiate the different material laws and be able to indicate their suital engineering applications.	oility for different structural
E044821 A	Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Gain a critic insight about the application possibilities of different types of elements for structur. Understand the impact on the overall design of certein elements from codes, construction met influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discus opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, digeneral buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling Designing a bridge in the most suited software package. Being able to reoport about this and beconcept. Knowing the crucial elements of the design and understanding them.	s this with others and develop an stortion of box girders, local and wind loads,) composite bridges
E050100 D	Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a st Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures	ructure.
E045860 V	Vater Management and Environment	guided self-study seminar: coached exercises lecture group work	open book examination report oral examination	INSIGHT: Schelde estuary SKILLS: Simulation of tides in a river INSIGHT: sediment transport INSIGHT: tides and tides in rivers SKILLS: Regulation of flood waves CONCEPTS: Flood management, water quality, hydrology of wetlands INSIGHT: waves CONCEPTS: European Water Framework Directive; environmentally friendly structures SKILLS: Design of sandtraps	
E053560 S	Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify t of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms	hem, based on the understanding
E044666 C	Offshore Structures	group work lecture	open book examination report oral examination	CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energy; SKILLS: design of offshore structures INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on piles; related to offshore constructions; renewable energies	. ,
E044902 C	Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experiment Give sufficient attention to generate alternatives for structures; persuing originality and addition Derive requirements for a concept, developed one-self; design a numerical model; use advance analysis; build a physical model of an advanced concept; develop original concepts for structures	nal value in basic concepts
E044930 S	Seismic Design	lecture seminar: coached exercises project	written examination with open questions report open book examination	Understand the differences, advantages and drawbacks of low dissipative and dissipative seis To be able to apply EN 1998-1 in a suitable way To be able to incorporate the probability of extreme earthquakes in the design such that collap prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate e preserved during the life of the structure.	se of the construction is
E091103 N	Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclipind an appropriate methodology, in accordance with the applicable scientific norms of the specific control of the specific contr	both to colleagues as to of research (literature search,

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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods evonden in de studiefiche	Evaluation methods	Course learning outcome
		occianment	Do able to make appropriate abelians with respect to the element much and colution method
E044940 FEM and Constitutive Material Laws in Structura Engineering	seminar: practical PC room classes lecture	assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained rest Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial	oral examination report	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary
	microteaching lecture	peer assessment assignment	conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develo opinion about the subject.
			Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local signeral buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable
			bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the init concept. Knowing the crucial
E050100 Design of Civil Structures	project		elements of the design and understanding them. Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure
E045621 Groundwater and Contaminant Flow	guided self-study seminar: coached exercises		Apply independently the knowledge acquired from other courses to real structures DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, sur stress, Retention curve;
	lecture group work		erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical behavior of unsaturated soils. SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determinated
			of flow characteristics out of pump tests; design of barriers against the transport of contaminants INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater
			pressure and the saturation degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled multiphase flow, transient
E044311 Structural Stability	guided self-study seminar: coached exercises	written examination oral examination	flow To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable).
	lecture	open book examination	To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding
			excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.
E052621 Concrete Structures: Prestressed Concrete and Slabs	guided self-study seminar: coached exercises lecture		Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders. Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indetermin systems.
			Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a prestressing tendon on a concrete beam.
			Derive the the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the eccentricity can be determined by a stepwise procedure.
			Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states.
			Substantiate the influence of prestressing on the shear resistance of beams. Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages.
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents.
			The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understar of the relationship between
E054680 Dredging: Techniques and Processes	lecture	written examination	mobility, infrastructure and space and on the knowledge of relevant paradigms Insight in the loosening processes of importance during dredging: breaching, jetting and cutting
2004000 Dreaging. Techniques and Processes	seminar: coached exercises	open book examination	Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies.
E061502 Spatial Structures	lecture seminar: coached exercises	written examination report	Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions. Understand the behaviour, formfinding, design and erection methods of spatial structures.
		assignment open book examination	
E044571 Non-linear and Plastic Methods of Structural Analysis	lecture seminar	open book examination oral examination	Have insight in the basic principles of limit analysis. Demonstrate the differences with a linear elastic analysis. Perform a step by step calculation of the collapse load with estimation of the deflections just prior to collapse. Explain the notions: plastic hinge, collapse mechanism, safe and statically admissible distribution of bending moments, kinematically possible mechanism,
			the real collapse mechanism. Demonstrate the basic principles of the yield line theory. Derive kinematically admissible yield line patterns for isotropic and orthotropic slabs.
			Asses the factors which influence the plastic rotation capacity of reinforced concrete sections. Derive simplified ductility conditions. Elucidate the basic principles of moment redistribution in continuous reinforced concrete beams. Substantiate the influence the reinforcement
			distribution. Direct calculation of the ultimate load of simple continuous beams and frames.
E044902 Conceptual Design	group work lecture		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural
			analysis; build a physical model of an advanced concept; develop original concepts for structures

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E044631 Glass and Facade Structures	lecture	oral examination	Design conceptually and structurally correct glass structures and facade structures. Recognise and apply basic principles of holistic facade design Recognise, denominate and explain frequent glass pathologies. Perform strength and stability checks of elementary glass and facade components and connections. Explain construction and structural concepts.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG3.5 Readily adapt to changing professional circumstances. <<

EMingwALG3.5 Readily adapt to			Intellectual competences
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E044930 Seismic Design	lecture seminar: coached exercises project		Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is preserved during the life of the structure.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course		Teaching methods	Evaluation methods	Course learning outcome
	evaluatievormen voorafgegaan door ** werden niet teruggev			
	EM and Constitutive Material Laws in Structural ingineering	guided self-study seminar: practical PC room classes lecture	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E050923 S	tructural Reliability and Risk Analysis	guided self-study seminar lecture	open book examination report oral examination	Being able to apply Monte Carlo simulations for the determination of failure probabilities. Being able to apply Bayesian decision theory to structural engineering applications. Understanding the difference between structural reliability methods of level 1, 2 and 3. Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods of level 2 and 3. Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes. Understanding the influence of uncertainties in structural design. Being able to apply fault and event trees to structural engineering applications. Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural
E044821 A		guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop a opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local an general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridge (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,)
E050100 D	Design of Civil Structures	project	oral examination	Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them. Design constructions autonomously; analyse and calculate independently components of a structure.
		p. 6,650	report	Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E040661 S	tructural Dynamics	lecture	oral examination	Apply modelstructure preserving reduction techniques. Identify modal parameters from experiments. Perform a modal analysis of a structure and formulate structural modifications. Calculate vibration levels of civil structures when they are subjected to dynamic loads of different nature. Design of vibration isolation and vibration absorption devices. Model structures based on Lagrange's technique.
E044311 S		guided self-study seminar: coached exercises lecture	written examination oral examination open book examination	To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable). To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding a excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.
	concrete Structures: Prestressed Concrete and slabs	guided self-study seminar: coached exercises lecture	oral examination	Elucidate the verification of the ultimate limit state of flexure. Clearly identify the underlying basic assumptions and material la Analyse the different types of splitting actions in the anchorage zones of prestressed concrete girders. Analyse the secondary moments that are caused by prestressing. Derive a procedure for the design of statically indeterminat systems. Discuss the criteria for the determination of the tendon profile over the length of a beam. Derive the forces exerted by a prestressing tendon on a concrete beam. Derive the the stress conditions in a critical section in service conditions. Demonstrate how the prestressing force and the eccentricity can be determined by a stepwise procedure. Have insight in the general design philosophy of prestressed concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Substantiate the influence of prestressing on the shear resistance of beams. Describe the different prestressing systems and concepts. Substantiate the advantages and disadvantages.
:054820 Ir	nland Waterways and Locks	guided self-study seminar project lecture	oral examination report	Being familiar with the most important terminology of (maritime and inland) navigation and with the CEMT classification of inlawaterways Knowing the different types of lock filling-emptying systems and having insight into their respective range of applicability Having insight into the respective mode of operation of mitre gates and rolling gates and into the load transfer Being able to discern the major components of mitre gates and rolling gates Being able to discern the major components of a navigation lock and knowing their function Having insight into the role of the water balance and the soil balance in the design of a canal Knowing the different means of infrastructural measures to improve the navigability of a river (river training, normalization, canalization) and their respective range of applicability Having insight into factors influencing the geometrical characteristics of a waterway, including lock-complexes
E052210 G	Geotechnics	guided self-study seminar: coached exercises lecture	written examination	Evaluating deep foundations Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications
E053560 S	pecialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understand of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms

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E055044 Introduction to Maritime Technology (partim)	guided self-study seminar: coached exercises lecture	open book examination report oral examination	Reason out the manoeuvring behaviour of a ship. Distinguish the most important characteristics of a ship's steering equipment (rudder). Define the main techniques used to determine and evaluate a ship' smanoeuvring behaviour. Execute hydrostatic calculations and stability calculations for a pontoon by means of specialised software. Distinguish the most important physical causes of a ship's resistance. Reason out the most important parameters on which a ship's resistance depends. Define and recognise the most usual technologies used for a ship's propulsion. Analyse specific problems concerning hydrostatics and stability of a simple floating structure. Get acquinted with the specific hydrodynamic behaviour of a ship in shallow and confined navigation areas. Give an explanation for the dynamic behaviour of a floating structure in waves. Be able to use professional terminology with respect to the behavviour of floating structures in waves. Describe the main actors in the shipping world. Get acquainted with professional terminology concerning types, external characteristics, structure and primary members of maritime constructions. Gain insight into hydrostatics and stability of floating structures.
E044666 Offshore Structures	group work lecture	open book examination report oral examination	CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energy; renewable energy SKILLS: design of offshore structures INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on piles; insight in potential and problems related to offshore constructions; renewable energies
E044671 Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E061502 Spatial Structures	seminar: coached exercises	written examination report assignment open book examination	Analyse and design spatial structures using simplified methods. Use three-dimensional thinking with respect to structural design and analysis. Understand the behaviour, formfinding, design and erection methods of spatial structures.
E044571 Non-linear and Plastic Methods of Structural Analysis	lecture seminar	open book examination oral examination	Have insight in the basic principles of limit analysis. Demonstrate the differences with a linear elastic analysis. Perform a step by step calculation of the collapse load with estimation of the deflections just prior to collapse. Explain the notions: plastic hinge, collapse mechanism, safe and statically admissible distribution of bending moments, kinematically possible mechanism, the real collapse mechanism. Demonstrate the basic principles of the yield line theory. Derive kinematically admissible yield line patterns for isotropic and orthotropic slabs. Asses the factors which influence the plastic rotation capacity of reinforced concrete sections. Derive simplified ductility conditions. Elucidate the basic principles of moment redistribution in continuous reinforced concrete beams. Substantiate the influence on the reinforcement distribution. Direct calculation of the ultimate load of simple continuous beams and frames.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044930 Seismic Design	lecture seminar: coached exercises project	written examination with open questions report open book examination	Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to apply EN 1998-1 in a suitable way To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is preserved during the life of the structure.
E044631 Glass and Facade Structures	lecture	oral examination	Design conceptually and structurally correct glass structures and facade structures. Recognise and apply basic principles of holistic facade design Recognise, denominate and explain frequent glass pathologies. Perform strength and stability checks of elementary glass and facade components and connections. Explain construction and structural concepts.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG4.2 Project management: have the ability to formulate objectives, report efficiently, keep track of targets, follow the progress of the Competences in cooperation and communication << project,... **Teaching methods Evaluation methods** Course learning outcome Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche E054920 Coastal Engineering and Harbour Construction group work report Report (written and oral) the results from a design project. E044821 Advanced Bridge and Tunnel Engineering Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the guided self-study assignment PDE tutorial influence of several boundary report microteaching peer assessment conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an lecture opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads, ...) composite bridges (connectors, stay cable bridges, different concepts, ...) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them. E050100 Design of Civil Structures project oral examination Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure report Apply independently the knowledge acquired from other courses to real structures E040661 Structural Dynamics practicum Apply Matlab for structural dynamics. E053560 Specialised Road Engineering and Mobility assignment The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms E055044 Introduction to Maritime Technology (partim) Analyse specific problems concerning hydrostatics and stability of a simple floating structure. guided self-study open book examination seminar: coached exercises Execute hydrostatic calculations and stability calculations for a pontoon by means of specialised software. report The possibility to combine the knowledge in a project with analytical and numerical calculations. E044671 Offshore Foundations group work oral examination What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some lecture report assignment knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these. E044902 Conceptual Design open book examination Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model group work Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts lecture report assignment Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures E044930 Seismic Design written examination with open Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design seminar: coached exercises questions To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is

preserved during the life

Render and synthesise the results concisely.

topical study, research and the

Define, study and analyse the research problem in a specific domain.

Self-assessment with adequate and critical self-correction and objectivity.

of the structure.

laypeople.

To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is

Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance.

Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,...).

Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to

Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search,

report

master's dissertation

E091103 Master's Dissertation

open book examination

oral examination

assignment

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EMingwALG4.3 Have the ability to work as a member of a team in a multidisciplinary workingenvironment, as well as being capable of taking on Competences in cooperation and communication supervisory responsibilities.

supervisory responsibilities.	Tooching motheds	Evaluation methods	Course learning outcome
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
E044940 FEM and Constitutive Material Laws in Structu Engineering	ral seminar: practical PC room classes	assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E044821 Advanced Bridge and Tunnel Engineering	microteaching PDE tutorial	assignment report peer assessment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E053560 Specialised Road Engineering and Mobility		assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E044671 Offshore Foundations	group work lecture		The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
E061502 Spatial Structures	seminar: coached exercises	assignment report	Analyse and design spatial structures using simplified methods. Use three-dimensional thinking with respect to structural design and analysis. Understand the behaviour, formfinding, design and erection methods of spatial structures.
E044902 Conceptual Design	group work lecture		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures

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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods evonden in de studiefiche	Evaluation methods	Course learning outcome
E044940 FEM and Constitutive Material Laws in Structura Engineering	I seminar: practical PC room classes	assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E054920 Coastal Engineering and Harbour Construction	group work	report	Report (written and oral) the results from a design project.
E044821 Advanced Bridge and Tunnel Engineering	guided self-study	oral examination	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the
	PDE tutorial microteaching	report peer assessment assignment	influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E040661 Structural Dynamics	practicum		Apply Matlab for structural dynamics.
E044311 Structural Stability	guided self-study seminar: coached exercises lecture	written examination oral examination open book examination	To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable). To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding and excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.
E045860 Water Management and Environment	guided self-study seminar: coached exercises lecture group work	open book examination report oral examination	INSIGHT: Schelde estuary SKILLS: Simulation of tides in a river INSIGHT: sediment transport INSIGHT: tides and tides in rivers SKILLS: Regulation of flood waves CONCEPTS: Flood management, water quality, hydrology of wetlands INSIGHT: waves CONCEPTS: European Water Framework Directive; environmentally friendly structures SKILLS: Design of sandtraps
E054820 Inland Waterways and Locks	guided self-study seminar project lecture	oral examination report	Being familiar with the most important terminology of (maritime and inland) navigation and with the CEMT classification of inland waterways Knowing the different types of lock filling-emptying systems and having insight into their respective range of applicability Having insight into the respective mode of operation of mitre gates and rolling gates and into the load transfer Being able to discern the major components of mitre gates and rolling gates Being able to discern the major components of a navigation lock and knowing their function Having insight into the role of the water balance and the soil balance in the design of a canal Knowing the different means of infrastructural measures to improve the navigability of a river (river training, normalization, canalization) and their respective range of applicability Having insight into factors influencing the geometrical characteristics of a waterway, including lock-complexes
E052210 Geotechnics	guided self-study seminar: coached exercises lecture	written examination	Evaluating deep foundations Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E055044 Introduction to Maritime Technology (partim)	seminar: coached exercises	report	Analyse specific problems concerning hydrostatics and stability of a simple floating structure.
E044666 Offshore Structures	group work lecture	open book examination report oral examination	Execute hydrostatic calculations and stability calculations for a pontoon by means of specialised software. CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energy; renewable energy SKILLS: design of offshore structures INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on piles; insight in potential and problems related to offshore constructions; renewable energies
E055400 Coastal Hydrodynamics	lecture	open book examination	Apply wave propagation modelling tools as design tool.
E044671 Offshore Foundations	group work lecture	report oral examination report assignment	Analyse physical model testing in the laboratory wave flume and wave tank. The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E061502 Spatial Structures	seminar: coached exercises	assignment report	Analyse and design spatial structures using simplified methods. Use three-dimensional thinking with respect to structural design and analysis. Understand the behaviour, formfinding, design and erection methods of spatial structures.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of

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E044930 Seismic Design	project seminar: coached exercises	written examination with open questions report open book examination	Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to apply EN 1998-1 in a suitable way To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is preserved during the life of the structure.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG5.1 Act in an ethical, professional and social way.

EMingwALG5.1 Act in an ethical,	·		Societal competence
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studienche		
E044821 Advanced Bridge and Tunnel Engineering	guided self-study lecture	oral examination	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E044902 Conceptual Design	group work lecture		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044930 Seismic Design	lecture project	written examination with open questions report open book examination	To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG5.2 Recognize the model	•	·		Societal competence
Course	Teaching methods	Evaluation methods	Course learning outcome	
loot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	gevonden in de studiefiche			
E044821 Advanced Bridge and Tunnel Engineering	guided self-study lecture	oral examination	Understand the impact on the overall design of certein elements from codes, construction mainfluence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discription about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunnel Designing a bridge in the most suited software package. Being able to reoport about this anconcept. Knowing the crucial elements of the design and understanding them.	cuss this with others and develop and distortion of box girders, local and s, wind loads,) composite bridge ling,)
E050100 Design of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures	structure.
E045860 Water Management and Environment	guided self-study seminar: coached exercises lecture group work	open book examination report oral examination	INSIGHT: Schelde estuary SKILLS: Simulation of tides in a river INSIGHT: sediment transport INSIGHT: tides and tides in rivers SKILLS: Regulation of flood waves CONCEPTS: Flood management, water quality, hydrology of wetlands INSIGHT: waves CONCEPTS: European Water Framework Directive; environmentally friendly structures SKILLS: Design of sandtraps	
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms	y them, based on the understanding
E055044 Introduction to Maritime Technology (partim)	lecture	oral examination	Describe the main actors in the shipping world.	
E044666 Offshore Structures	group work lecture	open book examination report oral examination	CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energ SKILLS: design of offshore structures INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on pile related to offshore constructions; renewable energies	
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutt Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspect Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependent Calculating the production for the different types of dregders depeding on dredger type, instructions.	cts cies.

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EMingwALG5.3 Understand the historical evolution of the own engineering discipline and its social relevance.

Societal	competences
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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug		Lvaluation methods	Course learning outcome
werden niet terug	gevonden in de stadienene		
E044821 Advanced Bridge and Tunnel Engineering	guided self-study microteaching	oral examination	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E053560 Specialised Road Engineering and Mobility	lecture		The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E055044 Introduction to Maritime Technology (partim)	lecture	oral examination	Describe the main actors in the shipping world. Distinguish the most important physical causes of a ship's resistance. Reason out the most important parameters on which a ship's resistance depends. Define and recognise the most usual technologies used for a ship's propulsion.
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E044930 Seismic Design	lecture seminar: coached exercises project		Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to apply EN 1998-1 in a suitable way To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is preserved during the life of the structure.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course	Teaching methods	Evaluation methods	Course learning outcome
loot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	_		
E044940 FEM and Constitutive Material Laws in Structura Engineering	l guided self-study seminar: practical PC room classes lecture	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E050923 Structural Reliability and Risk Analysis	guided self-study seminar lecture	open book examination oral examination	Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural applications. Being able to apply fault and event trees to structural engineering applications.
E054920 Coastal Engineering and Harbour Construction	group work	report	Describe and argue the coastal hydrodynamic processes, in particular waves and (tidal) currents and their interaction with coastal structures.
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop a opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridge (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E040661 Structural Dynamics	lecture seminar: coached exercises	written examination oral examination	Apply modelstructure preserving reduction techniques. Identify modal parameters from experiments. Perform a modal analysis of a structure and formulate structural modifications. Model structures based on Lagrange's technique.
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG6.2 Reconcile conflicting specifications and prior conditions in a highquality and innovative concept or process.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching lecture	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and developinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite to (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the inconcept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the underst of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E055400 Coastal Hydrodynamics	lecture	open book examination report	To have knowledge of and insight in basic engineering usage of coastal hydrodynamics (waves, currents and sediment transport) as loading conditions for nearshore and offshore structures. Apply wave propagation modelling tools as design tool.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	_	Evaluation methods	Course learning outcome
E044940 FEM and Constitutive Material Laws in Structure Engineering		written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching	oral examination report peer assessment	engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications. Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature.
	lecture	assignment	Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop a opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridge (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure
E054820 Inland Waterways and Locks	guided self-study seminar project lecture	oral examination report	Apply independently the knowledge acquired from other courses to real structures Being familiar with the most important terminology of (maritime and inland) navigation and with the CEMT classification of inlan waterways Knowing the different types of lock filling-emptying systems and having insight into their respective range of applicability Having insight into the respective mode of operation of mitre gates and rolling gates and into the load transfer Being able to discern the major components of mitre gates and rolling gates Being able to discern the major components of a navigation lock and knowing their function Having insight into the role of the water balance and the soil balance in the design of a canal Knowing the different means of infrastructural measures to improve the navigability of a river (river training, normalization, canalization) and their respective range of applicability Having insight into factors influencing the geometrical characteristics of a waterway, including lock-complexes
E052210 Geotechnics	guided self-study seminar: coached exercises lecture	written examination	Evaluating deep foundations Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understandin of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E055044 Introduction to Maritime Technology (partim)	guided self-study seminar: coached exercises	open book examination report	Analyse specific problems concerning hydrostatics and stability of a simple floating structure. Execute hydrostatic calculations and stability calculations for a pontoon by means of specialised software.
E044666 Offshore Structures	group work lecture	open book examination report oral examination	CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energy; renewable energy SKILLS: design of offshore structures INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on piles; insight in potential and problem related to offshore constructions; renewable energies
E061502 Spatial Structures	seminar: coached exercises	assignment report	Analyse and design spatial structures using simplified methods. Use three-dimensional thinking with respect to structural design and analysis. Understand the behaviour, formfinding, design and erection methods of spatial structures.
E044902 Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044930 Seismic Design	project	report	Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality preserved during the life of the structure.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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Course Noot: leer- en evaluatievormen voorafg	egaan door ** werden niet terud	Teaching methods gevonden in de studiefiche	Evaluation methods	Course learning outcome
		-		
E044940 FEM and Constitutive Engineering	e Material Laws in Structu	ral guided self-study seminar: practical PC room classes lecture	written examination assignment	Be able to make appropriate choices with respect to the element mesh and solution method. Gain an insight into the working and possibilities of finite element methods. Be able to execute a FEM analysis of a simple application and be able to perform a critical assessment of the obtained results Know and be able to differentiate the different material laws and be able to indicate their suitability for different structural engineering applications. Gain a critic insight about the application possibilities of different types of elements for structural engineering applications.
E050923 Structural Reliability a	and Risk Analysis	guided self-study	open book examination	Being able to apply Monte Carlo simulations for the determination of failure probabilities.
		seminar lecture	report oral examination	Being able to apply Bayesian decision theory to structural engineering applications. Understanding the difference between structural reliability methods of level 1, 2 and 3. Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods level 2 and 3.
				Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes. Understanding the influence of uncertainties in structural design. Being able to apply fault and event trees to structural engineering applications. Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural
E044821 Advanced Bridge and	d Tunnel Engineering	guided self-study PDE tutorial	oral examination report	applications. Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary
		microteaching lecture	peer assessment assignment	conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local argeneral buckling,
				suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridg (connectors, stay cable
				bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100 Design of Civil Struct	ures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E040661 Structural Dynamics		seminar: coached exercises	written examination	Apply modelstructure preserving reduction techniques. Identify modal parameters from experiments.
				Perform a modal analysis of a structure and formulate structural modifications.
E045621 Groundwater and Co	ntaminant Flow	guided self-study		Calculate vibration levels of civil structures when they are subjected to dynamic loads of different nature. DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, sucti
2040021 Groundwater and Oo	mammant riow	seminar: coached exercises		stress, Retention curve;
	lecture group work		erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical behavior of unsaturated soils.	
	9.004		SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determinati	
				of flow characteristics out of pump tests; design of barriers against the transport of contaminants
				INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater
				pressure and the saturation degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flo
				multiphase flow, transient
E044311 Structural Stability		guided self-study seminar: coached exercises lecture	written examination oral examination open book examination	To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable). To understand the effect of imperfections on the behaviour of structures.
				Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding a excentric compression.
E052210 Geotechnics		guided self-study	written examination	To understand and to be able to apply the theory of non linear behaviour of structures. Evaluating deep foundations
		seminar: coached exercises lecture	William Grammation	Designing deep foundations Designing common ground improvement techniques applications Evaluating common ground improvement techniques applications
E053560 Specialised Road En	gineering and Mobility	guided self-study	oral examination	The student must be able to choose the most efficient materials
		lecture	assignment	The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents.
				The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understand of the relationship between
E011666 Offahara Structura		aroun work	open book everyingtion	mobility, infrastructure and space and on the knowledge of relevant paradigms
E044666 Offshore Structures		group work lecture	open book examination report	CONCEPTS: design of offshore structures; wave forces on piles; scour; offshore wind energy; renewable energy SKILLS: design of offshore structures
			oral examination	INSIGHTS: distinction between breaking and non-breaking waves w.r.t. wave loading on piles; insight in potential and proble related to offshore constructions; renewable energies
E044671 Offshore Foundations	3	group work	oral examination	The possibility to combine the knowledge in a project with analytical and numerical calculations.
		lecture	report assignment	What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards.
E054680 Dredging: Technique	s and Processes	lecture	written examination	Knowledge of the various offshore foundation concepts and how to design these. Insight in the loosening processes of importance during dredging: breaching, jetting and cutting
		seminar: coached exercises	open book examination	Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.
E061502 Spatial Structures		lecture	written examination	Analyse and design spatial structures using simplified methods.
		seminar: coached exercises	report assignment open book examination	
E044902 Conceptual Design		group work	•	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model
		lecture		Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures

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E044930 Seismic Design	project	report	Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to apply EN 1998-1 in a suitable way To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is preserved during the life of the structure.
E044631 Glass and Facade Structures	lecture	oral examination	Design conceptually and structurally correct glass structures and facade structures. Recognise and apply basic principles of holistic facade design Recognise, denominate and explain frequent glass pathologies. Perform strength and stability checks of elementary glass and facade components and connections. Explain construction and structural concepts.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwALG6.5 Pay attention to entire life cycles of systems, machines, and processes.

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Profession-specific competence

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E044671 Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.

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EMingwALG6.6 Pay attention to sustainability, energyefficiency, environmental cost, use of raw materials and labour costs.

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Profession-s	pecific	competence
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Course	Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche			
E044821 Advanced Bridge and Tunnel Engineering	guided self-study oral examination lecture		Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and deve opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite by (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the inconcept. Knowing the crucial elements of the design and understanding them.	
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms	
E054680 Dredging: Techniques and Processes	lecture seminar: coached exercises	written examination open book examination	Insight in the loosening processes of importance during dredging: breaching, jetting and cutting Knowledge of dredging processes, pumps as used on dredging ships, and ecological aspects Knowledge of different contracts forms, pricing and project approach for dredging contracts. Understanding how various subprocesses are linked to each other and sees the dependencies. Calculating the production for the different types of dregders depeding on dredger type, installed power and soil conditions.	
E044631 Glass and Facade Structures	lecture	oral examination	Design conceptually and structurally correct glass structures and facade structures. Recognise and apply basic principles of holistic facade design Recognise, denominate and explain frequent glass pathologies. Perform strength and stability checks of elementary glass and facade components and connections. Explain construction and structural concepts.	

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EMingwALG6.7 Pay attention to all aspects of reliability, safety, and ergonon	nics
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Profession-specific competence

Course		Teaching methods	Evaluation methods	Course learning outcome
	evaluatievormen voorafgegaan door ** werden niet terugg	•		
±050923 St	tructural Reliability and Risk Analysis	guided self-study	open book examination	Being able to apply Monte Carlo simulations for the determination of failure probabilities.
		seminar	report	Being able to apply Bayesian decision theory to structural engineering applications.
		lecture	oral examination	Understanding the difference between structural reliability methods of level 1, 2 and 3.
				Being able to determine the failure probability of simple, but realistic, limit state equations using structural reliability methods of level 2 and 3.
				Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes.
				Understanding the influence of uncertainties in structural design.
				Being able to apply fault and event trees to structural engineering applications.
				Understanding specific properties of series and parallel systems and being able to apply such schematisation in structural
				applications.
E044821 Ad	dvanced Bridge and Tunnel Engineering	guided self-study	oral examination	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the
		PDE tutorial	report	influence of several boundary
		microteaching	peer assessment	conditions from a technical as well as non-technical nature.
		lecture	assignment	Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an
				opinion about the subject.
				Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and
				general buckling,
				suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges
				(connectors, stay cable
				bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial
				concept. Knowing the crucial
				elements of the design and understanding them.
F050100 De	esign of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a structure.
2000 100 Design of Olvir Oliveres	odigit of othir otherwise	project		Detect the function and use of construction parts and place them in the whole structure
				Apply independently the knowledge acquired from other courses to real structures
E044311 Structural Stability	tructural Stability	guided self-study	written examination	To be able to design and to calculate a frame taking into account geometrically non linear behaviour.
		seminar: coached exercises	oral examination	To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable).
		lecture	open book examination	To understand the effect of imperfections on the behaviour of structures.
				Being able to solve basic instability problems.
				Being able to design a twofold compression member.
				Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding and
				excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.
F055044 In	troduction to Maritime Technology (partim)	lecture	oral examination	Reason out the manoeuvring behaviour of a ship. Distinguish the most important characteristics of a ship's steering equipment
2000011 111	troduction to Martino Toolmology (partin)	locture	oral oxamination	(rudder). Define the main
				techniques used to determine and evaluate a ship' smanoeuvring behaviour.
				Get acquinted with the specific hydrodynamic behaviour of a ship in shallow and confined navigation areas.
				Gain insight into hydrostatics and stability of floating structures.
E044902 Co	onceptual Design	group work		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model
		lecture		Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts
				Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural
				analysis; build a physical model of
= 04.555 = 5				an advanced concept; develop original concepts for structures
E044930 Se	eismic Design	lecture		Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design
		seminar: coached exercises		To be able to apply EN 1998-1 in a suitable way
		project		To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is
				prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is
				preserved during the life
				of the structure.
=044631 G	lass and Facade Structures	lecture	oral examination	Design conceptually and structurally correct glass structures and facade structures.
_0++001 O	add and raddad directures	iodiaio	oral oxallillation	Recognise and apply basic principles of holistic facade design
				Recognise, denominate and explain frequent glass pathologies.
				Perform strength and stability checks of elementary glass and facade components and connections.
				renonn stenuth and stability checks of elementary diass and lacade components and connections.

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EMingwALG6.8 Have insight into and understanding of the importance of entrepreneurship.

Profession-specific competence

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werde	en niet teruggevonden in de studiefiche		
E050100 Design of Civil Structures	project		Design constructions autonomously; analyse and calculate independently components of a structure.
			Detect the function and use of construction parts and place them in the whole structure
			Apply independently the knowledge acquired from other courses to real structures
E044902 Conceptual Design	group work		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model
•	lecture		Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts
			Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural
			analysis; build a physical model of
			an advanced concept; develop original concepts for structures

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<<	EMingwALG6.9 Show perseveran	ice, innovativeness, and an a	aptitude for creating adde	d value. Profession-specific competend
Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- ei	n evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E044821	Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop ar opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial elements of the design and understanding them.
E050100	Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E044311	Structural Stability	guided self-study seminar: coached exercises lecture		To be able to design and to calculate a frame taking into account geometrically non linear behaviour. To perceive possible instabilities and being able to find out the nature of the equilibrium (stable, indifferent or unstable). To understand the effect of imperfections on the behaviour of structures. Being able to solve basic instability problems. Being able to design a twofold compression member. Being able to calculate the resistance of a structural element subjected to warping torsion, lateral torsional buckling, folding and excentric compression. To understand and to be able to apply the theory of non linear behaviour of structures.
E053560	Specialised Road Engineering and Mobility		assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understandin of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E044671	Offshore Foundations	group work lecture	oral examination report assignment	The possibility to combine the knowledge in a project with analytical and numerical calculations. What soil mechanical investigation is needed and how parameters relevant for offshore foundations are determined, some knowledge on the calculation standards. Knowledge of the various offshore foundation concepts and how to design these.
E044902	Conceptual Design	group work lecture	open book examination report assignment	Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E091103	Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search, topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

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EMingwCIVI6.1 Be able to perform design and/or research independently in a broad range of advanced civil engineering working situations.

Profession-specific competence

Course	Teaching methods	Evaluation methods	Course learning outcome	
loot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		•	
E044821 Advanced Bridge and Tunnel Engineering	guided self-study PDE tutorial microteaching	oral examination report peer assessment assignment	Understand the impact on the overall design of certein elements from codes, consinfluence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course sult opinion about the subject. Understand the main principles of the design and construction of steel bridges (we general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, T Designing a bridge in the most suited software package. Being able to reoport abord concept. Knowing the crucial elements of the design and understanding them.	oject. Discuss this with others and develop an elds, bolts, distortion of box girders, local and tolerances, wind loads,) composite bridges BM tunneling,)
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently component the function and use of construction parts and place them in the whole structures apply independently the knowledge acquired from other courses to real structures	ıcture
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design s The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate ar of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms	
E044902 Conceptual Design	group work lecture		Determine the list of requirements for a structure; develop basic concepts; assess Give sufficient attention to generate alternatives for structures; persuing originality Derive requirements for a concept, developed one-self; design a numerical model analysis; build a physical model of an advanced concept; develop original concepts for structures	and additional value in basic concepts
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creative Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and laypeople. Render and synthesise the results concisely. Critically analyse, formulate, study, execute and/or process different aspects in the topical study, research and the reflection on the research, experiments, experimentations, designs, simulations, reflection an appropriate methodology, in accordance with the applicable scientific normalizations.	found them, both to colleagues as to execution of research (literature search, esults, conclusions,).

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<<	EMingwCIVI6.2 Be aware of the social responsibility of a civil engineer.					
Course	Teaching methods	Evaluation methods	Course learning outcome			
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche						

EMingwCIVI6.2 Be aware of the s	ocial responsibility of a civil	engineer.	Profession-specific competence
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	iggevonden in de studiefiche		
E050923 Structural Reliability and Risk Analysis	guided self-study lecture		Understanding the influence of uncertainties in structural design. Having insight into the background of the semi-probabilistic methodology used in the Structural Eurocodes.
E044821 Advanced Bridge and Tunnel Engineering	guided self-study lecture	oral examination	Understand the impact on the overall design of certein elements from codes, construction methods, etc. Understand the influence of several boundary conditions from a technical as well as non-technical nature. Being able to understand and discuss research material relevant to the course subject. Discuss this with others and develop an opinion about the subject. Understand the main principles of the design and construction of steel bridges (welds, bolts, distortion of box girders, local and general buckling, suspension bridges, arch bridges, movable bridges, seismic and dynamic design, tolerances, wind loads,) composite bridges (connectors, stay cable bridges, different concepts,) and tunnel engineering (cut-and-cover tunneling, TBM tunneling,) Designing a bridge in the most suited software package. Being able to reoport about this and knowing how to refine the initial concept. Knowing the crucial
			elements of the design and understanding them.
E050100 Design of Civil Structures	project	oral examination report	Design constructions autonomously; analyse and calculate independently components of a structure. Detect the function and use of construction parts and place them in the whole structure Apply independently the knowledge acquired from other courses to real structures
E045621 Groundwater and Contaminant Flow	guided self-study seminar: coached exercises lecture group work		DEFINITIONS: porous medium, presence of water in the ground, direct flow; Flow lines, equipotential height; capillarity, suction stress, Retention curve; erosion; criteria for filters; control of groundwater flow, advection, diffusion, retardation, multiphase flow, soil mechanical behavior of unsaturated soils. SKILLS: modelling of transport of groundwater, design of granular filters; concept and design of water extraction; determination of flow characteristics out of
			pump tests; design of barriers against the transport of contaminants INSIGHTS: application of numerical models; determination of the risk and causes of erosion, impact of the groundwater pressure and the saturation degree on the stability of the soil and underground structures, mass transport of contaminants in groundwater and coupled flow, multiphase flow, transient flow
E045860 Water Management and Environment	guided self-study seminar: coached exercises lecture group work	open book examination report oral examination	INSIGHT: Schelde estuary SKILLS: Simulation of tides in a river INSIGHT: sediment transport INSIGHT: tides and tides in rivers SKILLS: Regulation of flood waves CONCEPTS: Flood management, water quality, hydrology of wetlands INSIGHT: waves CONCEPTS: European Water Framework Directive; environmentally friendly structures SKILLS: Design of sandtraps
E053560 Specialised Road Engineering and Mobility	guided self-study lecture	oral examination assignment	The student must be able to choose the most efficient materials The student must be able to grasp the design problems for non-standard design situations The student must be able to understand tender documents. The student must be able to design the layer composition of the road structure The student must be able to apply mobility design concepts and to substantiate and to clarify them, based on the understanding of the relationship between mobility, infrastructure and space and on the knowledge of relevant paradigms
E044902 Conceptual Design	group work lecture		Determine the list of requirements for a structure; develop basic concepts; assess experimentally physical model Give sufficient attention to generate alternatives for structures; persuing originality and additional value in basic concepts Derive requirements for a concept, developed one-self; design a numerical model; use advanced software for structural analysis; build a physical model of an advanced concept; develop original concepts for structures
E044930 Seismic Design	lecture seminar: coached exercises project		Understand the differences, advantages and drawbacks of low dissipative and dissipative seismic design To be able to apply EN 1998-1 in a suitable way To be able to incorporate the probability of extreme earthquakes in the design such that collapse of the construction is prevented. To be able to ensure elastic behavior of a steel and concrete construction under a moderate earthquake such that functionality is preserved during the life of the structure.
E091103 Master's Dissertation	master's dissertation	oral examination assignment	Define, study and analyse the research problem in a specific domain. Give proof of independency, motivation, dedication, drive to innovation and creativity, initiative and perseverance. Self-assessment with adequate and critical self-correction and objectivity. Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to

Communicate adequately on the research, the results and problems, present and found them, both to colleagues as to

reflection on the research, experiments, experimentations, designs, simulations, results, conclusions,...). Find an appropriate methodology, in accordance with the applicable scientific norms of the specific field of study.

Critically analyse, formulate, study, execute and/or process different aspects in the execution of research (literature search,

laypeople.
Render and synthesise the results concisely.

topical study, research and the

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