Competence coverage	matrix										Genera	l Cour	rses														Course	s Relate	d to the	e Main	Subject	Ė			
GHENT UNIVERSITY Bachelor of Science in	Engineering		iics			eurship and Ethics				of Matter	//easuring			gebra	etworks					l Signals	perations	Dynamic Systems	Instrumentation	Sie		Fechnology	Вu		SS		Il Mathematics		Conversion	ss of Mechanisms	Engineering
Electromechanical Engineering		natics	ermodynam	d Statistics	hnology	, Entrepren		Analysis I	nematics	e Structure	aking and M		Analysis II	d Linear Alg	cuits and Ne	Materials		enomena	Analysis III	ystems and	3usiness Op	d Control of	stems and I	ermodynam	, sə,	roduction T	ta Processii	Project	Rigid Bodie	nents	to Numerica	Project	etic Energy	nd Dynamic ver Systems	nbustion Er
Academic year 2021-20	022	asic Mather	hemical The	obability ar	aterials Tec	ustainability	Iysics I	athematical	iscrete Math	hemistry: th	odelling, Ma	formatics	athematical	eometry an	ectrical Circ	echanics of	Jysics II	ansport Ph	athematical	nalysis of Sy	ustainable E	odelling and	ectronic Sy:	echaines of	ectrical Driv	echanical P	atistical Da	ross-Course	ynamics of	achine Eler	troduction t	ngineering F	ectromagne	nematics ar ectrical Pov	eat and Cor
Legend: T=teaching methods E=evaluation methods 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.	■ 1 E001142 B	■ 1 E070080 C	E003043 Pi	■ ■ E066012 M	□ □ E098512 Si	□ □ E020061 PI	■ H E001132 M	T E E001460 D	■ 1 E070070 CI	T E098513 M	□ □ E015041 ln	■ H E001222 M	■ T E000662 G	■ T E090320 E	T E040420 M	A L E020220 PI	□ □ E045120 T ₁	■ H E001321 M	20	E076040 Si	T E007120 M	E	E E039110 Te	■ ■ E036111 E	T E063130 M	E003230 SI	T E099050 C	T E E040030 D	п н E062220 М	E002910 In	T E E099151 E	■ 1 E036210 E	E E E E E E E E E E E E E E E E E E E	E E037010 H
	Employ the basic sciences and techniques (statistics, ICT, CAD) in T 11 a creative and purposeful way. Be familiar with fluid dynamics, heat transfer, thermodynamics and T 3							T E	T E		T E	T E		T E				T E					T E	Т			T E					T E		T E	Т
	combustion and apply this knowledge creatively. Be familiar with system dynamics and control engineering and apply this knowledge creatively in the design of feedback loops.																	Ē				T E		Ē					T E					T E	E
	Be familiar with the conversion and application of electrical power and apply this knowledge creatively. T 4 E 4 Be familiar with the mechanics of structures and materials and the T 4														T E								1	Г	E	Т				Т		T	T E	T E	
	dimensioning of components of machines and mechanical constructions and apply this knowledge creatively. Identify and apply the relations and analogies between the different disciplines of electromechanical engineering.																	T E								E				E		T		Т	T
Scientific competence	Apply mathematical models and computational techniques to mechanical and electrotechnical applications. T 11 E 10 Research and process technical and scientific information in a				Т	Т					Т	Т			T E			T E				T E	T I	T E	Т					Т	T E	T E	Т	T T	T E
ocientino competence.	purposeful way. E 7 Employ standard models, methods and techniques in assignments. E 24	T E		T E	E T E	E		T E			E T	E T E	T E	T E	T E	T E			T E	T E		T E	T 1	T E	E T E	T E	T E		T E	Т		E	E T E	T T	T E
	Schematize and model phenomena, processes, and systems. T 18 E 17 Justify decision-making processes on rational grounds. T 13		Т	T E T	Т	T	T E	T E	T E	T	T		T E T	T E	T E		T E		T E T	T E	T E	T		E		E	T			T E T		T E T		E	T E
	Apply the acquired knowledge and essential concepts of electromechanical engineering to (multidisciplinary) projects, case studies and experiments.		Е		Е	E				E	E		Е						E			T E	T E				E			Е		E T E			
Intellectual	Design in a targeted way by using the acquired knowledge and bearing in mind the technological limitations. T 2 E 1 Understand and structure learning experiences. T 13	Т		Т	Т			Т				Т	Т	Т					Т	Т	Т	Т								Т		T E		Т	
competences	Think in a conceptual, analytical, system-oriented, problem-solving T 30 and synthesizing way at different levels of abstraction.	E T E		E T E	E T E	T E	Т	E T E	T E		T E	E T E	E T E	E T E	T E	T E	T E	T E	E T E	E T E	E	Т	T I	T E	T		T E			E T	T E	T E	T E	E T T E E	T E
	Show precision, perseverance and critical reflection. T 22 E 21 Show scientific curiosity. T 11 E 8	E	T	T E	T E T	T E T	Т	E	T E	T	T E		T E T	T E	E		T	E	E	T E T	T E	Т	E E	[E		E		E	T E T		E	E	T E	
	Justify further studies or professional opportunities on rational grounds. T 3 E 1 Analyse problems in the field of electromechanical engineering.				Т													Т		T E		Т	1	Т	Т				Т			Т		Т	Т
	Critically evaluate own solutions to problems in the field of electromechanical engineering.																	E				T E		E E	E T E				E			E T E		E	E
Competences in cooperation and communication	Master scientific and discipline-specific technical terminology (also T 24 in English).	E	E	E	T E	T E T	Т	E		Т	T E		E	E			E	E	E			Т	E	E	E	E	T		E	E		T	E	T T	E E
	Work as part of a team. T 8 E 8 Report results verbally, in writing, and graphically. T 9				Т	E T E					E T E											Т	T E T		T E		T E T	T E T				T	T E	E T E	
Societal competences	Act in an ethical and social way. T 4 E 4				E T E	E T E					E										T E	E	E	T			E					E		E	
	Be aware of the business aspects of the engineering discipline. E 2 Be aware of aspects of security and ecology and energy-efficiency in industrial environments. T 3 E 2 T 3 E 2					T E															T E				T							T E		Т	Т
	Be aware of the social and economic importance of the mechanical and electrotechnical industry. T 6 E 3	W C	10/	M 3	M 49	W 40	NAL E	M/ Q	N.E.	N 4	V 44	6	V 0	V 0	17	12	V.5.	0 - 1	/ 9	V 0	T E	10	0. 44	T E		Т	W. O	T E	MC	N 42	N 2		0 - 141	T	
		W 6 E 6	E 4	W 7	W 12 E 10	W 12 E 12	W 5 E 2	E8 E	V 5 V E 5 E	V 4 V E 3 E	V 11 W	6 E	9 E	8 E	7 E	3 E	V 5 W E 5 E 9	9 M	8 E	8 E	6 W 6 Е	16 W 9 E	9 K 1	0 W 10	E 11	E 4	W 8 E 8	E 2	K 6 K	W 12 V E 7 E	2 E	17 W	8 E 1	11 W 1:	2 W 11 E 9

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.

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Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	Teaching methods	Evaluation methods	Course learning outcome
weruen niet teru	iggovonaon in de siddielione		
E001142 Basic Mathematics	lecture	written examination	Being able to perform basic calculations quickly and efficiently by hand.
	seminar: coached exercises lecture: plenary exercises		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.
	iociaioi pionai, onereioco		To have a thorough knowledge of the topics matrices, complex numbers, elementary functions and vectors.
E070080 Chemical Thermodynamics	guided self-study	written examination	Application of the laws of thermodynamics on chemical systems.
	seminar: coached exercises	open book examination	Calculation of the solubility of ionic compounds in aqueous solutions.
	lecture		Calculation of the pH of aqueous solutions.
E066012 Materials Technology	guided self-study	written examination	Understand and apply chemical equilibrium. To name materials properties and to be able to distinguish between the different groups of materials
E000012 Materials reclinology	seminar: practical PC room classes		To be able to select, by using a material selection software program, the most appropriate material for a specific engineering
	seminar: coached exercises		problem taking into account
	lecture		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.
			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 us
E098512 Sustainability, Entrepreneurship and Ethics	lecture	narticipation	in specific situations. Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the
E090312 Sustainability, Entrepreneurship and Ethics	project	participation assignment	framework of engineering
	project	dosigninent	activities.
E020061 Physics I	demonstration	written examination	To understand the physical laws and concepts of the covered chapters.
	lecture		To be able to solve problems by applying these laws and concepts.
E001132 Mathematical Analysis I	guided self-study	written examination	Being able to assess the convergence of numerical series and series of functions.
	lecture: plenary exercises seminar	open book examination	To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral, improper integral and
	seminar lecture		improper integral and integrability.
	iodiaio		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 use rouner 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	guidad aalf atudy	written evenination	Being able to use power series for solving ordinary differential equations.
E001460 Discrete Mathematics I	guided self-study seminar: coached exercises	written examination open book examination	Distinguishing and applying fundamental algebraic and discrete structures. Being fluent in graph algorithms and applying them to real problem situations.
	practicum	open book examination	Deploying deductively correct reasonings in an independent way.
	lecture		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	written examination open book examination	Being able to perform stoichiometric calculations. Identify and describe the different types of intermolecular interactions.
	lecture: plenary exercises	орен воок еханинацон	Being able to determine the molecular geometry of covalent compounds.
	lecture		Identify and describe the different types of chemical bonding.
			Being able to order atoms and ions based on their periodic properties
FOODERO Martilla Martina and Martina	and and	and the second	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	written examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm
	seminar: practical PC room classes	open book examination	To design an algorithm solving a given problem, and to assess the complexity of this solution.
FOOLOGO Media and feel Anal efell	- Madagiff of d		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	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.
	lecture: plenary exercises	טףפוז טטטג פאמווווזמנוטוז	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.
	lecture		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 Coometry and Linear Alexand	guided self study	open healt aversing time	differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	guided self-study lecture: plenary exercises	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.
	seminar		Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms
	lecture		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.
F000000 Floatist Circ. Value 121	lasting		Having acquired insight in the mathematical, physical and geometric meaning of eigenvalues and eigenvectors.
E090320 Electrical Circuits and Networks	lecture seminar: coached exercises	written examination	Draw amplitude and phase Bode diagrams for transfer functions and determine the poles and zeros. Analyze basic electrical circuits containing diodes, bipolar transistors and MOSFETs.
	seminar. Coacheu exercises		Determine the balance of active and reactive electrical power in a three-phase electrical network.
			Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
	seminar: coached exercises	written examination	To be familiar with the applications of linear elasticity theory.
E040420 Mechanics of Materials		open book examination	To identify mechanical test methods.
E040420 Mechanics of Materials			Applications of the problem solving methods in elasticity theory.
E040420 Mechanics of Materials			
E040420 Mechanics of Materials			To identify linear and non-linear behaviour.
E040420 Mechanics of Materials			To identify linear and non-linear behaviour. Knowledge of the main techniques for damage control and diagnostics.
E040420 Mechanics of Materials E020220 Physics II	demonstration	written examination	To identify linear and non-linear behaviour.

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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.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	To master the laws of statics and dynamics and to be able to apply them. To master the basic theory of curves. To apply the residue theorem in a variety of situations.
	lecture. Pieriary exercises		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.)
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises	written examination	Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To implement modeling and control on small scale setups by using personal laptop To design of controllers based on the application of root-locus techniques and frequency-response techniques such as Bode, Nyquist. Being able to analyse feedback control systems using several stability criteria. To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems. To have insight regarding the static and dynamic behaviour of systems and to apply this insight when designing feedback loops. To derive transfer-function models and state-space models of physical systems and comprehend linear and nonlinear behavior.
E032010 Electronic Systems and Instrumentation	lecture practicum	written examination skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy, perseverance and critical reflection. Have the skill to communicate about own design of electronic systems in writing and in graphics. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice. Analyse basic analog and digital electronic circuits and think in a conceptual, analytical, system-oriented way about them.
E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Understand the operation of the basic electronic components Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E039110 Technical Thermodynamics	lecture	open book examination	Understanding and application of the first and second law of thermodynamics.
E036111 Electrical Drives	seminar: coached exercises lecture seminar: coached exercises practicum	oral examination written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient
E063130 Mechanical Production Technology	lecture seminar: coached exercises		way. Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes Recognize manufacturing machines and tools and explain their operation Explain the fundamental principles of plastic forming, machining and advanced manufacturing Critically compare and evaluate manufacturing processes
E099050 Cross-Course Project	project		Critically compare and evaluate manufacturing processes
E040030 Dynamics of Rigid Bodies	lecture	written examination	To calculate engineering problems of kinematics and kinetics of a rigid body in a plane motion
E062220 Machine Elements	seminar: coached exercises lecture seminar: coached exercises	open book examination oral examination	To calculate simple engineering problems of kinematics and kinteics of a rigid body in a 3D motion Understanding the operation of important machine elements Interpreting of and applying catalogue information Dimensioning of machine elements Being able to select machine elements based on functionality
E099151 Engineering Project	seminar: coached exercises seminar: practical PC room classes	oral examination report participation	Being able to calculate machine parts and defining main dimensions
E036210 Electromagnetic Energy Conversion	lecture seminar practicum	written examination skills test	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E041011 Kinematics and Dynamics of Mechanisms	lecture lecture: plenary exercises	written examination report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms. To be familiar with the basic notions of analyzing the motion of mechanisms.
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises	written examination	Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).

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E037010 Heat and Combustion Engineering

lecture lecture: plenary exercises

written examination

To be able to characterize and calculate the thermodynamic aspects of combustion and different flame types.

To be able to identify types of heat transfer and combustion in practical applications

Calculate exhaust gas composition and enthalpy of a furnace.

Being able to identify, describe and calculate heat transfer with phase change (evaporation / condensation)

Know the most important technical properties of fuels.

Know the formation mechanisms, consequences and basic countermeasures for harmful emissions, as well as principles related to emissions logislation.

to emissions legislation

Understand and calculate different types of heat transfer (such as conduction, convection, radiation)

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<<	EBingwALG1.2 Employ the basic	• •	· · · · · · · · · · · · · · · · · · ·	<u> </u>
Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en e	valuatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
E001132 Ma	athematical 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. Being able to use power series for solving ordinary differential equations.
	screte Mathematics I	practicum	written examination	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 Mo	odelling, Making and Measuring	project	participation report	Use of software tools to make simulations and diagrams
E015041 Inf	ormatics	lecture seminar: practical PC room classes	written 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 Ge	eometry 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 transform between abstract vector spaces.
E045120 Tra	ansport Phenomena	seminar: practical PC room classes	open book examination	To solve problems of stationary heat transport.
E007120 Mo	odelling and Control of Dynamic Systems	lecture seminar: coached exercises	written examination	To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.
E032010 Ele	ectronic Systems and Instrumentation	practicum	skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy perseverance and critical reflection. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice.
E003230 Sta	atistical 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
E099151 En	gineering Project	seminar: practical PC room classes	assignment	Being able to perform a detailed 3D machine design with SolidWorks Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections
E041011 Kir	nematics and Dynamics of Mechanisms	lecture	report	To be familiar with the basic notions of analyzing the motion of mechanisms. To be familiar with several well known mechanisms.

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EBingwWERK1.1 Be familiar with fluid dynamics, heat transfer, thermodynamics and combustion and apply this knowledge creatively. <<

Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden nie	et teruggevonden in de studiefiche		
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.
E039110 Technical Thermodynamics	lecture seminar: coached exercises	open book examination oral examination	Understanding the importance and application of exergy and anergy for processes. Calculation of properties for pure substances and mixtures. Understanding and application of the first and second law of thermodynamics. Calculate thermodynamic processes and cycles and using polytropic processes
E037010 Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	To be able to characterize and calculate the thermodynamic aspects of combustion and different flame types. To be able to identify types of heat transfer and combustion in practical applications Calculate exhaust gas composition and enthalpy of a furnace. Being able to identify, describe and calculate heat transfer with phase change (evaporation / condensation) Know the most important technical properties of fuels. Know the formation mechanisms, consequences and basic countermeasures for harmful emissions, as well as principles related to emissions legislation Understand and calculate different types of heat transfer (such as conduction, convection, radiation)

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EBingwWERK1.2 Be familiar with system dynamics and control engineering and apply this knowledge creatively in the design of feedback loops. <<

Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
		Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises practicum	written examination report	Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To implement modeling and control on small scale setups by using personal laptop
			To design of controllers based on the application of root-locus techniques and frequency-response techniques such as Bode, Nyquist. Being able to analyse feedback control systems using several stability criteria.
			To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.
			To have insight regarding the static and dynamic behaviour of systems and to apply this insight when designing feedback loops. To derive transfer-function models and state-space models of physical systems and comprehend linear and nonlinear behavior
E040030 Dynamics of Rigid Bodies	lecture	written examination	To calculate engineering problems of kinematics and kinetics of a rigid body in a plane motion
-	seminar: coached exercises	open book examination	To calculate simple engineering problems of kinematics and kinteics of a rigid body in a 3D motion
E041011 Kinematics and Dynamics of Mechanisms	lecture	written examination	Understanding and interpreting correctly the calculated quantities and their units.
·	lecture: plenary exercises	report	To be familiar with several well known mechanisms.
		•	To be familiar with velocities, accelerations, forces and energies in mechanisms.
			To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms.
			To be able to apply kinematics and dynamics techniques to mechanisms.
			To be familiar with the basic notions of analyzing the motion of mechanisms.

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EBingwWERK1.3 Be familiar with the conversion and application of electrical power and apply this knowledge creatively.

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Competences in one/more scientific discipline(s)

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet	teruggevonden in de studiefiche		
E090320 Electrical Circuits and Networks	lecture seminar: coached exercises	written examination	Determine the balance of active and reactive electrical power in a three-phase electrical network.
E036111 Electrical Drives	lecture seminar: coached exercises practicum	written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E036210 Electromagnetic Energy Conversion	lecture seminar practicum	written examination skills test	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises	written examination	Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).

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EBingwWERK1.4 Be familiar with the mechanics of structures and materials and the dimensioning of components of machines and mechanical Competences in one/more scientific discipline(s) << constructions and apply this knowledge creatively. Teaching methods Course **Evaluation methods** Course learning outcome Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche E044011 Mechanics of Structures Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the written examination seminar: coached exercises open book examination applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces.

open book examination

oral examination

oral examination

oral examination

E063130 Mechanical Production Technology

E062220 Machine Elements

E099151 Engineering Project

lecture

lecture

seminar: coached exercises

seminar: coached exercises

seminar: coached exercises

seminar: practical PC room classes report

Knowledge and application of advanced beam theory.

Critically compare and evaluate manufacturing processes

Interpreting of and applying catalogue information

Dimensioning of machine elements

Describe the working principles and applications of manufacturing processes

Recognize manufacturing machines and tools and explain their operation

Being able to calculate machine parts and defining main dimensions

Discuss on critical parameters that determine choice of manufacturing processes

Calculate needed forces and power consumption for classical manufacturing processes

Explain the fundamental principles of plastic forming, machining and advanced manufacturing

Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost

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EBingwWERK1.5 Identify and apply the relations and analogies between the different disciplines of electromechanical engineering.

<<	EBingwWERK1.5 Identify and a	apply the relations and analogies	between the different d	isciplines of electromechanical engineering.	Competences in one/more scientific discipline(s)
Course		Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en	evaluatievormen voorafgegaan door ** werden niet	teruggevonden in de studiefiche			
E045120 T	ransport Phenomena	lecture seminar	open book examination	To understand the similarities between transport of impulse, heat ar	nd mass.
E099151 E	Ingineering Project	seminar: coached exercises seminar: practical PC room classes	oral examination report assignment participation	Being able to analyse a design question and translate it into sketch Being able to design a machine with attention for mechanical safety Being able to apply principles of Life Cycle Analysis on a machine of Being able to select main machine parts based on functionality, pro-	lesign
E008310 E	lectrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of Model and analyse three-phase systems in non-symmetrical conditi Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, appar	load flow equations).
E037010 H	leat and Combustion Engineering	lecture lecture: plenary exercises	written examination	Understand and calculate different types of heat transfer (such as c To be able to identify types of heat transfer and combustion in pract	

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Course		Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- er	n evaluatievormen voorafgegaan door ** werden niet terug	_		
E090320 I	Electrical Circuits and Networks	lecture seminar: coached exercises	written examination	Draw amplitude and phase Bode diagrams for transfer functions and determine the poles and zeros. Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E045120	Transport Phenomena	seminar: practical PC room classes	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.
E007120 I	Modelling and Control of Dynamic Systems	lecture seminar: coached exercises	written examination	Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To derive transfer-function models and state-space models of physical systems and comprehend linear and nonlinear behavior.
E032010 I	Electronic Systems and Instrumentation	practicum	skills test	Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice.
E044011 I	Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E039110	Technical Thermodynamics	seminar: practical PC room classes	assignment	Calculate thermodynamic processes and cycles and using polytropic processes
E002910 I	Introduction to Numerical Mathematics	lecture seminar: practical PC room classes	written examination	Understanding and mastering of standard numerical methods for some basic problems (for (systems of) algebraic equations, initial problems for ODEs, boundary value problems and eigenvalue problems in 1D).
E099151 I	Engineering Project	lecture seminar: coached exercises	report	Being able to calculate machine parts and defining main dimensions
E041011 I	Kinematics and Dynamics of Mechanisms	lecture lecture: plenary exercises	written examination report	To be able to apply kinematics and dynamics techniques to mechanisms. To be familiar with several well known mechanisms.
E008310 I	Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010 I	Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	Understand and calculate different types of heat transfer (such as conduction, convection, radiation) To be able to identify types of heat transfer and combustion in practical applications

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EBingwALG2.1 Research and process technical and scientific information in a purposeful way.

Course	process technical and scientific in Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet t	_	Lvaluation inethous	Course learning duccome
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.
E098513 Modelling, Making and Measuring	project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E015041 Informatics	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.
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.
E036111 Electrical Drives	practicum	open book examination skills test	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E099050 Cross-Course Project	project		
E062220 Machine Elements	seminar: coached exercises		Being able to select machine elements based on functionality Interpreting of and applying catalogue information
E099151 Engineering Project	seminar: practical PC room classes	oral examination assignment	Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost
E036210 Electromagnetic Energy Conversion	practicum	written examination skills test	Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines.

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<<	EBingwALG2.2 Employ standard models, methods and techniques in assignments.

Sciontific	competences
SCIETITIC	COMBELETICES

Ebingwaloziz Employ Standard I	•		•
Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	Teaching methods	Evaluation methods	Course learning outcome
			Deliverable to a contract to the leaf contract to the contract
E001142 Basic Mathematics	lecture: plenary exercises seminar: coached exercises	written examination	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.
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
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.
E001132 Mathematical Analysis I	seminar	written examination open book 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.
			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, differentiability, gradient, multiple integral, Jacobian and co-ordinate transform.
E000662 Geometry and Linear Algebra	seminar	written examination open book examination	Being able to write down the respective reduced forms of a matrix and use them for solving systems of linear equations.
			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.
E090320 Electrical Circuits and Networks	seminar: coached exercises	written examination	Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E040420 Mechanics of Materials	seminar: coached exercises	open book examination	To be familiar with the applications of linear elasticity theory.
E001321 Mathematical Analysis III	lecture seminar: coached exercises lecture: plenary exercises	written examination	Applications of the problem solving methods in elasticity theory. 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	•	To identify systems and signals; to describe them in continuous time and discrete time.
	seminar: coached exercises	choice questions	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.)
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises practicum	report	Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To implement modeling and control on small scale setups by using personal laptop
E032010 Electronic Systems and Instrumentation	lecture practicum	written examination skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy perseverance and critical reflection. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice. Analyse basic analog and digital electronic circuits and think in a conceptual, analytical, system-oriented way about them.

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E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E039110 Technical Thermodynamics	seminar: coached exercises seminar: practical PC room classes	open book examination	Calculate thermodynamic processes and cycles and using polytropic processes Understanding and application of the first and second law of thermodynamics.
E036111 Electrical Drives	lecture seminar: coached exercises practicum	written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E063130 Mechanical Production Technology	lecture seminar: coached exercises	open book examination oral examination	Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes Recognize manufacturing machines and tools and explain their operation Explain the fundamental principles of plastic forming, machining and advanced manufacturing Critically compare and evaluate manufacturing processes
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
E040030 Dynamics of Rigid Bodies	seminar: coached exercises	open book examination	To calculate engineering problems of kinematics and kinetics of a rigid body in a plane motion To calculate simple engineering problems of kinematics and kinteics of a rigid body in a 3D motion
E062220 Machine Elements	seminar: coached exercises		Dimensioning of machine elements
E036210 Electromagnetic Energy Conversion	lecture seminar practicum	written examination skills test	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E041011 Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with several well known mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms.
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises	written examination	Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010 Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	Understand and calculate different types of heat transfer (such as conduction, convection, radiation) To be able to identify types of heat transfer and combustion in practical applications Calculate exhaust gas composition and enthalpy of a furnace.

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Course	EBingwALG2.3 Schematize and m	• • •	· •	Scientific competence
	evaluatievormen voorafgegaan door ** werden niet terugg	Teaching methods vevonden in de studiefiche	Evaluation methods	Course learning outcome
E003043 P	robability and Statistics	guided self-study	written examination with multiple	To reason and to work with multi-dimensional random variables
	•	seminar: coached exercises lecture	choice questions open book examination	To identify an appropriate probabilistic model for the analysis of an event or experiment
E020061 P	hysics 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 M	lathematical 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 value problems.
E001460 D	iscrete Mathematics I	guided self-study seminar: coached exercises practicum lecture	written examination open book examination	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 M	lathematical 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 G	eometry 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.
E090320 E	lectrical Circuits and Networks	lecture seminar: coached exercises	written examination	Draw amplitude and phase Bode diagrams for transfer functions and determine the poles and zeros. Analyze basic electrical circuits containing diodes, bipolar transistors and MOSFETs. Determine the balance of active and reactive electrical power in a three-phase electrical network. Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E020220 P	hysics 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 M	lathematical 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 A	nalysis 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 S	ustainable 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
E007120 M	lodelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To derive transfer-function models and state-space models of physical systems and comprehend linear and nonlinear behavior.
E039110 T	echnical Thermodynamics	lecture seminar: coached exercises	open book examination oral examination	Calculate thermodynamic processes and cycles and using polytropic processes Explaining the important thermodynamic cycles.
E063130 M	lechanical Production Technology	lecture seminar: coached exercises	open book examination oral examination	Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes

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oral examination

written examination

written examination

E062220 Machine Elements

E099151 Engineering Project

E008310 Electrical Power Systems

E037010 Heat and Combustion Engineering

lecture

lecture online seminar

lecture

online lecture

seminar: coached exercises

seminar: coached exercises lecture: plenary exercises

lecture: plenary exercises

seminar: practical PC room classes participation

Calculate needed forces and power consumption for classical manufacturing processes

Understand transmission of active and reactive power (by means of load flow equations).

Explain the fundamental principles of plastic forming, machining and advanced manufacturing

Recognize manufacturing machines and tools and explain their operation

Being able to analyse a design question and translate it into sketch design

Model and analyse three-phase systems in non-symmetrical conditions.

Understand power quantities (active, reactive, instantaneous, apparent power).

To be able to identify types of heat transfer and combustion in practical applications

Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks.

Decompose three-phase quantities in symmetrical components.

Critically compare and evaluate manufacturing processes
Understanding the operation of important machine elements

Dimensioning of machine elements

EBingwALG2.4 Justify decision-r			Scientific competences
Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terus	Teaching methods ggevonden in de studiefiche	Evaluation methods	Course learning outcome
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	lecture		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.
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	Writing reports Oral presentation
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.
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
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises practicum	written examination report	vector fields. To have acquired skills in calculations with the nabla operator. To have insight regarding the static and dynamic behaviour of systems and to apply this insight when designing feedback loops. To implement modeling and control on small scale setups by using personal laptop To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback
E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	control systems. Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E003230 Statistical Data Processing	seminar: practical PC room classes	written examination report	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
E062220 Machine Elements	lecture	oral examination	Being able to select machine elements based on functionality

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oral examination

oral examination

report

E062220 Machine Elements

E099151 Engineering Project

lecture

lecture

seminar: coached exercises

seminar: coached exercises

Being able to select machine elements based on functionality Interpreting of and applying catalogue information Dimensioning of machine elements

Being able to apply principles of Life Cycle Analysis on a machine design

Being able to calculate machine parts and defining main dimensions

Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost

EBingwWERK2.1 Apply the acquired knowledge and essential concepts of electromechanical engineering to (multidisciplinary) projects, case

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Scientific competences

studies and experiments.	_		
Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises practicum	written examination report	Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To implement modeling and control on small scale setups by using personal laptop To have insight regarding the static and dynamic behaviour of systems and to apply this insight when designing feedback loops.
E032010 Electronic Systems and Instrumentation	lecture practicum	written examination skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy, perseverance and critical reflection. Have the skill to communicate about own design of electronic systems in writing and in graphics. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice. Analyse basic analog and digital electronic circuits and think in a conceptual, analytical, system-oriented way about them. Understand the operation of the basic electronic components
E099151 Engineering Project	seminar: coached exercises seminar: practical PC room classes	assignment report	Being able to analyse a design question and translate it into sketch design Being able to design a machine with attention for mechanical safety Being able to apply principles of Life Cycle Analysis on a machine design Being able to calculate machine parts and defining main dimensions Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost

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EBingwWERK2.2 Design in a targeted way by using the acquired knowledge and bearing in mind the technological limitations.

Scientific competences

Course	Teaching methods	Evaluation methods	Course learning outcome			
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche						
E062220 Machine Elements	seminar: coached exercises		Being able to select machine elements based on functionality			
			Interpreting of and applying catalogue information			
			Dimensioning of machine elements			
E099151 Engineering Project	seminar: practical PC room classe	s oral examination	Being able to analyse a design question and translate it into sketch design			
		assignment	Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost			

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<< Course		and structure learning experiences.	Evaluation methods	Intellectual competence
	n evaluatievormen voorafgegaan door ** werden n	Teaching methods iet teruggevonden in de studiefiche	Evaluation methods	Course learning outcome
			ittan avanination	To have a thereweb by evulades of the tenior metrices, compley numbers, elementary functions and vectors
=001142 1	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 I	Probability and Statistics	guided self-study		To reason and to work with multi-dimensional random variables
		seminar: coached exercises lecture	choice questions open book examination	To perform a linear regression and to interpret its results To understand and to apply methods for hypothesis testing
		locture	opon book oxanimation	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
066012	Materials Technology	guided self-study	written examination	To name materials properties and to be able to distinguish between the different groups of materials
		seminar: practical PC room classes seminar: coached exercises		To be able to select, by using a material selection software program, the most appropriate material for a specific engineering
		lecture		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.
				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.
E001132 I	Mathematical Analysis I	guided self-study	written examination	Being able to assess the convergence of numerical series and series of functions.
			open book examination	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 initi
				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.	
015041 Informatics	guided self-study	written examination	To master the structured programming paradigm and to realize a Python program, using this structured programming paradigm	
		seminar: practical PC room classes	open book examination	To design an algorithm solving a given problem, and to assess the complexity of this solution.
=001222 I	Mathematical Analysis II	lecture guided self-study	written 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.
-001222 1	viatricination / trialysis ii	seminar: coached exercises	open book examination	Being able to carry out co-ordinate transforms in multiple integrals in two and three dimensions.
		lecture: plenary exercises		Being able to compute integrals in two and three dimensions by subsequent integration.
		lecture		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	differentiability, gradient, multiple integral, Jacobian and co-ordinate transform. Having acquired skills in the manipulation of vectors.
	,		open book examination	
=001321 I	Mathematical Analysis III	lecture seminar: coached exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations.
		lecture: plenary exercises		
				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.
		Seminar. Coached exercises	choice questions	(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.
-076040 °	Sustainable Business Operations	lecture	written examination with open	To describe linear systems by means of the state model. (exclusively for the 6 credit points course.) Critical, creative thinking and scientific reasoning
_0,0070 (Dustaniasio Businoss Operations	iodaio	questions	Be able to think carefully about social, scientific and ethical problems and possible solutions to these problems
			written examination with multiple	

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order to obtain

mathematical models of physical dynamic systems.

To be familiar with several well known mechanisms.

Understanding the operation of important machine elements

To be familiar with the basic notions of analyzing the motion of mechanisms.

Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in

choice questions

oral examination

report

lecture

lecture

seminar: coached exercises

seminar: coached exercises

lecture: plenary exercises

E007120 Modelling and Control of Dynamic Systems

E041011 Kinematics and Dynamics of Mechanisms

E062220 Machine Elements

Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terd	Teaching methods uggevonden in de studiefiche	Evaluation methods	Course learning outcome
E001142 Basic Mathematics	lecture seminar: coached exercises lecture: plenary exercises	written examination	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 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 To understand the basic concepts of materials science and engineering and to be able to explain materials behaviour when us 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.
E020061 Physics I	demonstration		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 init 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	written examination	Being able to use power series for solving ordinary differential equations. Distinguishing and applying fundamental algebraic and discrete structures.
2001400 Bisoroto Matriornatios I	seminar: coached exercises practicum lecture	open book examination	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.
E098513 Modelling, Making and Measuring	project	report	Using basic concepts from set theory, group theory, combinatorics and graph theory. Concepts: working collaboration in a group, scientific techniques, use of scientific language.
E015041 Informatics	lecture seminar: practical PC room classes	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 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	written examination 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.
	seminar lecture		Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transform 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.
E090320 Electrical Circuits and Networks	seminar: coached exercises	written examination	Draw amplitude and phase Bode diagrams for transfer functions and determine the poles and zeros. Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
E040420 Mechanics of Materials	seminar: coached exercises	open book examination	To be familiar with the applications of linear elasticity theory. Applications of the problem solving methods in 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 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	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations.
	lecture: plenary exercises		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.

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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.)
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems.
E032010 Electronic Systems and Instrumentation	lecture practicum	written examination skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy, perseverance and critical reflection. Have the skill to communicate about own design of electronic systems in writing and in graphics. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice. Analyse basic analog and digital electronic circuits and think in a conceptual, analytical, system-oriented way about them. Understand the operation of the basic electronic components
E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E039110 Technical Thermodynamics	lecture seminar: practical PC room classes seminar: coached exercises practicum	open book examination skills test assignment oral examination	Understanding the importance and application of exergy and anergy for processes. Explaining the important thermodynamic cycles. Understanding and application of the first and second law of thermodynamics. Calculate thermodynamic processes and cycles and using polytropic processes
E036111 Electrical Drives	lecture seminar: coached exercises practicum	written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
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
E062220 Machine Elements	lecture seminar: coached exercises		Understanding the operation of important machine elements Being able to select machine elements based on functionality
E002910 Introduction to Numerical Mathematics	lecture seminar: practical PC room classes	written examination	A critical usage of algorithms in practical applications using software.
E099151 Engineering Project	lecture seminar: practical PC room classes seminar: coached exercises	assignment report	Being able to analyse a design question and translate it into sketch design Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections Being able to perform a detailed 3D machine design with SolidWorks Being able to calculate machine parts and defining main dimensions Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost
E036210 Electromagnetic Energy Conversion	lecture seminar practicum	written examination	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E041011 Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with several well known mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms. To be familiar with the basic notions of analyzing the motion of mechanisms.
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises	written examination	Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010 Heat and Combustion Engineering	lecture: plenary exercises	written examination	Understand and calculate different types of heat transfer (such as conduction, convection, radiation) To be able to identify types of heat transfer and combustion in practical applications Being able to identify, describe and calculate heat transfer with phase change (evaporation / condensation)

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<<	EBingwALG3.3 Show precision, perseverance and critical reflection.			
0	To a shine a mostle a de	Fredrick mostles de	Course leaving outcome	

Course Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru <u>(</u>	Teaching methods ggevonden in de studiefiche	Evaluation methods	Course learning outcome
E001142 Basic Mathematics	lecture	written examination	Being able to formulate correctly and with mathematical precision.
LOOT 142 Dasic Mathematics	seminar: coached exercises lecture: plenary exercises	whiterrexamination	Deling 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
E066012 Materials Technology	guided self-study seminar: practical PC room classes seminar: coached exercises lecture	written examination	To calculate probabilities of events and expectations of random variables 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	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.
E001460 Discrete Mathematics I	guided self-study	written 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.
E001400 Discrete Mathematics 1	seminar: coached exercises practicum lecture	open book examination	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.
E090320 Electrical Circuits and Networks	seminar: coached exercises	written examination	Analyze linear circuits with resistors, (coupled) inductors and capacitors in dc, in the periodic regime and during transients.
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.

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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.)
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.
E032010 Electronic Systems and Instrumentation	practicum	skills test	Being able to build and experimentally evaluate analog and digital electronic circuits at breadboard level with sufficient accuracy, perseverance and critical reflection.
			Have the skill to communicate about own design of electronic systems in writing and in graphics. Have the skills to perform numerical simulations of electronic circuits by means of standard models and methods, in particular PSpice.
E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations.
			Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E036111 Electrical Drives	lecture	written examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of
	seminar: coached exercises practicum	open book examination	classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines.
			Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements.
			Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
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
E040030 Dynamics of Rigid Bodies	lecture seminar: coached exercises	written examination open book examination	To calculate engineering problems of kinematics and kinetics of a rigid body in a plane motion To calculate simple engineering problems of kinematics and kinteics of a rigid body in a 3D motion
E062220 Machine Elements	seminar: coached exercises	oral examination	Dimensioning of machine elements Interpreting of and applying catalogue information
E099151 Engineering Project	seminar: practical PC room classes	oral examination assignment	Being able to analyse a design question and translate it into sketch design Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost
E036210 Electromagnetic Energy Conversion	lecture seminar	written examination	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E041011 Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	To be familiar with the basic notions of analyzing the motion of mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	_		
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		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 use 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.
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.
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	participation report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Use of software tools to make simulations and diagrams
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.
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.
E005020 Analysis of Systems and Signals	lecture seminar: coached exercises	written examination with multiple choice questions	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	Understanding sustainability aspects in an economic context
E062220 Machina Flaments	locturo		Understanding the operation of important machine elements

Understanding the operation of important machine elements Dimensioning of machine elements

E062220 Machine Elements

lecture

seminar: coached exercises

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden n	iet teruggevonden in de studiefiche		
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.)
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).

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EBingwWERK3.1 Analyse problems in the field of electromechanical engineering. Intellectual competences << Course Teaching methods **Evaluation methods** Course learning outcome Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teruggevonden in de studiefiche E045120 Transport Phenomena To understand the properties of fluids. lecture open book examination

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E045120 Transport Phenomena	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.
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To implement modeling and control on small scale setups by using personal laptop To design of controllers based on the application of root-locus techniques and frequency-response techniques such as Bode, Nyquist. Being able to analyse feedback control systems using several stability criteria. To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems. To have insight regarding the static and dynamic behaviour of systems and to apply this insight when designing feedback loops. To derive transfer-function models and state-space models of physical systems and comprehend linear and nonlinear behavior.
E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E039110 Technical Thermodynamics	lecture seminar: coached exercises	open book examination	Understanding the importance and application of exergy and anergy for processes. Calculation of properties for pure substances and mixtures. Calculate thermodynamic processes and cycles and using polytropic processes
E036111 Electrical Drives	lecture seminar: coached exercises practicum	written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E040030 Dynamics of Rigid Bodies	lecture seminar: coached exercises	written examination open book examination	To calculate engineering problems of kinematics and kinetics of a rigid body in a plane motion To calculate simple engineering problems of kinematics and kinteics of a rigid body in a 3D motion
E099151 Engineering Project	seminar: practical PC room classes	participation	Being able to analyse a design question and translate it into sketch design
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises	written examination	Understand the function and principles of electric power systems. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010 Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	To be able to characterize and calculate the thermodynamic aspects of combustion and different flame types. To be able to identify types of heat transfer and combustion in practical applications Calculate exhaust gas composition and enthalpy of a furnace. Being able to identify, describe and calculate heat transfer with phase change (evaporation / condensation) Know the most important technical properties of fuels. Know the formation mechanisms, consequences and basic countermeasures for harmful emissions, as well as principles related to emissions legislation Understand and calculate different types of heat transfer (such as conduction, convection, radiation)

EBingwWERK3.2 Critically evaluate own solutions to problems in the field of electromechanical engineering.

EBingwWERK3.2 Critically evaluations.	< EBingwWERK3.2 Critically evaluate own solutions to problems in the field of electromechanical engineering.				
Course	Teaching methods	Evaluation methods	Course learning outcome		
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche				
E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises	written examination	To evaluate in a correct way the results of computer simulations and numerical techniques when designing feedback control systems.		
E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.		
E036111 Electrical Drives	practicum	open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) usin commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficie way.		
E099151 Engineering Project	seminar: practical PC room classes	oral examination report	Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost Being able to design a machine with attention for mechanical safety Being able to apply principles of Life Cycle Analysis on a machine design		

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Course Noot: leer- en evaluatievormen voorafgegaan door ** w	Teaching methods erden niet teruggevonden in de studiefiche	Evaluation methods	Course learning outcome
		200	
E001142 Basic Mathematics	lecture 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.
	lecture: plenary exercises		Being able to make a correct reasoning and to write it down in a structured way.
E070080 Chemical Thermodynamics	guided self-study	written examination	Application of the laws of thermodynamics on chemical systems.
	seminar: coached exercises	open book examination	Calculation of the solubility of ionic compounds in aqueous solutions.
	lecture		Calculation of the pH of aqueous solutions. Understand and apply chemical equilibrium.
E003043 Probability and Statistics	guided self-study	written examination with multiple	
,	seminar: coached exercises	choice questions	To perform a linear regression and to interpret its results
	lecture	open book examination	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	written examination	To name materials properties and to be able to distinguish between the different groups of materials
	seminar: practical PC room classes		To be able to select, by using a material selection software program, the most appropriate material for a specific engineering
	seminar: coached exercises lecture		problem taking into account various material properties
	icotaic		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 a		participation	Having a general knowledge about aspects of sustainability, entrepreneurship and ethics, and being able to apply those in the
	project	assignment	framework of engineering
E020061 Physics I	demonstration		activities. To understand the physical laws and concepts of the covered chapters.
LUZUUUT FTIYSICS T	lecture		To be able to solve problems by applying these laws and concepts.
E001132 Mathematical Analysis I	guided self-study	written examination	Being able to assess the convergence of numerical series and series of functions.
	lecture: plenary exercises	open book examination	To have acquired insight in the mathematical, geometric and physical interpretation of notions of primitive function, integral,
	seminar		improper integral and
	lecture		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		Being able to use power series for solving ordinary differential equations. Being able to perform stoichiometric calculations.
2070070 Chemistry. the Structure of Matter	seminar: coached exercises		Identify and describe the different types of intermolecular interactions.
	lecture		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.
g,a.ag aaoaoag	p. ojoot	. op o	Oral presentation
			Writing reports
E001222 Mathematical Analysis II	guided self-study	written examination	Being able to perform the chain rules for differentiable functions.
	seminar: coached exercises lecture: plenary exercises	open book examination	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.
	lecture		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	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.
C000002 Geometry and Linear Algebra	lecture: plenary exercises	open book examination	Having acquired skills in the manipulation of vectors.
	seminar		Being able to write down vector representations of curves and surfaces, and to perform chains of active and passive transforms
	lecture		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	written examination	To be able to solve physics problems by applying these laws and concepts.
F045400 T	lecture	participation	To understand the physical laws and concepts of the covered chapters.
E045120 Transport Phenomena	lecture seminar: practical PC room classes	open book examination	To understand the properties of fluids. To understand the similarities between transport of impulse, heat and mass.
	seminar: practical PC room classes seminar		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.
F004004 Mathematical LA	Lat.		To master the laws of statics and dynamics and to be able to apply them.
E001321 Mathematical Analysis III	lecture seminar: coached exercises	written examination	To master the basic theory of curves. To apply the residue theorem in a variety of situations.
	seminar: coacned exercises lecture: plenary exercises		το αρριγ της τεοισία τη τουτείτη τη α νατίετε στ οιτιατίστο.
	issuars. Promary expressions		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
			CONTROL VALUE OF CONTROL OF CONTR
			vector fields.

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E007120 Modelling and Control of Dynamic Systems	lecture seminar: coached exercises		Combining the knowledge of several engineering disciplines (electronics, electro-mechanical, physics, chemical engineering) in order to obtain mathematical models of physical dynamic systems. To design of controllers based on the application of root-locus techniques and frequency-response techniques such as Bode, Nyquist.
E044011 Mechanics of Structures	lecture seminar: coached exercises	written examination open book examination	Knowledge of the traditional formulas describing an elastic problem and the alternative formulations. Being able to assess the applicability of the traditional or alternative formulations. Be familiar with instability phenomena. Recognize the factors that affect the instability. Identification of the forces that dominate the stress and deformation state of a beam or column. Design of beams and columns able to resist well-defined forces. Knowledge and application of advanced beam theory.
E039110 Technical Thermodynamics	lecture	oral examination	Understanding the importance and application of exergy and anergy for processes. Explaining the important thermodynamic cycles.
E036111 Electrical Drives	lecture seminar: coached exercises practicum	written examination open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E063130 Mechanical Production Technology	lecture seminar: coached exercises	open book examination oral examination	Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes Recognize manufacturing machines and tools and explain their operation Explain the fundamental principles of plastic forming, machining and advanced manufacturing Critically compare and evaluate manufacturing processes
E040030 Dynamics of Rigid Bodies	lecture seminar: coached exercises	written examination open book examination	To calculate engineering problems of kinematics and kinetics of a rigid body in a plane motion To calculate simple engineering problems of kinematics and kinteics of a rigid body in a 3D motion
E062220 Machine Elements	lecture	oral examination	Understanding the operation of important machine elements
E036210 Electromagnetic Energy Conversion	lecture seminar	written examination	Insights into the operation of electrical equipment, especially transformers and DC machines. Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines. Analyze and solve problems related to electromagnetism Computation of magnetic fluxes and derived variables in magnetic networks.
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Analyse static optimisation of power division. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).
E037010 Heat and Combustion Engineering	lecture lecture: plenary exercises	written examination	To be able to characterize and calculate the thermodynamic aspects of combustion and different flame types. To be able to identify types of heat transfer and combustion in practical applications Calculate exhaust gas composition and enthalpy of a furnace. Being able to identify, describe and calculate heat transfer with phase change (evaporation / condensation) Know the most important technical properties of fuels. Know the formation mechanisms, consequences and basic countermeasures for harmful emissions, as well as principles related to emissions legislation Understand and calculate different types of heat transfer (such as conduction, convection, radiation)

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EBingwALG4.2 Carry out concrete assignments systematically.

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Competences in cooperation and communication

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
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.
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
E099151 Engineering Project	seminar: coached exercises seminar: practical PC room classes	assignment report	Being able to analyse a design question and translate it into sketch design Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections Being able to perform a detailed 3D machine design with SolidWorks Being able to calculate machine parts and defining main dimensions Being able to select main machine parts based on functionality, producability, (dis)assembly, and with attention to cost
E041011 Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	To be able to apply kinematics and dynamics techniques to mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms.

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EBingwALG4.3 Work as part of a team.

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Competences in cooperation and communication

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
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.
E032010 Electronic Systems and Instrumentation	practicum	skills test	Have the skill to communicate about own design of electronic systems in writing and in graphics.
E036111 Electrical Drives	practicum	open book examination	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
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
E099050 Cross-Course Project	project	oral examination report	
E036210 Electromagnetic Energy Conversion	practicum	skills test	Computation and measurement of electromagnetic and mechanical quantities in transformers and DC machines.
E041011 Kinematics and Dynamics of Mechanisms	lecture: plenary exercises	report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with several well known mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms.

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Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
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	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.
E098513 Modelling, Making and Measuring	lecture project	report	Concepts: working collaboration in a group, scientific techniques, use of scientific language. Oral presentation Writing reports
E007120 Modelling and Control of Dynamic Systems	practicum	report	To implement modeling and control on small scale setups by using personal laptop
E032010 Electronic Systems and Instrumentation	practicum	skills test	Have the skill to communicate about own design of electronic systems in writing and in graphics.
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
E099050 Cross-Course Project	project		
E099151 Engineering Project	seminar: practical PC room classes	oral examination report assignment	Being able to calculate machine parts and defining main dimensions Being able to extract 2D working drawings out of a 3D component, including dimensions and tolerances, surface finish, Being able to extract 2D drawings out of a 3D machine model by means of judiciously selected sections
E041011 Kinematics and Dynamics of Mechanisms	lecture	written examination report	Understanding and interpreting correctly the calculated quantities and their units. To be familiar with several well known mechanisms. To be familiar with velocities, accelerations, forces and energies in mechanisms. To be familiar with the basic notions of velocity, acceleration, force and energy in mechanisms. To be able to apply kinematics and dynamics techniques to mechanisms. To be familiar with the basic notions of analyzing the motion of mechanisms.

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

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet terug	ggevonden in de studiefiche		
E066012 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
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.
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
E039110 Technical Thermodynamics	excursion lecture	oral examination	Explaining the important thermodynamic cycles. Basic understanding of working principles and technology of piston machinery and turbomachinery.

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

Societal competences

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden niet teru	ggevonden in de studiefiche		
E098512 Sustainability, 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 Sustainable Business Operations	lecture	written examination with open questions assignment written examination with multipl 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 etheory) 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
E008310 Electrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Analyse static optimisation of power division. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).

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EBingwWERK5.1 Be aware of aspects of security and ecology and energy-efficiency in industrial environments.

Societal competences

Course	Teaching methods	Evaluation methods	Course learning outcome
Noot: leer- en evaluatievormen voorafgegaan door ** werden nie	t teruggevonden in de studiefiche		
E036111 Electrical Drives	excursion	skills test	Knowledge and understanding of operating principles and use of rotating field machines, of power electronic converters and of classical and power electronic electrical drives. Understanding of rotating field excitation, emf and force in rotating field electrical machines. Design, layout and dimensioning of an electrical drive with classical machines (DC, induction and synchronous machines) using commercial components (machines, converters) taking into account economical and energetic requirements. Usage of equivalent circuits of induction and synchronous machines, including simplifying these equivalent circuits in an efficient way.
E099151 Engineering Project	lecture seminar: practical PC room seminar: coached exercises		Being able to apply principles of Life Cycle Analysis on a machine design Being able to design a machine with attention for mechanical safety
E037010 Heat and Combustion Engineering	lecture		Know the formation mechanisms, consequences and basic countermeasures for harmful emissions, as well as principles related to emissions legislation

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EBingwWERK5.2 Be aware of the social and economic importance of the mechanical and electrotechnical industry.

<<	EBingwWERK5.2 Be aware of	electrotechnical industry.	Societal competence		
Course		Teaching methods	Evaluation methods	Course learning outcome	
Noot: leer- en e	valuatievormen voorafgegaan door ** werden niet	teruggevonden in de studiefiche			
E076040 Su	stainable 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 practica Mastering the basic concepts of macroeconomics and microeconomy: law of supply and demonopoly, 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 molanalysis 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	mand, markets (perfect competition,
E039110 Te	chnical Thermodynamics	excursion lecture	oral examination	Understanding the importance and application of exergy and anergy for processes. Understanding and application of the first and second law of thermodynamics.	
E063130 Me	echanical Production Technology	lecture seminar: coached exercises		Describe the working principles and applications of manufacturing processes Discuss on critical parameters that determine choice of manufacturing processes Calculate needed forces and power consumption for classical manufacturing processes Recognize manufacturing machines and tools and explain their operation Explain the fundamental principles of plastic forming, machining and advanced manufacturin Critically compare and evaluate manufacturing processes	ng
E099050 Cr	oss-Course Project	project	report		
E008310 Ele	ectrical Power Systems	lecture online seminar online lecture seminar: coached exercises lecture: plenary exercises		Understand the function and principles of electric power systems. Analyse static optimisation of power division. Calculate voltage drop in distribution networks. Understand transmission of active and reactive power (by means of load flow equations). Model and analyse three-phase systems in non-symmetrical conditions. Decompose three-phase quantities in symmetrical components. Understand power quantities (active, reactive, instantaneous, apparent power).	
E037010 He	eat and Combustion Engineering	lecture		Know the most important technical properties of fuels.	

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