Competence coverage	matrix								Ge	eneral C	ourses	5													Cour	rses Rela	ated to	the Ma	ain Sub	ject						
																								s _e .												
GHENT UNIVERSITY Bachelor of Science in	Engineering		amics	ics		eneurship and Ethics			re of Matter	Measuring		=	Algebra	Ø			S III	Operations	sbu	,	Construction Law	Reinforced Concrete		Geotechnical Structur			Engineering		opics			ssing	CD.	Бu		Roads
Civil Engineering		ematics	hermodyna	and Statisti	echnology	ity, Entrepr		cal Analysis	the Structu	Making and		al Analysis	and Linear	of Materials		henomena	Sveteme a	Business	n of Buildir	ysics	of Law and	tructures: F	nics	nalysis of	_	tures	to Bridge		Selected T	se Project	nalysis I	Data Proces	Aided Desig	Engineerir	g Project	Aspects of
Academic year 2021-20	022	Basic Math	hemical T	robability	/aterials T	ustainabil	hysics I	Aathematic	hemistry:	Aodelling, I	nformatics	/athematic	seometry a	1echanics	hysics II	ransport F	nathernatic palysis of	ustainable	onstructio	uilding Ph	rinciples	concrete S	structural A	structural A	opography	/etal Struc	ntroductior	lydraulics	hemistry:	coss-Cour	structural A	statistical D	computer A	/echanical	ingineering	seometric
Legend: T=teaching methods E=evaluation methods		E001142 E	E070080 (E003043 F	E066012 N	E098512 S	E020061 F	E001132 N	E070070 C	E098513 N	E015041	122	E000662 (E040420 N	E020220 F	E045120 T	E001321 R	E076040 S	E050410 (E050310 E	E076621 F	E052412 (E044220 S	E044230 S	E000810 T	E044510 N	E044811	E045411 H	E070160 C	E099000 (E044120 S	E003230 S	E061430 (E090420 N	E099101 E	E053510 (
Competences in one/more scientific discipline(s)	Have a clear understanding of the basic sciences and basic engineering sciences, and have the ability to apply them in a creative and purposeful way in the chosen specific engineering discipline.	E	E		T E	T E	T E	T T	E	E	E	E	E	T E	E	T E	T E			E		T E	T E	E		Т	T E		T E	T E	T E			T E		
	Employ the basic sciences and techniques (statistics, ICT, CAD) in T 15 a creative and purposeful way.							T T		T E	T E		T E			T E				T E		_	T E	Т	T E		T E	T E		T E		T E	T E		_	
	Be familiar with important terms, basic principles, theories, models, T 14 boundaries, methods, processes and applications of civil engineering and have the ability to apply this knowledge in a creative way.															Ē			Ė	É		Ē	E	Ė	Ē	Ė	E			Ė	Ē		Ė		Ē	E
	Be familiar with standard calculation methods and apply them in standard architectural and civil engineering construction problems. E 9 Be able to critically analyse these methods.															T E				T E		T E	T E	T E		T E	T E				T E					
	Be able to interpret basic features and basic characteristics of (building-) materials and their use in simple civil engineering constructions.															T E			E			T E	T E	T E		T E	T E			-	T E		E		T E	T E
	Be able to identify and understand transport phenomena in liquids, T 3 especially the flow of water, and to apply them to standard design problems.															T E				E								T E		_						
	Be able to apply basic knowledge of soil characteristics to basic foundation problems. Be familiar with constructional and physical aspects of buildings and basic principles of the construction of roads and bridges.	H																	E	E			E	Ė			T			E T						Ţ
Scientific competence	and basic principles of the construction of roads and bridges. E 5 Research and process technical and scientific information in a purposeful way. E 9				T E	T E				T									E	T			T E	T E			E	T E		T E					T E	E
	Employ standard models, methods and techniques in assignments. T 25 E 25	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 E		T E	
	Schematize and model phenomena, processes, and systems.		<u>_</u>	T E			T E	T T				E	T E		T E	· ·	T T	E		T E			T E	E	T E	T E	T E	E		T E	T E	_		T E		
	Justify decision-making processes on rational grounds. T 16 E 15 Employ basic civil engineering knowledge in an integrated way to T 5		E	Т	E	E			E	E		E				ı	[]		Т	Т			T E T	E T			E	E		T E T	E I	E			E	
	case studies in the field of the construction of buildings. Use an integral approach to the design and examination of building activities of others thereby constructively handling limitations of knowledge and applied methods.																		E T E	Е			E	E			T E			E T E						T E
Intellectual competences	Understand and structure learning experiences. T 17 E 16	T E		T E	T E	_	_	T E			T E	T E	T E	_	_	1	T T	T	-			-	T E	T E	Т	-	T E	_		E	T E	_		T E		_
	Think in a conceptual, analytical, system-oriented, problem-solving T 29 and synthesizing way at different levels of abstraction.	Ė		E	E	Ė		E E	:	Ė	Ė	Ë	Ë	Ē	Ė	Ė E	E		Ė	Ė		<u>'</u>	Ë	E	Ė	Ë	Ë	Ė		Ė	-	Ë	_			E
	Show precision, perseverance and critical reflection. T 24 E 24 Show scientific curiosity. T 14	E	-	E	E	E T	_	E E		-		E	E		T	E I	E		-	E		E	E	E	E	E	E	E		E	E I	E	E			E
	Justify further studies or professional opportunities on rational grounds. E 12 T 4 E 2		Ė		Т	E	•		E	E		E			E		E	Ė	E				E	Ë			T E			E T						
Competences in	Master scientific and discipline-specific technical terminology (also T 27 in English).	T E	T E	T	T	T E	Т	T E	Т	TE		T	T E		T E	T 1				T E			T E	T	T	T	T E	T E		T E	T E		T	T	T	T
cooperation and communication	Carry out concrete assignments systematically.	-	=		_	Т		-		Т		-	E		=	-	-		T	Т			T	T	T	<u> </u>	=	=		T	-	T	T		T	T
	Work as part of a team.					T _				E T									Е	T			T	T	T		Ţ	Ţ		T		T	E		T	T
	Report results verbally, in writing, and graphically.				T	T				T									T	T			T	T	T	T	E T	E T		T		E T			T	E
Societal competences	Act in an ethical and social way.				T	T -				E								Т	E	E	Т		E	E	T	E	T	Е		T		E			E	
	Be aware of the business aspects of the engineering discipline.					T -												T			T					Т	T			Т				_	Т	T
	Be familiar with aspects of environment and mobility in the field of civil engineering.					E												E	T	Т	E T				Т		E						Ţ			E
Profession-specific	To be able to identify all kinds of professional situations and fields of activity of a civil engineer.																		E						T		T			Т			E		Т	T
competence	E 2	W 6			W 12 W					W 11			W 8	W 3	W 5 V	V 9 W 8	3 W 8	W 5					V 18 W 1													W 11
		E 6	E 4	E 6	E 10 E	12 E 2	2 E	8 E 5	E 3	E 11	E 6	E 9	E 8	E 3	E 5 E	9 E 8	E 8	E 5	E 12	E 16	E 1	E 6	E 18 E 1	E 18	E 9	E 9	20 E	E 11	E 2	21 E	10 E 8	8 E	4 E 4	E 4	E 9	E 11

EBingwALG1.1 Have a clear understanding of the basic sciences and basic engineering sciences, and have the ability to apply them in a creative and purposeful way in the chosen specific engineering discipline.

<<

Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	Teaching methods	Evaluation methods	Course learning outcome
	ggevonden in de stadienone		
E001142 Basic Mathematics	lecture seminar: coached exercises lecture: plenary exercises	written examination	Being able to perform basic calculations quickly and efficiently by hand. Being able to formulate correctly and with mathematical precision. Being able to make a correct reasoning and to write it down in a structured way. To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors.
E070080 Chemical Thermodynamics	guided self-study seminar: coached exercises lecture	written examination open book examination	Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions. Calculation of the pH of aqueous solutions. Understand and apply chemical equilibrium.
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired
			properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	lecture project	participation assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E020061 Physics I	demonstration	written examination	To understand the physical laws and concepts of the covered chapters.
E001132 Mathematical Analysis I	lecture guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	To be able to solve problems by applying these laws and concepts. Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to
			be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series.
E001460 Discrete Mathematics I	guided self-study seminar: coached exercises practicum lecture	written examination open book examination	Being able to use power series for solving ordinary differential equations. Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E070070 Chemistry: the Structure of Matter	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform stoichiometric calculations. Identify and describe the different types of intermolecular interactions. Being able to determine the molecular geometry of covalent compounds. Identify and describe the different types of chemical bonding. Being able to order atoms and ions based on their periodic properties Being able to write the electron configuration of atoms and ions.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E015041 Informatics	lecture seminar: practical PC room classes	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm To design an algorithm solving a given problem, and to assess the complexity of this solution. To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative,
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	open book examination	differentiability, gradient, multiple integral, Jacobian and co-ordinate transform. Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Having acquired insight in the notions vector space, linear dependence and independence, basis and dimension. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
E040420 Mechanics of Materials	seminar: coached exercises	written examination open book examination	To be familiar with the applications of linear elasticity theory. To identify mechanical test methods. Applications of the problem solving methods in elasticity theory. To identify linear and non-linear behaviour. Knowledge of the main techniques for damage control and diagnostics. To be familiar with the basic notions of linear elasticity theory.
E020220 Physics II	demonstration lecture	written examination participation	To be able to solve physics problems by applying these laws and concepts. To understand the physical laws and concepts of the covered chapters.
E045120 Transport Phenomena	lecture seminar: practical PC room classes seminar	open book examination	To understand the physical laws and concepts of the covered chapters. To understand the properties of fluids. To understand the similarities between transport of impulse, heat and mass. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it. To master the laws of statics and dynamics and to be able to apply them.

E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations.
			To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal
			vector fields. To have acquired skills in calculations with the nabla operator.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points
			course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications.
			To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well
			as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals.
E050310 Building Physics	lecture	assignment	To describe linear systems by means of the state model. (exclusively for the 6 credit points course.) Be able to derive and build calculation methods and models in building physics, and be able to use these methods when
	seminar practicum		evaluating building physics performances.
			Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E052412 Concrete Structures: Reinforced Concrete	lecture seminar: coached exercises	oral examination	Elucidate the interaction mechanisms between reinforcement and concrete (equivalent concrete section, bond, cracking, anchorage).
			Practical evaluation of concrete stresses, crack widths and deflections in the serviceability limit states. Assessment of the load-bearing capacity of existing concrete structures by checking the relevant ultimate limit states.
			Substantiate the ultimate behaviour of linear reinforced concrete members (columns and beams) submitted to compression, bending, compound bending,
			shear and torsion by means of appropriate design models. Develop the moment-curvature relationship of reinforced concrete sections as a tool for the prediction of the deformation
			behaviour of linear elements
			including the time-dependent aspects. Selection of the dimensions of linear concrete members and calculation of the required reinforcement areas based on the
			internal forces in the ultimate limit state.
			Have insight in the general design philosophy of concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the
			relevant limit states. Analyse the force transfer in disturbed regions by means of strut-and-tie models. Justify the proposed solution.
E044220 Structural Analysis II	lecture seminar: practical PC room classes	oral examination report	Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar
	seminar: coached exercises	·	and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures.
			Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for
			the analysis of simple, but
			realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method.
			Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these.
E044230 Structural Analysis of Geotechnical Structures	lecture	oral examination	Critical analysis of calculation results and the presentation of these results both individually as in a team. Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and
	seminar: practical PC room classes seminar: coached exercises	report	serviceability limit states. Being able to calculate the resistance against general sliding in soils.
			Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-
			plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and
			analysis.
5044540 Maria Orania			Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E044510 Metal Structures	lecture seminar: coached exercises		To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the
			verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts
E044811 Introduction to Bridge Engineering	group work lecture	oral examination report	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding
			area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design
			Argument the equilibrium of abutments; identify the behaviour of piers
			Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent
E070160 Chemistry: Selected Topics	lecture	written examination with open	manner an ordinary bridge and build it Understanding the relation between reaction rate and reaction mechanism
	seminar: coached exercises	questions	Knowledge of the properties and synthesis of important types of synthetic organic polymers Knowledge of the relation between chemical structure and properties of important types of biomolecules Knowledge of the properties and synthesis of important types of inorganic polymers Being able to develop the rate equation of a chemical reaction
E099000 Cross-Course Project	group work	oral examination	Knowledge
	self-reliant study activities project	report	• Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design, building materials and
	lecture		structural elements.
			 Design of the concept of a bearing structure, including its foundation, and design of structural elements.

E044120 Structural Analysis I	** guided self-study seminar: coached exercises lecture	written examination	Determining the load distribution and displacements in statically determinate and indeterminate trusses. Determining influence lines for trusses. Determining the flexural critical buckling load of compressed members by means of appropriate differential equations and boundary conditions. Knowing and using the principle of funicular arches. Deriving and applying Bresses's equations for different arch types and be able to determine influence lines for these elements. Understanding which types of structural systems exist and which types of load can work on a structure. Having insight in the design philosophy of the eurocodes with regard to limit states and being able to apply this. Determining the influence lines of stress resultants and deformations in a direct and indirect manner. Understanding the effects of bending moments, normal force, shear force and St Venant Torsion on the normal and shear stresses in a cross-section and be able to determine these. Understanding the principle of virtual work and using this to determine the deformation of structural elements and to express compatibility conditions, e.g. on the basis of the integrals and analogies of Mohr and the theorems of Greene. Understanding and applying the slope-deflection method for frames and continuous beams with rigid or spring supports. Knowing and being able to use basic terminology with regard to structural analysis
E090420 Mechanical Engineering	lecture	written examination	Understand operation of energetic equipment: piston machines, turbomachinery Distinguishing and describing mechanical production processes: forming and machining Reading of mechanical drawings Knowledge of important machine elements: gears, belts, chains, hydraulic components, bearings

<<

Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	Teaching methods gevonden in de studiefiche	Evaluation methods	Course learning outcome
E001132 Mathematical Analysis I	lecture lecture: plenary exercises seminar	written examination	Being able to assess the convergence of numerical series and series of functions. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for
			solving initial value problems. Being able to construct and manipulate power series and Fourier series.
E001460 Discrete Mathematics I	practicum	written examination	Being able to use power series for solving ordinary differential equations. Distinguishing and applying fundamental algebraic and discrete structures.
	•		Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E098513 Modelling, Making and Measuring	project	participation report	Use of software tools to make simulations and diagrams
E015041 Informatics	lecture seminar: practical PC room classes	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	written examination	Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them.
			Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear
E045120 Transport Phenomena	seminar: practical PC room classes	open book examination	transform between abstract vector spaces. To solve problems of stationary heat transport.
E050310 Building Physics	lecture seminar practicum	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances.
E044220 Structural Analysis II		oral examination	Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of
	seminar: practical PC room classes seminar: coached exercises	report	structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these.
E044230 Structural Analysis of Geotechnical Structures	lecture		Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response an
E000810 Topography	lecture	written examination	analysis. SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report.
	practicum	report	SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project.
			INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring,
E044811 Introduction to Bridge Engineering	group work lecture	oral examination report	compensator, setting up, coordinate system, projection system, EDM. Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding
			area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
E045411 Hydraulics	demonstration seminar: coached exercises project practicum lecture group work	written examination report oral examination	Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels. Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles. Being able to identify and assess pressure surge problems in pipes. Having insight into the behaviour and modelling of pressurized flow in pipe networks. Having insight into the position of water surface profiles in non-prismatic channels and transition sections. Being able to analyze and rationally solve a pipe network problem. Having insight into the different types of models for unsteady flow in pressurized pipes. Being able to determine and calculate backwater-curves in prismatic open channels.
E099000 Cross-Course Project	group work self-reliant study activities project lecture	oral examination report	Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting.

E003230 Statistical Data Processing	lecture seminar: practical PC room classes seminar: coached exercises	written examination report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E061430 Computer Aided Design	demonstration seminar: practical PC room classes	open book examination	Exporting to several types of graphical documents, including the representation of specific views. Being familiar with CAD software.

Course	o apply this knowledge in a cre Teaching methods	Evaluation methods	Course learning outcome
ot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg			
45120 Transport Phenomena	lecture seminar: practical PC room classes seminar	open book examination	To understand the properties of fluids. To understand the similarities between transport of impulse, heat and mass. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it.
050/10 Construction of Buildings	lecture	written examination with open	To master the laws of statics and dynamics and to be able to apply them. Analyse and apply principles of horizontal and vertical stability of buildings.
050410 Construction of Buildings	lecture seminar	questions report written examination with open questions report written examination with multiple choice questions	Understanding the pre-design of technical volumes, based on experience based data. Understand and explain basic principles and structural concequences of HVAC, internal sewage and elevator installations.
50310 Building Physics	lecture	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when
	seminar practicum		evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
52412 Concrete Structures: Reinforced Concrete	lecture	oral examination	Elucidate the interaction mechanisms between reinforcement and concrete (equivalent concrete section, bond, cracking,
	seminar: coached exercises		anchorage). Practical evaluation of concrete stresses, crack widths and deflections in the serviceability limit states. Assessment of the load-bearing capacity of existing concrete structures by checking the relevant ultimate limit states. Substantiate the ultimate behaviour of linear reinforced concrete members (columns and beams) submitted to compression, bending, compound bending, shear and torsion by means of appropriate design models. Develop the moment-curvature relationship of reinforced concrete sections as a tool for the prediction of the deformation behaviour of linear elements including the time-dependent aspects. Selection of the dimensions of linear concrete members and calculation of the required reinforcement areas based on the internal forces in the ultimate limit state. Have insight in the general design philosophy of concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Analyse the force transfer in disturbed regions by means of strut-and-tie models. Justify the proposed solution.
44220 Structural Analysis II	lecture seminar: practical PC room classes seminar: coached exercises	written examination report oral examination open book examination	Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Critical analysis of calculation results and the presentation of these results both individually as in a team.
044230 Structural Analysis of Geotechnical Structures	lecture	written examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and
00040 Tanagara	seminar: practical PC room classes seminar: coached exercises	oral examination open book examination	serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
000810 Topography	lecture practicum	written examination report	SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring,

open book examination

oral examination

report

E044510 Metal Structures

E044811 Introduction to Bridge Engineering

lecture

group work

lecture

seminar: coached exercises

quality, centring,

verification of the local or the global

manner an ordinary bridge and build it

attention to the surrounding

technically consistent

compensator, setting up, coordinate system, projection system, EDM.

To be able to design and to calculate connections with welds or bolts

area impact and social acceptance and ecologic footprint of bridge design

Argument the equilibrium of abutments; identify the behaviour of piers

Recognize the design loads for bridges, understand them and use them in design

To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the

Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give

Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a

stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III").

Understanding of construction methods using pre- and posttensioning and using them in design situations

To be able to dictate the conditions for a good execution of welds

E099000 Cross-Course Project	excursion self-reliant study activities project lecture group work	oral examination report	 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design, building materials and structural elements. Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields. Demonstrating insight into the approach and elaboration of the structural design. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain. Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting.
E044120 Structural Analysis I	** guided self-study seminar: coached exercises lecture	written examination open book examination	Determining the load distribution and displacements in statically determinate and indeterminate trusses. Determining influence lines for trusses. Determining the flexural critical buckling load of compressed members by means of appropriate differential equations and boundary conditions. Knowing and using the principle of funicular arches. Deriving and applying Bresses's equations for different arch types and be able to determine influence lines for these elements. Understanding which types of structural systems exist and which types of load can work on a structure. Having insight in the design philosophy of the eurocodes with regard to limit states and being able to apply this. Determining the influence lines of stress resultants and deformations in a direct and indirect manner. Understanding the effects of bending moments, normal force, shear force and St Venant Torsion on the normal and shear stresses in a cross-section and be able to determine these. Understanding the principle of virtual work and using this to determine the deformation of structural elements and to express compatibility conditions, e.g. on the basis of the integrals and analogies of Mohr and the theorems of Greene. Understanding and applying the slope-deflection method for frames and continuous beams with rigid or spring supports. Knowing and being able to use basic terminology with regard to structural analysis
E052720 Concrete Technology	lecture seminar	oral examination	To be acquainted with the constituent materials of concrete, concrete mix design, and the properties of fresh, hardening and hardened concrete.
E099101 Engineering Project	excursion lecture group work	oral examination report participation	Application of the knowledge of Concrete Technology, in an independent way. Present results by giving a presentation and writing a report, within a realistic industrial context. Work together in small groups of students, on a topic related to concrete technology.
E053510 Geometric Aspects of Roads	group work lecture	oral examination report	Have basic knowledge of material use. To be able to make a (pre)design of a road project from a geometric point of view as there is: the design of a cross section, calculating an axe in plan view and the design of a length profile, design and conception of a crossing and/or a traffic interchanger. To be able to read and to understand a road design project.

EBingwBOUW1.2 Be familiar with standard calculation methods and apply them in standard architectural and civil engineering construction problems. Be able to critically analyse these methods.

Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	Teaching methods	Evaluation methods	Course learning outcome
E045120 Transport Phenomena	lecture seminar	open book examination	To understand the properties of fluids. To master the laws of statics and dynamics and to be able to apply them.
E050310 Building Physics	lecture	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when
- cook of a manifest of the cook of the co	seminar		evaluating building physics
	practicum		performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way.
			Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E052412 Concrete Structures: Reinforced Concrete	lecture	oral examination	Elucidate the interaction mechanisms between reinforcement and concrete (equivalent concrete section, bond, cracking,
	seminar: coached exercises		anchorage).
			Practical evaluation of concrete stresses, crack widths and deflections in the serviceability limit states. Assessment of the load-bearing capacity of existing concrete structures by checking the relevant ultimate limit states.
			Substantiate the ultimate behaviour of linear reinforced concrete members (columns and beams) submitted to compression,
			bending, compound bending,
			shear and torsion by means of appropriate design models. Develop the moment-curvature relationship of reinforced concrete sections as a tool for the prediction of the deformation
			behaviour of linear elements
			including the time-dependent aspects. Selection of the dimensions of linear concrete members and calculation of the required reinforcement areas based on the
			internal forces in the ultimate limit
			state.
			Have insight in the general design philosophy of concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the
			relevant limit states.
			Analyse the force transfer in disturbed regions by means of strut-and-tie models. Justify the proposed solution.
E044220 Structural Analysis II	lecture	written examination	Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of
	seminar: practical PC room classes seminar: coached exercises	report oral examination	structures composed of bar and plate elements.
		open book examination	Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures.
			Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for
			the analysis of simple, but
			realistic design situations.
			Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to
			solve these.
			Critical analysis of calculation results and the presentation of these results both individually as in a team.
E044230 Structural Analysis of Geotechnical Structures	lecture seminar: practical PC room classes	written examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states.
	seminar: coached exercises	oral examination	Being able to calculate the resistance against general sliding in soils.
		open book examination	Insight into the possible mechanisms of failure of earth retaining structures.
			The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto- plastic' methods of analysis
			and insight into the importance of successive construction stages on earth retaining structures with respect to their response a
			analysis.
			Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering tean Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state.
			Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E044510 Metal Structures	lecture seminar: coached exercises	open book examination	To be able to design and to calculate connections with welds or bolts To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the
	Seminar. Coached exercises		verification of the local or the global
			stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III").
E044811 Introduction to Bridge Engineering	group work	oral examination	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give
	lecture	report	attention to the surrounding
			area impact and social acceptance and ecologic footprint of bridge design
			Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers
			Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a
			technically consistent
TOOOOOO Cross Course Project	aroup work	aral avamination	manner an ordinary bridge and build it
E099000 Cross-Course Project	group work self-reliant study activities	oral examination report	 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural designation.
	project		building materials and
	lecture		structural elements.
			 Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields.
			Demonstrating insight into the approach and elaboration of the structural design.
			 Proficiencies Application of project work (creativity, cooperation, communication, gathering information).
			 Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools).
			Use of knowledge 'structural engineering design' in realistic projects.
E044120 Structural Analysis I	** guided self-study	written examination	 Relevant reporting. Determining the load distribution and displacements in statically determinate and indeterminate trusses. Determining influence
LUTT 120 Structural Arialysis I	seminar: coached exercises	open book examination	lines for trusses.
	lecture	•	Determining the flexural critical buckling load of compressed members by means of appropriate differential equations and
			boundary conditions. Knowing and using the principle of funicular arches. Deriving and applying Bresses's equations for different arch types and be
			able to determine influence
			lines for these elements.
			Understanding which types of structural systems exist and which types of load can work on a structure. Having insight in the design philosophy of the eurocodes with regard to limit states and being able to apply this
			Having insight in the design philosophy of the eurocodes with regard to limit states and being able to apply this. Determining the influence lines of stress resultants and deformations in a direct and indirect manner.
			Understanding the effects of bending moments, normal force, shear force and St Venant Torsion on the normal and shear
			stresses in a cross-section and
			be able to determine these.
			be able to determine these. Understanding the principle of virtual work and using this to determine the deformation of structural elements and to express compatibility conditions, e.g.
			be able to determine these. Understanding the principle of virtual work and using this to determine the deformation of structural elements and to express

EBingwBOUW1.3 Be able to interpret basic features and basic characteristics of (building-) materials and their use in simple civil engineering	Competences in one/more scientific discipline(s)
constructions.	

<<

men voorafgegaan door ** werden niet terugg Phenomena n of Buildings	Teaching methods gevonden in de studiefiche lecture seminar lecture seminar	open book examination written examination with open	To know the basic laws of stationary heat transport and to be able to apply them. To solve problems of stationary heat transport. Understanding of concepts and functioning of loadbearing constructions and building components.
n of Buildings	seminar lecture	written examination with open	To solve problems of stationary heat transport. Understanding of concepts and functioning of loadbearing constructions and building components.
n of Buildings	seminar lecture	written examination with open	To solve problems of stationary heat transport. Understanding of concepts and functioning of loadbearing constructions and building components.
·		•	
io		questions	Create structural concepts and detailing in a correct way.
velee		report written examination with multiple	Reason and argue the use of steel, timber, concrete, masonry and glass as building materials. Estimate the dimensions of a number of major building components by means of simplified formulas and rules-of-thumb.
		choice questions	Mastering basic principles of terrain, soil and foundation techniques.
ysics	lecture seminar	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics
	practicum		performances.
			Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
tructures: Reinforced Concrete	lecture	oral examination	Elucidate the interaction mechanisms between reinforcement and concrete (equivalent concrete section, bond, cracking,
	seminar: coached exercises		anchorage). Practical evaluation of concrete stresses, crack widths and deflections in the serviceability limit states.
			Assessment of the load-bearing capacity of existing concrete structures by checking the relevant ultimate limit states.
			Substantiate the ultimate behaviour of linear reinforced concrete members (columns and beams) submitted to compression, bending, compound bending,
			shear and torsion by means of appropriate design models. Develop the moment-curvature relationship of reinforced concrete sections as a tool for the prediction of the deformation
			behaviour of linear elements
			including the time-dependent aspects. Selection of the dimensions of linear concrete members and calculation of the required reinforcement areas based on the
			internal forces in the ultimate limit
			state. Have insight in the general design philosophy of concrete structures in the framework of the semi-probabilistic safety format.
			Identify and characterize the
			relevant limit states. Analyse the force transfer in disturbed regions by means of strut-and-tie models. Justify the proposed solution.
analysis II	lecture	oral examination	Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of
	seminar: practical PC room classes seminar: coached exercises	report	structures composed of bar and plate elements.
	-		Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures.
			Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for
			the analysis of simple, but realistic design situations.
			Modelling and calculation of structural elements composed of bar and plate elements using the displacement method.
			Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these.
			Critical analysis of calculation results and the presentation of these results both individually as in a team.
analysis of Geotechnical Structures	lecture seminar: practical PC room classes	written examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and
analysis of Geotechnical Structures	lecture seminar: practical PC room classes seminar: coached exercises	report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils.
analysis of Geotechnical Structures	seminar: practical PC room classes	report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures.
analysis of Geotechnical Structures	seminar: practical PC room classes	report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis
analysis of Geotechnical Structures	seminar: practical PC room classes	report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-
analysis of Geotechnical Structures	seminar: practical PC room classes	report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team.
,	seminar: practical PC room classes seminar: coached exercises	report oral examination open book examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
analysis of Geotechnical Structures	seminar: practical PC room classes seminar: coached exercises	report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds
,	seminar: practical PC room classes seminar: coached exercises	report oral examination open book examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elastoplastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global
,	seminar: practical PC room classes seminar: coached exercises	report oral examination open book examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elastoplastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III").
,	seminar: practical PC room classes seminar: coached exercises lecture seminar: coached exercises group work	oral examination open book examination open book examination oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elastoplastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations
tures	seminar: practical PC room classes seminar: coached exercises lecture seminar: coached exercises	report oral examination open book examination open book examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts
tures	seminar: practical PC room classes seminar: coached exercises lecture seminar: coached exercises group work	oral examination open book examination open book examination oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design
tures	seminar: practical PC room classes seminar: coached exercises lecture seminar: coached exercises group work	oral examination open book examination open book examination oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers
tures	seminar: practical PC room classes seminar: coached exercises lecture seminar: coached exercises group work	oral examination open book examination open book examination oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a
tures n to Bridge Engineering	seminar: practical PC room classes seminar: coached exercises lecture seminar: coached exercises group work	open book examination open book examination open book examination oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent
tures	seminar: practical PC room classes seminar: coached exercises lecture seminar: coached exercises group work lecture excursion	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and buil
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project	open book examination open book examination open book examination oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent Manner an ordinary bridge and bui
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent Knowledge • Familiarity with conce
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to design an ordinary steel construction of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or botts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it K
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elastoplastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design, bui
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elastoplastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of beams on elastic Foundation.' To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elastoplastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation.' To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and postensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it Knowledge Familiarity with concepts regarding force flow, bearing structure a
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elastoplastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to dictate the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III'). To be able to design and to calculate connections with welds or botts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding Recognize the design loads for bridges, understand them and use them in design Recognize the design loads for bridges, understand them and us
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies Ill"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet plinings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to design and origination of application of the concept of 'beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course 'Berekening van Bouwkundige Constructies III'). To be able to design and to calculate connections with welds or boths Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to be surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments, identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary br
tures n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture group work ** guided self-study	open book examination open book examination open book examination oral examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation.' To be able to dictate the conditions for a good execution of welds or be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course 'Berekening van Bouwkundige Constructies III'). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations. Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length, evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it Knowledge • Familiarity with concepts regarding force flow, bearing structure an
n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture group work	open book examination open book examination oral examination report oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies Ill"). To be able to design and to calculate connections with welds or boths Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design i
n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture group work ** guided self-study seminar: coached exercises	open book examination open book examination oral examination report oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of intermal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elastoplastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of beams on elastic Foundation. To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posterisoining and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it R
n to Bridge Engineering	lecture seminar: coached exercises lecture seminar: coached exercises group work lecture excursion self-reliant study activities project lecture group work ** guided self-study seminar: coached exercises	open book examination open book examination oral examination report oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of beams on elastic Foundation'. To be able to dictate the conditions for a good execution of welds To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies Ill"). To be able to design and to calculate connections with welds or boths Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design i
		nalysis II lecture seminar: practical PC room classes	nalysis II lecture oral examination seminar: practical PC room classes report

E099101 Engineering Project	excursion	oral examination	Application of the knowledge of Concrete Technology, in an independent way.	
	lecture	report	Present results by giving a presentation and writing a report, within a realistic industrial context.	
	group work	participation	Work together in small groups of students, on a topic related to concrete technology.	
E053510 Geometric Aspects of Roads	group work	oral examination	Have basic knowledge of material use.	
	locturo	raport		

EBingwBOUW1.4 Be able to identify and understand transport phenomena in liquids, especially the flow of water, and to apply them to

Competences in one/more scientific discipline(s)

standard design problem	IS.		
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** wer	rden niet teruggevonden in de studiefiche		
E045120 Transport Phenomena	lecture	open book examination	To understand the properties of fluids.
	seminar: practical PC room class	ses	To understand the similarities between transport of impulse, heat and mass.
	seminar		To understand the law of energy in open and closed systems and to be able to apply it.
			To master the laws of statics and dynamics and to be able to apply them.
E050310 Building Physics	lecture	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when
	seminar		evaluating building physics
	practicum		performances.
			Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way.
			Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
045411 Hydraulics	demonstration	written examination	Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels.
	seminar: coached exercises	report	Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles.
	project	oral examination	Being able to identify and assess pressure surge problems in pipes.
	practicum		Having insight into the behaviour and modelling of pressurized flow in pipe networks.
	lecture		Having insight into the position of water surface profiles in non-prismatic channels and transition sections.
	group work		Being able to analyze and rationally solve a pipe network problem.
			Having insight into the different types of models for unsteady flow in pressurized pipes.
			Being able to determine and calculate backwater-curves in prismatic open channels.

<<

EBingwBOUW1.5 Be able to apply basic knowledge of soil characteristics to basic foundation problems.

<<

Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	evonden in de studiefiche		
E050410 Construction of Buildings	lecture seminar	written examination with open questions report written examination with multiple choice questions	Mastering basic principles of terrain, soil and foundation techniques.
E050310 Building Physics	lecture seminar practicum	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E046010 Soil Mechanics	lecture project	oral examination report	Basic knowledge of soil behaviour is applied to simple foundation problems.
E044230 Structural Analysis of Geotechnical Structures	lecture seminar: practical PC room classes seminar: coached exercises	written examination report oral examination open book examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E099000 Cross-Course Project	group work self-reliant study activities project lecture	oral examination report	 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design, building materials and structural elements. Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields. Demonstrating insight into the approach and elaboration of the structural design.

bridges. Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden	niet teruggevonden in de studiefiche		
E050410 Construction of Buildings	lecture seminar	written examination with open questions report written examination with multiple choice questions	Understanding of concepts and functioning of loadbearing constructions and building components. Understand and explain basic principles and structural concequences of HVAC, internal sewage and elevator installations. Understand the integration challenge of centralized components of al typical technical installations. Recognizing typical technical structures in buildings. Create structural concepts and detailing in a correct way. Reason and argue the use of steel, timber, concrete, masonry and glass as building materials.
E050310 Building Physics	lecture seminar practicum	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E044811 Introduction to Bridge Engineering	group work lecture	oral examination report	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
E099000 Cross-Course Project	excursion self-reliant study activities project lecture group work	oral examination report	 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design building materials and structural elements. Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields. Demonstrating insight into the approach and elaboration of the structural design. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain. Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting.
E053510 Geometric Aspects of Roads	group work lecture	oral examination report	Have basic knowledge of material use. To be able to make a (pre)design of a road project from a geometric point of view as there is: the design of a cross section, calculating an axe in plan view and the design of a length profile, design and conception of a crossing and/or a traffic interchanger. To be able to read and to understand a road design project.

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugge	evonden in de studiefiche		
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired properties.
E009512 Suptainability Entraprenaurabin and Ethica	project	assignment	To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use in specific situations. Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	framework of engineering activities.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E015041 Informatics	·	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E050310 Building Physics	lecture seminar practicum		Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E044220 Structural Analysis II	seminar: coached exercises seminar: practical PC room classes	oral examination report	Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Critical analysis of calculation results and the presentation of these results both individually as in a team.
E044230 Structural Analysis of Geotechnical Structures	seminar: coached exercises seminar: practical PC room classes	oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response ar analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E045411 Hydraulics	demonstration seminar: coached exercises project practicum lecture group work	written examination report oral examination	Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels. Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles. Being able to identify and assess pressure surge problems in pipes. Having insight into the behaviour and modelling of pressurized flow in pipe networks. Having insight into the position of water surface profiles in non-prismatic channels and transition sections. Being able to analyze and rationally solve a pipe network problem. Having insight into the different types of models for unsteady flow in pressurized pipes. Being able to determine and calculate backwater-curves in prismatic open channels.
E099000 Cross-Course Project	group work self-reliant study activities project lecture	oral examination report	Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain.
E099101 Engineering Project	excursion lecture group work	oral examination report participation	Application of the knowledge of Concrete Technology, in an independent way. Present results by giving a presentation and writing a report, within a realistic industrial context. Work together in small groups of students, on a topic related to concrete technology.

Status GOEDGEKEURD op 2020-09-17 13:09:19.065 15 /45 25-01-2022

EBingwALG2.2 Employ standard models, met	thods and techniques in assignments.
--	--------------------------------------

Ebingwaloziz Employ Stand	,	•	·
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden nie	et teruggevonden in de studiefiche		
E001142 Basic Mathematics E003043 Probability and Statistics	lecture: plenary exercises seminar: coached exercises guided self-study seminar: coached exercises	written examination written examination with multiple choice questions	Being able to perform basic calculations quickly and efficiently by hand. To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors. To reason and to work with multi-dimensional random variables To identify an appropriate probabilistic model for the analysis of an event or experiment
E066012 Materials Technology	lecture guided self-study seminar: practical PC room classes seminar: coached exercises lecture	open book examination written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties
			To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired properties. To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when understand the basic concepts of materials are concepts of materials and consequently to design materials and consequently to design material and consequently design material and con
E001132 Mathematical Analysis I	seminar	written examination open book examination	in specific situations. Being able to assess the convergence of numerical series and series of functions. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to
			be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems.
			Being able to construct and manipulate power series and Fourier series. Being able to use power series for solving ordinary differential equations.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Use of software tools to make simulations and diagrams
E015041 Informatics	lecture seminar: practical PC room classes	written examination open book examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm. To design an algorithm solving a given problem, and to assess the complexity of this solution. To master the basic concepts of objectorientation and to realize an objectoriented program in Python.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative,
E000662 Geometry and Linear Algebra	seminar	written examination open book examination	differentiability, gradient, multiple integral, Jacobian and co-ordinate transform. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transfor on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear
E040420 Mechanics of Materials	seminar: coached exercises	open book examination	transform between abstract vector spaces. To be familiar with the applications of linear elasticity theory. Applications of the problem solving methods in elasticity theory.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations.
			To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively the 6 credit points course.) To have understood the sampling theorem and its applications.
			To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E050410 Construction of Buildings	lecture seminar	written examination with open questions report written examination with multiple choice questions	Analyse and apply principles of horizontal and vertical stability of buildings. Understanding the pre-design of technical volumes, based on experience based data. Create structural concepts and detailing in a correct way. Reason and argue the use of steel, timber, concrete, masonry and glass as building materials. Estimate the dimensions of a number of major building components by means of simplified formulas and rules-of-thumb. Understanding of concepts and functioning of loadbearing constructions and building components.
E050310 Building Physics	lecture seminar practicum	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way.

E052412 Concrete Structures: Reinforced Concrete	lecture seminar: coached exercises	oral examination	Elucidate the interaction mechanisms between reinforcement and concrete (equivalent concrete section, bond, cracking, anchorage). Practical evaluation of concrete stresses, crack widths and deflections in the serviceability limit states. Assessment of the load-bearing capacity of existing concrete structures by checking the relevant ultimate limit states. Substantiate the ultimate behaviour of linear reinforced concrete members (columns and beams) submitted to compression, bending, compound bending, shear and torsion by means of appropriate design models. Develop the moment-curvature relationship of reinforced concrete sections as a tool for the prediction of the deformation behaviour of linear elements including the time-dependent aspects. Selection of the dimensions of linear concrete members and calculation of the required reinforcement areas based on the internal forces in the ultimate limit state. Have insight in the general design philosophy of concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Analyses the force trapefor in disturbed regions by means of ctrut and tip models. Justify the prepaged calution.
E044220 Structural Analysis II	seminar: coached exercises seminar: practical PC room classes	open book examination report oral examination	Analyse the force transfer in disturbed regions by means of strut-and-tie models. Justify the proposed solution. Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Critical analysis of calculation results and the presentation of these results both individually as in a team.
E044230 Structural Analysis of Geotechnical Structures	seminar: coached exercises seminar: practical PC room classes	open book examination report oral examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E000810 Topography	lecture practicum	written examination report	SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring,
E044510 Metal Structures	seminar: coached exercises	open book examination	compensator, setting up, coordinate system, projection system, EDM. To be able to design and to calculate connections with welds or bolts To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Construction III")
E044811 Introduction to Bridge Engineering	group work online lecture online group work lecture	oral examination report	Stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
E045411 Hydraulics	demonstration seminar: coached exercises project practicum lecture group work	written examination report oral examination	Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels. Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles. Being able to identify and assess pressure surge problems in pipes. Having insight into the behaviour and modelling of pressurized flow in pipe networks. Having insight into the position of water surface profiles in non-prismatic channels and transition sections. Being able to analyze and rationally solve a pipe network problem. Having insight into the different types of models for unsteady flow in pressurized pipes. Being able to determine and calculate backwater-curves in prismatic open channels.
E070160 Chemistry: Selected Topics	seminar: coached exercises	written examination with open questions	Understanding the relation between reaction rate and reaction mechanism Knowledge of the properties and synthesis of important types of synthetic organic polymers Knowledge of the properties and synthesis of important types of inorganic polymers
E099000 Cross-Course Project	group work self-reliant study activities project lecture	oral examination report	 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design, building materials and structural elements. Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields. Demonstrating insight into the approach and elaboration of the structural design. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain. Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting.

E003230 Statistical Data Processing	seminar: coached exercises seminar: practical PC room classes	written examination report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis	
E061430 Computer Aided Design	demonstration seminar: practical PC room classes	open book examination	Exporting to several types of graphical documents, including the representation of specific views. Being familiar with CAD software.	
E099101 Engineering Project	excursion lecture group work	oral examination report participation	Application of the knowledge of Concrete Technology, in an independent way. Present results by giving a presentation and writing a report, within a realistic industrial context. Work together in small groups of students, on a topic related to concrete technology.	

EBingwALG2.3 Schematize and model phenomena, processes, and systems.	Scientific competences
--	------------------------

<<

Course	Teaching methods	Evaluation methods	Course learning outcome
loot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	evonden in de studiefiche		
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To identify an appropriate probabilistic model for the analysis of an event or experiment
E020061 Physics I	demonstration lecture	written examination	To understand the physical laws and concepts of the covered chapters. To be able to solve problems by applying these laws and concepts.
E001132 Mathematical Analysis I	lecture lecture: plenary exercises seminar	written examination	To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial
E001460 Discrete Mathematics I	guided self-study seminar: coached exercises practicum lecture	written examination open book examination	value problems. Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	lecture lecture: plenary exercises seminar	written examination open book examination	Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them.
E020220 Physics II	demonstration lecture	written examination participation	To be able to solve physics problems by applying these laws and concepts. To understand the physical laws and concepts of the covered chapters.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations.
			To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E076040 Sustainable Business Operations	lecture	written examination with open questions written examination with multiple choice questions	Understand the technique of financial balance sheet reading and be able to apply it practically in simple accounting exercises
E050310 Building Physics	lecture seminar practicum	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E044220 Structural Analysis II	lecture seminar: practical PC room classes seminar: coached exercises	written examination report oral examination open book examination	Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method.
E044230 Structural Analysis of Geotechnical Structures	lecture seminar: practical PC room classes seminar: coached exercises	written examination report oral examination open book examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response an analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.

E000810 Topography	lecture practicum	written examination report	SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring, compensator, setting up, coordinate system, projection system, EDM.
E044510 Metal Structures	lecture seminar: coached exercises	open book examination	To be able to design and to calculate connections with welds or bolts To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III").
E044811 Introduction to Bridge Engineering	group work lecture	oral examination report	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
E045411 Hydraulics	demonstration seminar: coached exercises project practicum lecture group work	written examination report oral examination	Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels. Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles. Being able to identify and assess pressure surge problems in pipes. Having insight into the behaviour and modelling of pressurized flow in pipe networks. Having insight into the position of water surface profiles in non-prismatic channels and transition sections. Being able to analyze and rationally solve a pipe network problem. Having insight into the different types of models for unsteady flow in pressurized pipes. Being able to determine and calculate backwater-curves in prismatic open channels.
E099000 Cross-Course Project	excursion self-reliant study activities project lecture group work	oral examination report	 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design, building materials and structural elements. Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields. Demonstrating insight into the approach and elaboration of the structural design. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain.
E044120 Structural Analysis I	** guided self-study seminar: coached exercises lecture	written examination	Determining the load distribution and displacements in statically determinate and indeterminate trusses. Determining influence lines for trusses. Determining the flexural critical buckling load of compressed members by means of appropriate differential equations and boundary conditions. Knowing and using the principle of funicular arches. Deriving and applying Bresses's equations for different arch types and be able to determine influence lines for these elements. Understanding which types of structural systems exist and which types of load can work on a structure. Having insight in the design philosophy of the eurocodes with regard to limit states and being able to apply this. Determining the influence lines of stress resultants and deformations in a direct and indirect manner. Understanding the effects of bending moments, normal force, shear force and St Venant Torsion on the normal and shear stresses in a cross-section and be able to determine these. Understanding the principle of virtual work and using this to determine the deformation of structural elements and to express compatibility conditions, e.g. on the basis of the integrals and analogies of Mohr and the theorems of Greene. Understanding and applying the slope-deflection method for frames and continuous beams with rigid or spring supports.
E090420 Mechanical Engineering	lecture	written examination	Understand operation of energetic equipment: piston machines, turbomachinery

Course	Teaching methods	Evaluation methods	Course learning outcome
loot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	_		
070080 Chemical Thermodynamics	guided self-study seminar: coached exercises lecture	written examination open book examination	Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions. Calculation of the pH of aqueous solutions. Understand and apply chemical equilibrium.
003043 Probability and Statistics	lecture		To calculate probabilities of events and expectations of random variables
66012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties. To be able to correlate the structure and properties of materials
98512 Sustainability, Entrepreneurship and Ethics	project	assignment	To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations. Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering
			activities.
70070 Chemistry: the Structure of Matter	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform stoichiometric calculations. Identify and describe the different types of intermolecular interactions. Being able to determine the molecular geometry of covalent compounds. Identify and describe the different types of chemical bonding. Being able to order atoms and ions based on their periodic properties Being able to write the electron configuration of atoms and ions.
98513 Modelling, Making and Measuring	project	report	Writing reports
001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Oral presentation Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results.
			To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
)44220 Structural Analysis II	seminar: coached exercises seminar: practical PC room classes	open book examination report oral examination	Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for
			the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Critical analysis of calculation results and the presentation of these results both individually as in a team.
944230 Structural Analysis of Geotechnical Structures	seminar: coached exercises seminar: practical PC room classes	oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis
			and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
044811 Introduction to Bridge Engineering	group work lecture	oral examination report	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a
			technically consistent manner an ordinary bridge and build it
45411 Hydraulics	demonstration seminar: coached exercises project practicum lecture group work	written examination report oral examination	Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels. Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles. Being able to identify and assess pressure surge problems in pipes. Having insight into the behaviour and modelling of pressurized flow in pipe networks. Having insight into the position of water surface profiles in non-prismatic channels and transition sections. Being able to analyze and rationally solve a pipe network problem. Having insight into the different types of models for unsteady flow in pressurized pipes.
099000 Cross-Course Project	group work self-reliant study activities project	oral examination report	Being able to determine and calculate backwater-curves in prismatic open channels. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight).

** guided self-study seminar: coached exercises	written examination open book examination	Determining the load distribution and displacements in statically determinate and indeterminate trusses. Determining influence lines for trusses.
lecture		Determining the flexural critical buckling load of compressed members by means of appropriate differential equations and boundary conditions.
		Knowing and using the principle of funicular arches. Deriving and applying Bresses's equations for different arch types and be able to determine influence
		lines for these elements. Understanding which types of structural systems exist and which types of load can work on a structure.
		Having insight in the design philosophy of the eurocodes with regard to limit states and being able to apply this. Determining the influence lines of stress resultants and deformations in a direct and indirect manner.
		Understanding the effects of bending moments, normal force, shear force and St Venant Torsion on the normal and shear stresses in a cross-section and
		be able to determine these.
		Understanding the principle of virtual work and using this to determine the deformation of structural elements and to express
		compatibility conditions, e.g.
		on the basis of the integrals and analogies of Mohr and the theorems of Greene.
		Understanding and applying the slope-deflection method for frames and continuous beams with rigid or spring supports.
seminar: practical PC room classes		Describe trends in data and find correlations using regression analysis
	•	Elaborate and interpret a statistical analysis of data, using statistical software
		Estimate model parameters
		Be able to carry out analysis of variance and multiple comparison of treatment means
		Suggest suitable statistical models
		Decide based on a limited sample, using appropriate hypothesis tests
excursion	oral examination	Application of the knowledge of Concrete Technology, in an independent way.
lecture	report	Present results by giving a presentation and writing a report, within a realistic industrial context.
group work	participation	Work together in small groups of students, on a topic related to concrete technology.
_	seminar: coached exercises lecture seminar: practical PC room classes excursion lecture	seminar: coached exercises open book examination lecture seminar: practical PC room classes written examination report excursion oral examination report

EBingwBOUW2.1 Employ basic civil engineering knowledge in an integrated way to case studies in the field of the construction of buildings.

	competences	

Course	Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	evonden in de studiefiche			
E050410 Construction of Buildings	lecture seminar	written examination with open questions report written examination with multiple choice questions	Analyse and apply principles of horizontal and vertical stability of buildings. Understanding the pre-design of technical volumes, based on experience based data. Understand and explain basic principles and structural concequences of HVAC, internal sewage Understand the integration challenge of centralized components of all typical technical installations. Recognizing typical technical estructural concepts and detailing in a correct way. Reason and argue the use of steel, timber, concrete, masonry and glass as building materials. Estimate the dimensions of a number of major building components by means of simplified form Mastering basic principles of terrain, soil and foundation techniques. Understanding of concepts and functioning of loadbearing constructions and building components.	chnical structures in buildings.
E050310 Building Physics	lecture seminar practicum	assignment	Be able to derive and build calculation methods and models in building physics, and be able to evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a ph Define typical variables in building physics and relate them to hygrothermal material - and construction.	use these methods when sysically correct way.
E044220 Structural Analysis II	seminar: coached exercises seminar: practical PC room classes	open book examination report oral examination	Being able to perform a critical evaluation of the results obtained from commercially available F structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral st Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures compos the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the Develop an engineering attitude for the simplified modeling of real structures composed of bars solve these. Critical analysis of calculation results and the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of these results both individually as in the presentation of the p	EM software for the analysis of tability of structures. ed of bar and plate elements for displacement method. and plates and being able to
E044230 Structural Analysis of Geotechnical Structures	seminar: coached exercises seminar: practical PC room classes	oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures viserviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads a plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a design able to calculate a 2D pile foundation according to the serviceability limit state and ultimate Insight into the range and domain of application of the concept of 'beams on elastic Foundation	vith respect to the ultimate and according to 'plastic' and 'elastowith respect to their response and quay wall to an engineering team. ate limit state.
E099000 Cross-Course Project	excursion self-reliant study activities project lecture group work	oral examination report	 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engine building materials and structural elements. Design of the concept of a bearing structure, including its foundation, and design of structural Recognition of construction project stages and the cross-connection between knowledge field. Demonstrating insight into the approach and elaboration of the structural design. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with working substantive and with understanding (insight). Showing insight in a construction project and be able to explain. Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting. 	l elements. ds.

23 /45 Status GOEDGEKEURD op 2020-09-17 13:09:19.065 25-01-2022

Course	limitations of knowledge and a	Teaching methods	Evaluation methods	Course learning outcome	
loot: leer- er	n evaluatievormen voorafgegaan door ** werden niet	teruggevonden in de studiefiche			
E050410(Construction of Buildings	lecture seminar	written examination with open questions report written examination with multiple choice questions	Reason and argue the use of steel, timber, concrete, masonry and glass as building materials. Create structural concepts and detailing in a correct way.	
E044811 I	Introduction to Bridge Engineering	group work lecture	oral examination report	Understanding of construction methods using pre- and posttensioning and using them in desig Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of tra attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and technically consistent manner an ordinary bridge and build it	ffic loads on a bridge deck; give
E099000 €	Cross-Course Project	excursion self-reliant study activities project lecture group work	oral examination report	 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, enbuilding materials and structural elements. Design of the concept of a bearing structure, including its foundation, and design of structural Recognition of construction project stages and the cross-connection between knowledge fiele. Demonstrating insight into the approach and elaboration of the structural design. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain. Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting. 	al elements. ds.
E053510(Geometric Aspects of Roads	group work	report	Have basic knowledge of material use. To be able to make a (pre)design of a road project from a geometric point of view as there is: t calculating an axe in plan view and the design of a length profile, design and conception of a crossing and/or a traffic intercha To be able to read and to understand a road design project.	-

Status GOEDGEKEURD op 2020-09-17 13:09:19.065 24 /45 25-01-2022

EBingwALG3.1 Understand and structure learning experiences.	Intellectual competences
---	--------------------------

Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet	Teaching methods teruggevonden in de studiefiche	Evaluation methods	Course learning outcome
E001142 Basic Mathematics	seminar: coached exercises	written examination	To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors. Being able to formulate correctly and with mathematical precision. Being able to make a correct reasoning and to write it down in a structured way.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To perform a linear regression and to interpret its results To understand and to apply methods for hypothesis testing To understand and to apply methods for (parameter) estimation To interpret and to judge the results of statistical sampling, and to represent them in an appropriate form To identify an appropriate probabilistic model for the analysis of an event or experiment To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired properties.
E001132 Mathematical Analysis I	guided self-study	written examination open book examination	To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use in specific situations. Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series.
E015041 Informatics	guided self-study	written examination	Being able to use power series for solving ordinary differential equations. To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm
E001222 Mathematical Analysis II	seminar: practical PC room classes lecture guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination open book examination	To design an algorithm solving a given problem, and to assess the complexity of this solution. To master the basic concepts of objectorientation and to realize an objectoriented program in Python. Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative,
E000662 Geometry and Linear Algebra	guided self-study	written examination open book examination	differentiability, gradient, multiple integral, Jacobian and co-ordinate transform. Having acquired skills in the manipulation of vectors.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E076040 Sustainable Business Operations	lecture	written examination with open questions written examination with multiple choice questions	Critical, creative thinking and scientific reasoning Be able to think carefully about social, scientific and ethical problems and possible solutions to these problems
E044220 Structural Analysis II	seminar: coached exercises seminar: practical PC room classes	written examination report oral examination open book examination	Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Critical analysis of calculation results and the presentation of these results both individually as in a team.

E044230 Structural Analysis of Geotechnical Structures	seminar: coached exercises seminar: practical PC room classes	written examination report oral examination open book examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis.
			Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E000810 Topography	lecture practicum		SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing.
			SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and
			drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring,
E044811 Introduction to Bridge Engineering	group work	report	compensator, setting up, coordinate system, projection system, EDM. Understanding of construction methods using pre- and posttensioning and using them in design situations
5 5 5	0 1	•	Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding
			area impact and social acceptance and ecologic footprint of bridge design
			Recognize the design loads for bridges, understand them and use them in design
			Argument the equilibrium of abutments; identify the behaviour of piers
			Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent
			manner an ordinary bridge and build it
E099000 Cross-Course Project	excursion	oral examination	Proficiencies
	self-reliant study activities	report	 Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools).
	project lecture		 Use of knowledge 'structural engineering design' in realistic projects.
	group work		Relevant reporting.
			Attitudes
			Working in a team.
			 Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain.
E044120 Structural Analysis I	** guided self-study	written examination	Determining the load distribution and displacements in statically determinate and indeterminate trusses. Determining influence
, and the second	seminar: coached exercises lecture		lines for trusses. Determining the flexural critical buckling load of compressed members by means of appropriate differential equations and boundary conditions.
			Knowing and using the principle of funicular arches. Deriving and applying Bresses's equations for different arch types and be able to determine influence lines for these elements.
			Understanding which types of structural systems exist and which types of load can work on a structure.
			Having insight in the design philosophy of the eurocodes with regard to limit states and being able to apply this.
			Determining the influence lines of stress resultants and deformations in a direct and indirect manner.
			Understanding the effects of bending moments, normal force, shear force and St Venant Torsion on the normal and shear stresses in a cross-section and
			be able to determine these.
			Understanding the principle of virtual work and using this to determine the deformation of structural elements and to express
			compatibility conditions, e.g.
			on the basis of the integrals and analogies of Mohr and the theorems of Greene.
			Understanding and applying the slope-deflection method for frames and continuous beams with rigid or spring supports. Knowing and being able to use basic terminology with regard to structural analysis
E090420 Mechanical Engineering	lecture	written examination	Understand operation of energetic equipment: piston machines, turbomachinery Distinguishing and describing mechanical production processes: forming and machining

Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet	Teaching methods t teruggevonden in de studiefiche	Evaluation methods	Course learning outcome
E001142 Basic Mathematics	lecture seminar: coached exercises	written examination	Being able to make a correct reasoning and to write it down in a structured way.
E003043 Probability and Statistics	lecture: plenary exercises guided self-study seminar: coached exercises lecture	written examination with multipl choice questions open book examination	e To reason and to work with multi-dimensional random variables To identify an appropriate probabilistic model for the analysis of an event or experiment To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired properties. To be able to correlate the structure and properties of materials
E098512 Sustainability, Entrepreneurship and Ethic	s project	assignment	To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use in specific situations. Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the
			framework of engineering activities.
E020061 Physics I	demonstration lecture		To understand the physical laws and concepts of the covered chapters. To be able to solve problems by applying these laws and concepts.
E001132 Mathematical Analysis I	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems.
E001460 Discrete Mathematics I	guided self-study seminar: coached exercises practicum lecture	written examination open book examination	Being able to construct and manipulate power series and Fourier series. Being able to use power series for solving ordinary differential equations. Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E015041 Informatics	lecture	written examination	Use of software tools to make simulations and diagrams To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm
E001222 Mathematical Analysis II	seminar: practical PC room classes guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination open book examination	To master the basic concepts of objectorientation and to realize an objectoriented program in Python. Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Having acquired insight in the notions vector space, linear dependence and independence, basis and dimension. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
E040420 Mechanics of Materials	seminar: coached exercises	open book examination	To be familiar with the applications of linear elasticity theory.
E020220 Physics II	demonstration lecture	written examination participation	Applications of the problem solving methods in elasticity theory. To be able to solve physics problems by applying these laws and concepts. To understand the physical laws and concepts of the covered chapters.
E045120 Transport Phenomena	lecture seminar: practical PC room classes seminar	open book examination	To master the laws of statics and dynamics and to be able to apply them. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.

Status GOEDGEKEURD op 2020-09-17 13:09:19.065 27 /45 25-01-2022

E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for
			the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals.
E050410 Construction of Buildings	lecture seminar	written examination with open questions report	To describe linear systems by means of the state model. (exclusively for the 6 credit points course.) Analyse and apply principles of horizontal and vertical stability of buildings. Understanding the pre-design of technical volumes, based on experience based data. Understand and explain basic principles and structural concequences of HVAC, internal sewage and elevator installations.
		written examination with multiple choice questions	
E050310 Building Physics	lecture seminar practicum	assignment	Understanding of concepts and functioning of loadbearing constructions and building components. Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and mainture insulation in the construction and building design in a physically correct way.
			Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E052412 Concrete Structures: Reinforced Concrete	lecture seminar: coached exercises		Elucidate the interaction mechanisms between reinforcement and concrete (equivalent concrete section, bond, cracking, anchorage).
	Serminar. Codemed exercises		Practical evaluation of concrete stresses, crack widths and deflections in the serviceability limit states. Assessment of the load-bearing capacity of existing concrete structures by checking the relevant ultimate limit states. Substantiate the ultimate behaviour of linear reinforced concrete members (columns and beams) submitted to compression, bending, compound bending, shear and torsion by means of appropriate design models.
			Develop the moment-curvature relationship of reinforced concrete sections as a tool for the prediction of the deformation behaviour of linear elements including the time-dependent aspects. Selection of the dimensions of linear concrete members and calculation of the required reinforcement areas based on the internal forces in the ultimate limit
			state. Have insight in the general design philosophy of concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states.
E044220 Structural Analysis II	lecture seminar: practical PC room classes seminar: coached exercises	oral examination	Analyse the force transfer in disturbed regions by means of strut-and-tie models. Justify the proposed solution. Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar and plate elements.
		open book examination	Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method.
			Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these.
E044230 Structural Analysis of Geotechnical Structures	lecture	written examination	Critical analysis of calculation results and the presentation of these results both individually as in a team. Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and
E044230 Structural Arialysis of Geolechnical Structures	seminar: practical PC room classes		serviceability limit states.
	seminar: coached exercises	oral examination open book examination	Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-
			plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and
			analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team.
			Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wan to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E000810 Topography	lecture practicum	written examination report	SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing.
			SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a
			surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these
			instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring, compensator, setting up, coordinate system, projection system, EDM.
E044510 Metal Structures	lecture seminar: coached exercises	open book examination	To be able to dictate the conditions for a good execution of welds To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III").
E044811 Introduction to Bridge Engineering	group work lecture	peer assessment report	To be able to design and to calculate connections with welds or bolts Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design
			Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a
			technically consistent manner an ordinary bridge and build it

E045411 Hydraulics	demonstration seminar: coached exercises project practicum lecture group work	written examination report oral examination	Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels. Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles. Being able to identify and assess pressure surge problems in pipes. Having insight into the behaviour and modelling of pressurized flow in pipe networks. Having insight into the position of water surface profiles in non-prismatic channels and transition sections. Being able to analyze and rationally solve a pipe network problem. Having insight into the different types of models for unsteady flow in pressurized pipes. Being able to determine and calculate backwater-curves in prismatic open channels.
E099000 Cross-Course Project	group work self-reliant study activities project lecture	oral examination report	 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design, building materials and structural elements. Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields. Demonstrating insight into the approach and elaboration of the structural design. Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting.
E044120 Structural Analysis I	** guided self-study seminar: coached exercises lecture	written examination open book examination	Determining the load distribution and displacements in statically determinate and indeterminate trusses. Determining influence lines for trusses. Determining the flexural critical buckling load of compressed members by means of appropriate differential equations and boundary conditions. Knowing and using the principle of funicular arches. Deriving and applying Bresses's equations for different arch types and be able to determine influence lines for these elements. Understanding which types of structural systems exist and which types of load can work on a structure. Having insight in the design philosophy of the eurocodes with regard to limit states and being able to apply this. Determining the influence lines of stress resultants and deformations in a direct and indirect manner. Understanding the effects of bending moments, normal force, shear force and St Venant Torsion on the normal and shear stresses in a cross-section and be able to determine these. Understanding the principle of virtual work and using this to determine the deformation of structural elements and to express compatibility conditions, e.g. on the basis of the integrals and analogies of Mohr and the theorems of Greene. Understanding and applying the slope-deflection method for frames and continuous beams with rigid or spring supports.
E003230 Statistical Data Processing	seminar: coached exercises seminar: practical PC room classes	written examination report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E053510 Geometric Aspects of Roads	group work lecture	report	Have basic knowledge of material use. To be able to make a (pre)design of a road project from a geometric point of view as there is: the design of a cross section, calculating an axe in plan view and the design of a length profile, design and conception of a crossing and/or a traffic interchanger. To be able to read and to understand a road design project.

EBingwALG3.3 Show precision, perseverance and critical reflection.	Intellectual competences
--	--------------------------

Course	Teaching methods	Evaluation methods	Course learning outcome
oot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
E001142 Basic Mathematics	lecture seminar: coached exercises lecture: plenary exercises	written examination	Being able to formulate correctly and with mathematical precision.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	To reason and to work with multi-dimensional random variables To perform a linear regression and to interpret its results To understand and to apply methods for hypothesis testing To understand and to apply methods for (parameter) estimation To interpret and to judge the results of statistical sampling, and to represent them in an appropriate form To identify an appropriate probabilistic model for the analysis of an event or experiment To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties.
			To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E001132 Mathematical Analysis I	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series. Poing able to use power series for solving ordinary differential equations.
E001460 Discrete Mathematics I	guided self-study seminar: coached exercises practicum lecture	written examination open book examination	Being able to use power series for solving ordinary differential equations. Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations. Deploying deductively correct reasonings in an independent way. Evaluating logical reasonings with respect to correctness / identifying errors. Deploying mathematical reasoning and proof argumentation. Using basic concepts from set theory, group theory, combinatorics and graph theory.
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them. Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Having acquired insight in the notions vector space, linear dependence and independence, basis and dimension. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
E045120 Transport Phenomena	lecture seminar: practical PC room classes seminar	open book examination	To understand the properties of fluids. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it. To master the laws of statics and dynamics and to be able to apply them.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations. To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.

E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals.
E050310 Building Physics	lecture seminar practicum	assignment	To describe linear systems by means of the state model. (exclusively for the 6 credit points course.) Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances.
	praotioum		Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E052412 Concrete Structures: Reinforced Concrete	lecture seminar: coached exercises	oral examination	Elucidate the interaction mechanisms between reinforcement and concrete (equivalent concrete section, bond, cracking, anchorage). Practical evaluation of concrete stresses, crack widths and deflections in the serviceability limit states. Assessment of the load-bearing capacity of existing concrete structures by checking the relevant ultimate limit states. Substantiate the ultimate behaviour of linear reinforced concrete members (columns and beams) submitted to compression, bending, compound bending, shear and torsion by means of appropriate design models. Develop the moment-curvature relationship of reinforced concrete sections as a tool for the prediction of the deformation behaviour of linear elements including the time-dependent aspects. Selection of the dimensions of linear concrete members and calculation of the required reinforcement areas based on the internal forces in the ultimate limit state.
E044220 Structural Analysis II	seminar: coached exercises seminar: practical PC room classes	written examination report oral examination open book examination	Have insight in the general design philosophy of concrete structures in the framework of the semi-probabilistic safety format. Identify and characterize the relevant limit states. Analyse the force transfer in disturbed regions by means of strut-and-tie models. Justify the proposed solution. Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations.
E044230 Structural Analysis of Geotechnical Structures	seminar: coached exercises seminar: practical PC room classes	oral examination report	Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Critical analysis of calculation results and the presentation of these results both individually as in a team. Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-
			plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E000810 Topography	lecture practicum	written examination report	SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring, compensator, setting up, coordinate system, projection system, EDM.
E044510 Metal Structures	seminar: coached exercises	open book examination	To be able to design and to calculate connections with welds or bolts To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III").
E044811 Introduction to Bridge Engineering	group work	report	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent
E045411 Hydraulics	demonstration seminar: coached exercises project practicum lecture group work	written examination report oral examination	manner an ordinary bridge and build it Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels. Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles. Being able to identify and assess pressure surge problems in pipes. Having insight into the behaviour and modelling of pressurized flow in pipe networks. Having insight into the position of water surface profiles in non-prismatic channels and transition sections. Being able to analyze and rationally solve a pipe network problem. Having insight into the different types of models for unsteady flow in pressurized pipes. Being able to determine and calculate backwater-curves in prismatic open channels.

E099000 Cross-Course Project	group work self-reliant study activities project	oral examination report	 Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain.
E044120 Structural Analysis I	** guided self-study seminar: coached exercises lecture	written examination open book examination	Determining the load distribution and displacements in statically determinate and indeterminate trusses. Determining influence lines for trusses. Determining the flexural critical buckling load of compressed members by means of appropriate differential equations and boundary conditions. Knowing and using the principle of funicular arches. Deriving and applying Bresses's equations for different arch types and be able to determine influence lines for these elements. Understanding which types of structural systems exist and which types of load can work on a structure. Having insight in the design philosophy of the eurocodes with regard to limit states and being able to apply this. Determining the influence lines of stress resultants and deformations in a direct and indirect manner. Understanding the effects of bending moments, normal force, shear force and St Venant Torsion on the normal and shear stresses in a cross-section and be able to determine these. Understanding the principle of virtual work and using this to determine the deformation of structural elements and to express compatibility conditions, e.g. on the basis of the integrals and analogies of Mohr and the theorems of Greene. Understanding and applying the slope-deflection method for frames and continuous beams with rigid or spring supports. Knowing and being able to use basic terminology with regard to structural analysis
E003230 Statistical Data Processing	seminar: practical PC room classes	report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E061430 Computer Aided Design	demonstration seminar: practical PC room classes	open book examination	Exporting to several types of graphical documents, including the representation of specific views. Being familiar with CAD software.
E053510 Geometric Aspects of Roads	group work lecture	oral examination report	Have basic knowledge of material use. To be able to make a (pre)design of a road project from a geometric point of view as there is: the design of a cross section, calculating an axe in plan view and the design of a length profile, design and conception of a crossing and/or a traffic interchanger. To be able to read and to understand a road design project.

<<	EBingwALG3.4 Show scientific cur		Freshooties word	Intellectual competences
Course Voot: leer- en e	evaluatievormen voorafgegaan door ** werden niet terugge	Teaching methods evonden in de studiefiche	Evaluation methods	Course learning outcome
E070080 CI	hemical Thermodynamics	guided self-study seminar: coached exercises lecture	written examination open book examination	Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions. Calculation of the pH of aqueous solutions. Understand and apply chemical equilibrium.
066012 M	aterials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture		To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties.
				To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E098512 Si	ustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E020061 PI	hysics I	demonstration lecture		To understand the physical laws and concepts of the covered chapters. To be able to solve problems by applying these laws and concepts.
E070070 CI	hemistry: the Structure of Matter	guided self-study	written examination open book examination	Being able to perform stoichiometric calculations. Identify and describe the different types of intermolecular interactions. Being able to determine the molecular geometry of covalent compounds. Identify and describe the different types of chemical bonding. Being able to order atoms and ions based on their periodic properties Being able to write the electron configuration of atoms and ions.
E098513 M	odelling, Making and Measuring	project	participation report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Use of software tools to make simulations and diagrams
E001222 M	athematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E020220 PI	hysics II	demonstration	written examination	To be able to solve physics problems by applying these laws and concepts.
E005020 Ai	nalysis of Systems and Signals	lecture lecture seminar: coached exercises	participation written examination with multiple choice questions	To understand the physical laws and concepts of the covered chapters. To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications. To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well as in their mutual relationships.
F076040 Si	ustainable Business Operations	lecture	written examination with open	To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.) Understanding sustainability aspects in an economic context
L070040 O	ustamable business Operations	lecture	questions written examination with multiple choice questions	
E050410 Co	onstruction of Buildings	lecture seminar	report	Reason and argue the use of steel, timber, concrete, masonry and glass as building materials. Create structural concepts and detailing in a correct way.
≣044220 St	tructural Analysis II		oral examination report	Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Critical analysis of calculation results and the presentation of these results both individually as in a team.
≣044230 St	tructural Analysis of Geotechnical Structures		oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E099000 Ci	ross-Course Project	excursion self-reliant study activities project lecture group work	oral examination report	 Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting.

Course	Tooching mothods	Evaluation motheds	Course learning outcome
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden nie	t teruggevonden in de studietiche		
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture		To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties.
			To be able to correlate the structure and properties of materials
			To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	To identify systems and signals; to describe them in continuous time and discrete time. To be able to execute the Laplace transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.)
			To be able to execute the Z-transform, to calculate its inverse, and to apply when studying systems and signals. (exclusively for the 6 credit points course.) To have understood the sampling theorem and its applications.
			To have gained insight in the various Fourier transforms. To have gained insight in the impulse response, the frequency response and the transfer function as an alternative description of a linear system, as well
			as in their mutual relationships. To have gained insight in Fourier series as a basis for the decription of signals and as a basis for transforming signals. To describe linear systems by means of the state model. (exclusively for the 6 credit points course.)
E044811 Introduction to Bridge Engineering	group work lecture	oral examination report	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding
			area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design
			Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
E099000 Cross-Course Project	excursion project		 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design, building materials and structural elements.
			 Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields. Demonstrating insight into the approach and elaboration of the structural design.
			Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity.
			 Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain.

Status GOEDGEKEURD op 2020-09-17 13:09:19.065 34 /45 25-01-2022

<<

Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	Teaching methods ggevonden in de studiefiche	Evaluation methods	Course learning outcome
E001142 Basic Mathematics	lecture seminar: coached exercises lecture: plenary exercises	written examination	To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors. Being able to formulate correctly and with mathematical precision. Being able to make a correct reasoning and to write it down in a structured way.
E070080 Chemical Thermodynamics	guided self-study seminar: coached exercises lecture	written examination open book examination	Application of the laws of thermodynamics on chemical systems. Calculation of the solubility of ionic compounds in aqueous solutions. Calculation of the pH of aqueous solutions. Understand and apply chemical equilibrium.
E003043 Probability and Statistics	guided self-study seminar: coached exercises lecture	written examination with multiple choice questions open book examination	e To reason and to work with multi-dimensional random variables To perform a linear regression and to interpret its results To understand and to apply methods for hypothesis testing To understand and to apply methods for (parameter) estimation To interpret and to judge the results of statistical sampling, and to represent them in an appropriate form To calculate probabilities of events and expectations of random variables
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design material with the desired properties.
E098512 Sustainability, Entrepreneurship and Ethics	lecture project	participation assignment	To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when use in specific situations. Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering
E020061 Physics I	demonstration	accignment	activities. To understand the physical laws and concepts of the covered chapters.
E001132 Mathematical Analysis I	lecture guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	To be able to solve problems by applying these laws and concepts. Being able to assess the convergence of numerical series and series of functions. To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and integrability. To know the structure of the general solution of a linear differential equation, as well as the lack of a general solution of a non-linear differential equation, to
			be able to solve specific differential equations and to check the existence and uniqueness conditions for the corresponding initial value problems. Being able to use Fourier series for solving partial differential equation by separation of variables. Being able to perform integral transforms, having acquired insight in their respective properties and being able to use them for solving initial value problems. Being able to construct and manipulate power series and Fourier series.
E070070 Chemistry: the Structure of Matter	guided self-study seminar: coached exercises lecture		Being able to use power series for solving ordinary differential equations. Being able to perform stoichiometric calculations. Identify and describe the different types of intermolecular interactions. Being able to determine the molecular geometry of covalent compounds. Identify and describe the different types of chemical bonding. Being able to order atoms and ions based on their periodic properties Being able to write the electron configuration of atoms and ions.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Oral presentation Writing reports
E001222 Mathematical Analysis II	guided self-study seminar: coached exercises lecture: plenary exercises lecture	written examination open book examination	Being able to perform the chain rules for differentiable functions. Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions. Being able to compute integrals in two and three dimensions by subsequent integration. Having acquired insight in local, absolute and conditional extremum problems, and being able to solve such problems. Having acquired insight in the mathematical, geometric and physical interpretation of the notions limit, continuity, derivative, partial derivative, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises seminar lecture	written examination open book examination	Having acquired insight in the notions rank, image, kernel, invertability, and determinant of a linear transform. Having acquired skills in the manipulation of vectors. Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms on them.
			Being able to construct an orthogonal basis by means of the Gram-Schmidt-procedure, to project a vector orthogonally onto a subspace and to perform a least squares algorithm. Being able to give the matrix representation and the corresponding formulae of an affine or co-ordinate transform in threedimensional space, or of a linear transform between abstract vector spaces. Having acquired insight in the notions vector space, linear dependence and independence, basis and dimension. Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations. Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
E020220 Physics II	demonstration lecture	written examination participation	To be able to solve physics problems by applying these laws and concepts. To understand the physical laws and concepts of the covered chapters.
E045120 Transport Phenomena	lecture seminar: practical PC room classes seminar	open book examination	To understand the properties of fluids. To understand the similarities between transport of impulse, heat and mass. To solve problems of stationary heat transport. To know the basic laws of stationary heat transport and to be able to apply them. To understand the law of energy in open and closed systems and to be able to apply it. To master the laws of statics and dynamics and to be able to apply them.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations.
			To calculate complex line integrals both directly and by means of theoretical results. To have insight in the meaning of holomorphic functions and to be able to apply their properties. To calculate line and surface integrals both directly and by means of theoretical results. To have insight in the meaning of the notions line and surface integral and in the theorems of Green, Gauss and Stokes. To have acquired insight in the meaning of the notions scalar and vector potential, rotation and divergence free vector fields, conservative and solenoidal vector fields. To have acquired skills in calculations with the nabla operator.

E050310 Building Physics	lecture seminar practicum	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way.
E044220 Structural Analysis II	lecture seminar: practical PC room classes		Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar
	seminar: coached exercises	oral examination open book examination	and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures.
			Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but
			realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to
			solve these. Critical analysis of calculation results and the presentation of these results both individually as in a team.
E044230 Structural Analysis of Geotechnical Structures	lecture seminar: practical PC room classes	written examination	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states.
	seminar: coached exercises	oral examination	Being able to calculate the resistance against general sliding in soils.
		open book examination	Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-
			plastic' methods of analysis
			and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis.
			Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E000810 Topography	lecture practicum	written examination report	SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical
			data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method.
			ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project.
			INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these
			instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring,
E044510 Metal Structures	lecture	open book examination	compensator, setting up, coordinate system, projection system, EDM. To be able to dictate the conditions for a good execution of welds
	seminar: coached exercises		To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global
			stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III"). To be able to design and to calculate connections with welds or bolts
E044811 Introduction to Bridge Engineering	group work lecture	peer assessment report	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding
			area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design
			Argument the equilibrium of abutments; identify the behaviour of piers
			Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent
E045411 Hydraulics	demonstration	written examination	manner an ordinary bridge and build it Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels.
	seminar: coached exercises	report	Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles.
	project practicum	oral examination	Being able to identify and assess pressure surge problems in pipes. Having insight into the behaviour and modelling of pressurized flow in pipe networks.
	lecture group work		Having insight into the position of water surface profiles in non-prismatic channels and transition sections. Being able to analyze and rationally solve a pipe network problem.
	group work		Having insight into the different types of models for unsteady flow in pressurized pipes.
E099000 Cross-Course Project	excursion	oral examination	Being able to determine and calculate backwater-curves in prismatic open channels. Knowledge
2000000 01000 0001001 10,000	self-reliant study activities	report	 Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design, building materials and
	project lecture		structural elements.
	group work		 Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields.
E044120 Structural Analysis I	** guided self-study	written examination	Demonstrating insight into the approach and elaboration of the structural design. Knowing and being able to use basic terminology with regard to structural analysis
2044120 Citadian Analysis i	seminar: coached exercises lecture	open book examination	Tarlowing and being able to use basic terminology with regard to structural analysis
E052720 Concrete Technology	lecture seminar	oral examination	To be acquainted with the constituent materials of concrete, concrete mix design, and the properties of fresh, hardening and hardened concrete.
E090420 Mechanical Engineering	lecture	written examination	Understand operation of energetic equipment: piston machines, turbomachinery Distinguishing and describing mechanical production processes: forming and machining Reading of mechanical drawings
E099101 Engineering Project	excursion	oral examination	Knowledge of important machine elements: gears, belts, chains, hydraulic components, bearings Application of the knowledge of Concrete Technology, in an independent way.
	lecture	report	Present results by giving a presentation and writing a report, within a realistic industrial context.
E053510 Geometric Aspects of Roads	group work group work	participation oral examination	Work together in small groups of students, on a topic related to concrete technology. Have basic knowledge of material use.
2000 TO Coomotio Acposts of Modes	lecture	report	To be able to make a (pre)design of a road project from a geometric point of view as there is: the design of a cross section, calculating an axe in plan view
			and the design of a length profile, design and conception of a crossing and/or a traffic interchanger. To be able to read and to understand a road design project.

Out	concrete	assignments	systematica
Jul	COLICIELE	assiullilicilis	SvStCillatica

		communication

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	_	Lvaluation methods	Course learning outcome
E098512 Sustainability, Entrepreneurship and Ethics	project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E098513 Modelling, Making and Measuring	project	participation report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E050410 Construction of Buildings	seminar	report	Analyse and apply principles of horizontal and vertical stability of buildings. Create structural concepts and detailing in a correct way. Reason and argue the use of steel, timber, concrete, masonry and glass as building materials. Mastering basic principles of terrain, soil and foundation techniques. Understanding of concepts and functioning of loadbearing constructions and building components.
E050310 Building Physics	lecture seminar practicum	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E044220 Structural Analysis II	seminar: coached exercises seminar: practical PC room classes	oral examination report	Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method.
E044230 Structural Analysis of Geotechnical Structures	seminar: coached exercises seminar: practical PC room classes	oral examination report	Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response an analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E000810 Topography	lecture practicum	written examination report	SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring, compensator, setting up, coordinate system, projection system, EDM.
E099000 Cross-Course Project	group work self-reliant study activities project	oral examination report	 Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting.
E003230 Statistical Data Processing	seminar: practical PC room classes	report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E061430 Computer Aided Design	demonstration seminar: practical PC room classes	open book examination	Exporting to several types of graphical documents, including the representation of specific views. Being familiar with CAD software.
E099101 Engineering Project	excursion lecture group work	oral examination report participation	Application of the knowledge of Concrete Technology, in an independent way. Present results by giving a presentation and writing a report, within a realistic industrial context. Work together in small groups of students, on a topic related to concrete technology.
E053510 Geometric Aspects of Roads	group work	report	Have basic knowledge of material use. To be able to make a (pre)design of a road project from a geometric point of view as there is: the design of a cross section, calculating an axe in plan view and the design of a length profile, design and conception of a crossing and/or a traffic interchanger. To be able to read and to understand a road design project.

Status GOEDGEKEURD op 2020-09-17 13:09:19.065 37 /45 25-01-2022

EBingwALG4.3 Work as part of a team. Competences in cooperation and communication << Course **Teaching methods Evaluation methods Course learning outcome** Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche E098512 Sustainability, Entrepreneurship and Ethics assignment Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities. E098513 Modelling, Making and Measuring Concepts: working collaboration in a group, scientific techniques, use of scientific language. participation project report Be able to derive and build calculation methods and models in building physics, and be able to use these methods when E050310 Building Physics lecture seminar evaluating building physics performances. practicum Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics E044220 Structural Analysis II seminar: coached exercises oral examination Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar seminar: practical PC room classes report and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations.

solve these

serviceability limit states.

plastic' methods of analysis

resulting statistical-analytical

attention to the surrounding

manner an ordinary bridge and build it

technically consistent

Proficiencies

Attitudes

Relevant reporting.

· Working in a team

Design an experiment

Estimate model parameters

Suggest suitable statistical models

Have basic knowledge of material use.

calculating an axe in plan view

data processing.

surveying method.

drawbacks of these

quality, centring,

E044230 Structural Analysis of Geotechnical Structures

E000810 Topography

E045411 Hydraulics

E099000 Cross-Course Project

E003230 Statistical Data Processing

E099101 Engineering Project

E053510 Geometric Aspects of Roads

E044811 Introduction to Bridge Engineering

seminar: coached exercises

practicum

group work

demonstration

project

lecture

project

practicum

group work

group work

excursion

group work

group work

lecture

lecture

seminar: coached exercises

seminar: practical PC room classes report

lecture

seminar: practical PC room classes report

oral examination

oral examination

peer assessment

written examination

oral examination

oral examination

oral examination

report

report

participation

report

Modelling and calculation of structural elements composed of bar and plate elements using the displacement method. Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to

Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and

The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-

and insight into the importance of successive construction stages on earth retaining structures with respect to their response and

Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team.

SKILLS: To learn how to handle surveying instruments (levels, total stations, GPS....). To learn how to write a surveying report.

SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific

ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a

INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and

TERMS: Level, levelling instrument, theodolite, total station, GPS, GNSS, adjustments, accuracy, precision, bluncer detection,

Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give

Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a

SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the

Critical analysis of calculation results and the presentation of these results both individually as in a team.

Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state.

instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project.

Understanding of construction methods using pre- and posttensioning and using them in design situations

Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels. Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles.

Having insight into the position of water surface profiles in non-prismatic channels and transition sections.

Have attention for the project as a whole and the parties involved. Approach the project with creativity.

Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.

Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures.

compensator, setting up, coordinate system, projection system, EDM.

area impact and social acceptance and ecologic footprint of bridge design

Argument the equilibrium of abutments; identify the behaviour of piers

Being able to identify and assess pressure surge problems in pipes.

Being able to analyze and rationally solve a pipe network problem.

• Use of knowledge 'structural engineering design' in realistic projects.

• Showing insight in a construction project and be able to explain.

Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis

To be able to read and to understand a road design project.

· Working substantive and with understanding (insight).

Recognize the design loads for bridges, understand them and use them in design

Having insight into the behaviour and modelling of pressurized flow in pipe networks.

Having insight into the different types of models for unsteady flow in pressurized pipes. Being able to determine and calculate backwater-curves in prismatic open channels.

• Develop feeling for order of magnitudes (usefull utilization of calculation tools).

Elaborate and interpret a statistical analysis of data, using statistical software

Application of the knowledge of Concrete Technology, in an independent way.

Work together in small groups of students, on a topic related to concrete technology.

Be able to carry out analysis of variance and multiple comparison of treatment means

Analyse the outcome of the experiment using frequency tables and graphical representation

Present results by giving a presentation and writing a report, within a realistic industrial context.

and the design of a length profile, design and conception of a crossing and/or a traffic interchanger.

To be able to make a (pre)design of a road project from a geometric point of view as there is: the design of a cross section,

Application of project work (creativity, cooperation, communication, gathering information).

<<

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terugg	evonden in de studiefiche		
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To name materials properties and to be able to distinguish between the different groups of materials To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties To have some basic understanding on the available possibilities to steer the structure of a material and consequently to design a material with the desired properties.
E098512 Sustainability, Entrepreneurship and Ethics	lecture	assignment	To be able to correlate the structure and properties of materials To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when used in specific situations. Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the
	project	accignment	framework of engineering activities.
E098513 Modelling, Making and Measuring	lecture project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Oral presentation Writing reports
E050410 Construction of Buildings	seminar	report	Understanding of concepts and functioning of loadbearing constructions and building components. Create structural concepts and detailing in a correct way. Reason and argue the use of steel, timber, concrete, masonry and glass as building materials. Mastering basic principles of terrain, soil and foundation techniques.
E050310 Building Physics	lecture seminar practicum	assignment	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way.
E044220 Structural Analysis II	seminar: coached exercises seminar: practical PC room classes	oral examination report	Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics Being able to perform a critical evaluation of the results obtained from commercially available FEM software for the analysis of structures composed of bar and plate elements. Conceptual design and dimensioning of wind and stability bracings with respect to the lateral stability of structures. Being able to calculate the influence of wind loads on rigid and flexible structures. Being able to apply commercially available FEM software for the analysis of structures composed of bar and plate elements for the analysis of simple, but realistic design situations. Modelling and calculation of structural elements composed of bar and plate elements using the displacement method.
E044230 Structural Analysis of Geotechnical Structures	seminar: coached exercises seminar: practical PC room classes	oral examination report	Develop an engineering attitude for the simplified modeling of real structures composed of bars and plates and being able to solve these. Critical analysis of calculation results and the presentation of these results both individually as in a team. Being able to determine lateral earth pressures on rigid and slender earth retaining structures with respect to the ultimate and serviceability limit states. Being able to calculate the resistance against general sliding in soils. Insight into the possible mechanisms of failure of earth retaining structures. The determination of internal forces in slurry walls and sheet pilings subjected to lateral loads according to 'plastic' and 'elasto-
			plastic' methods of analysis and insight into the importance of successive construction stages on earth retaining structures with respect to their response and analysis. Being able to design, calculate, evaluate, communicate and defend a realistic case study of a quay wall to an engineering team. Being able to calculate a 2D pile foundation according to the serviceability limit state and ultimate limit state. Insight into the range and domain of application of the concept of 'beams on elastic Foundation'.
E000810 Topography	lecture practicum	written examination report	SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring, compensator, setting up, coordinate system, projection system, EDM.
E044510 Metal Structures	seminar: coached exercises	open book examination	To be able to design and to calculate connections with welds or bolts To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III").
E044811 Introduction to Bridge Engineering	group work	peer assessment report	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
E045411 Hydraulics	demonstration seminar: coached exercises project practicum lecture group work	written examination report oral examination	Having insight into the influence of boundary conditions onto backwater-curves in prismatic open channels. Having insight into the effect of hydraulic engineering measures onto the position of water surface profiles. Being able to identify and assess pressure surge problems in pipes. Having insight into the behaviour and modelling of pressurized flow in pipe networks. Having insight into the position of water surface profiles in non-prismatic channels and transition sections. Being able to analyze and rationally solve a pipe network problem. Having insight into the different types of models for unsteady flow in pressurized pipes. Being able to determine and calculate backwater-curves in prismatic open channels.

E099000 Cross-Course Project	group work self-reliant study activities project	oral examination report	 Proficiencies Application of project work (creativity, cooperation, communication, gathering information). Develop feeling for order of magnitudes (usefull utilization of calculation tools). Use of knowledge 'structural engineering design' in realistic projects. Relevant reporting. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain.
E003230 Statistical Data Processing	seminar: practical PC room clas	ses report	Design an experiment Elaborate and interpret a statistical analysis of data, using statistical software Estimate model parameters Be able to carry out analysis of variance and multiple comparison of treatment means Suggest suitable statistical models Analyse the outcome of the experiment using frequency tables and graphical representation Decide based on a limited sample, using appropriate hypothesis tests Describe trends in data and find correlations using regression analysis
E099101 Engineering Project	excursion lecture group work	oral examination report participation	Application of the knowledge of Concrete Technology, in an independent way. Present results by giving a presentation and writing a report, within a realistic industrial context. Work together in small groups of students, on a topic related to concrete technology.

EBingwALG5.1 Act in an ethical and social way. Societal competences <<

Course	Teaching methods	Evaluation methods	Course learning outcome
oot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
066012 Materials Technology	seminar: practical PC room classes	written examination	To be able to select, by using a material selection software program, the most appropriate material for a specific engineering problem taking into account various material properties
098512 Sustainability, Entrepreneurship and Ethics	lecture project	participation assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
076040 Sustainable Business Operations	lecture	written examination with open questions written examination with multiple choice questions	Critical, creative thinking and scientific reasoning Be able to think carefully about social, scientific and ethical problems and possible solutions to these problems
E076621 Principles of Law and Construction Law	lecture lecture: response lecture		The student understands principles of insurance and damages. The student is able to use the relevant sources. The student can situate contracting law within the general contracting law. The student can apply the concepts to a case. The student knows the procedures for government issued tendering.
E000810 Topography	practicum		SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring, compensator, setting up, coordinate system, projection system, EDM.
E044811 Introduction to Bridge Engineering	group work	peer assessment report	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
E099000 Cross-Course Project	excursion lecture		 Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain.

Status GOEDGEKEURD op 2020-09-17 13:09:19.065 41 /45 25-01-2022

EBingwALG5.2 Be aware of the business aspects of the engineering discipline.

Societal	l competences

Course	EBingwALG5.2 Be aware of the bu		Evaluation methods	Societal competence
	evaluatievormen voorafgegaan door ** werden niet terug	Teaching methods	Evaluation methods	Course learning outcome
ioot: ieer- en	evalualievormen vooralgegaan door - werden niet lerug	gevonden in de studienche		
E098512 S	ustainability, Entrepreneurship and Ethics	lecture project	assignment	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the framework of engineering activities.
E076040 S	ustainable Business Operations	lecture	written examination with open questions assignment written examination with multiple choice questions	Understand the technique of financial balance sheet reading and be able to apply it practically in simple accounting exercises Mastering the basic concepts of macroeconomics and microeconomy: law of supply and demand, markets (perfect competition, monopoly, oligopoly, game theory) Understanding the coherence between the different stakeholders of the company Being able to make a simple investment analysis and apply the concept of time value of money in all aspects of investment analysis Being able to make a complete costing for a product or a service Being able to distinguish between fixed, variable, direct and indirect costs Be able to analyze and assess the data of a company's balance sheet Understanding sustainability aspects in an economic context
E076621 P	rinciples of Law and Construction Law	lecture lecture: response lecture	oral examination	The student understands principles of insurance and damages. The student is able to use the relevant sources. The student can situate contracting law within the general contracting law. The student can apply the concepts to a case. The student knows the procedures for government issued tendering.
E044510 M	letal Structures	lecture		To be able to design and to calculate connections with welds or bolts To be able to design an ordinary steel construction so that the strength conditions in the cross sections are fulfilled (the verification of the local or the global stability of the structure is teached in the course "Berekening van Bouwkundige Constructies III").
E044811 Ir	stroduction to Bridge Engineering	lecture	oral examination	Understanding of construction methods using pre- and posttensioning and using them in design situations Give attention to aesthetics of piers; have a feeling of the effect of transverse distribution of traffic loads on a bridge deck; give attention to the surrounding area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in design Argument the equilibrium of abutments; identify the behaviour of piers Assess a viaduct span length; evaluate the composition of bridge deck with precast girders and anchorage blocks; design in a technically consistent manner an ordinary bridge and build it
≣099000 C	ross-Course Project	excursion lecture		 Knowledge Familiarity with concepts regarding force flow, bearing structure and stability of buildings, engineering and architectural design building materials and structural elements. Design of the concept of a bearing structure, including its foundation, and design of structural elements. Recognition of construction project stages and the cross-connection between knowledge fields. Demonstrating insight into the approach and elaboration of the structural design. Attitudes Working in a team. Have attention for the project as a whole and the parties involved. Approach the project with creativity. Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain.
E099101 E	ngineering Project	excursion lecture group work		Application of the knowledge of Concrete Technology, in an independent way. Present results by giving a presentation and writing a report, within a realistic industrial context. Work together in small groups of students, on a topic related to concrete technology.
E053510 G	eometric Aspects of Roads	group work lecture	oral examination report	To be able to read and to understand a road design project. To be able to make a (pre)design of a road project from a geometric point of view as there is: the design of a cross section, calculating an axe in plan view and the design of a length profile, design and conception of a crossing and/or a traffic interchanger.

Status GOEDGEKEURD op 2020-09-17 13:09:19.065 42 /45 25-01-2022

EBingwBOUW5.1 Be familiar with aspects of environment and mobility in the field of civil engineering.

Societal competence

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet te	ruggevonden in de studiefiche		
E050410 Construction of Buildings	lecture seminar	written examination with open questions report written examination with multiple choice questions	Reason and argue the use of steel, timber, concrete, masonry and glass as building materials.
E050310 Building Physics	lecture seminar practicum	·	Be able to derive and build calculation methods and models in building physics, and be able to use these methods when evaluating building physics performances. Apply and integrate heat and moisture insulation in the construction and building design in a physically correct way. Define typical variables in building physics and relate them to hygrothermal material - and construction characteristics
E076621 Principles of Law and Construction Law	lecture lecture: response lecture		The student understands principles of insurance and damages. The student is able to use the relevant sources. The student can situate contracting law within the general contracting law. The student can apply the concepts to a case. The student knows the procedures for government issued tendering.
E000810 Topography	lecture practicum		SKILLS: To learn how to handle surveying instruments (levels, totalstations, GPS,). To learn how to write a surveying report. SKILLS: To discern and to be able to optimise the factors that influence the reliability and accuracy of a sureying task and the resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific surveying instrument in combination with a specific surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To be aware of all parameters that can influence a surveying project. INSIGHT: To know wich surveying instruments and surveying methods are available on the market, what the advantages and drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to perform a surveying project. TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjustments, accuracy, precision, bluncer detection, quality, centring,
E052720 Concrete Technology	lecture seminar	oral examination	compensator, setting up, coordinate system, projection system, EDM. To be acquainted with the constituent materials of concrete, concrete mix design, and the properties of fresh, hardening and hardened concrete.

Course	Teaching methods	Evaluation methods	Course learning outcome	
loot: leer- en evaluatievormen voorafgegaan door ** werden nie		Evaluation methods	Course learning outcome	
ioot. leer- en evaluatievonnen vooralgegaan door - werden nie	t teruggevonden in de stadienene			
E000810 Topography	lecture practicum		SKILLS: To learn how to handle surveying instruments (levels, totalstations, GF SKILLS: To discern and to be able to optimise the factors that influence the reli resulting statistical-analytical data processing. SKILLS: To be able to predict the accuracy of surveying task with a specific sur surveying method. ATTITUDES: To be careful when performing or interpreting surveying data. To surveying project.	ability and accuracy of a sureying task and the rveying instrument in combination with a specific
			INSIGHT: To know wich surveying instruments and surveying methods are ava drawbacks of these instruments and surveying methods are. To have the knowledge to plan and to	perform a surveying project.
			TERMS: Level, levelling instrument, theodolite, totalstation, GPS, GNSS, adjus quality, centring, compensator, setting up, coordinate system, projection system, EDM.	tments, accuracy, precision, bluncer detection,
E044811 Introduction to Bridge Engineering	group work lecture	oral examination report	Understanding of construction methods using pre- and posttensioning and usin Give attention to aesthetics of piers; have a feeling of the effect of transverse d attention to the surrounding	
			area impact and social acceptance and ecologic footprint of bridge design Recognize the design loads for bridges, understand them and use them in desi Argument the equilibrium of abutments; identify the behaviour of piers	gn
			Assess a viaduct span length; evaluate the composition of bridge deck with pre technically consistent manner an ordinary bridge and build it	cast girders and anchorage blocks; design in a
E099000 Cross-Course Project	excursion self-reliant study activities project lecture		Knowledge Familiarity with concepts regarding force flow, bearing structure and stability building materials and structural elements.	of buildings, engineering and architectural design
	group work		 Design of the concept of a bearing structure, including its foundation, and des Recognition of construction project stages and the cross-connection between Demonstrating insight into the approach and elaboration of the structural des Attitudes 	knowledge fields.
			 Working in a team. Have attention for the project as a whole and the parties involved. Approach Working substantive and with understanding (insight). Showing insight in a construction project and be able to explain. 	the project with creativity.
E099101 Engineering Project	excursion lecture group work		Application of the knowledge of Concrete Technology, in an independent way. Present results by giving a presentation and writing a report, within a realistic in Work together in small groups of students, on a topic related to concrete technology.	
E053510 Geometric Aspects of Roads	group work lecture	oral examination report	Have basic knowledge of material use. To be able to make a (pre)design of a road project from a geometric point of viccalculating an axe in plan view and the design of a length profile, design and conception of a crossing and/or a To be able to read and to understand a road design project.	•